

EN

Annex 9

Horizon Europe

Work Programme 2021-2022

*9. Food, Bioeconomy Natural Resources, Agriculture and
Environment*

DISCLAIMER

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Table of contents

Introduction	15
Destination 1 – Biodiversity and Ecosystem Services	20
Call - Biodiversity and Ecosystem Services	25
Conditions for the Call	25
Understanding biodiversity decline.....	27
HORIZON-CL6-2021-BIODIV-01-01: European participation in global biodiversity genomics endeavours aimed at identifying all biodiversity on Earth	27
HORIZON-CL6-2021-BIODIV-01-02: Data and technologies for the inventory, fast identification and monitoring of endangered wildlife and other species groups	29
HORIZON-CL6-2021-BIODIV-01-03: Understanding and valuing coastal and marine biodiversity and ecosystems services	31
HORIZON-CL6-2021-BIODIV-01-04: Assess and predict integrated impacts of cumulative direct and indirect stressors on coastal and marine biodiversity, ecosystems and their services	35
Valuing and restoring biodiversity and ecosystem services.....	38
HORIZON-CL6-2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding	38
HORIZON-CL6-2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector	42
HORIZON-CL6-2021-BIODIV-01-07: Ecosystems and their services for an evidence-based policy and decision-making	45
HORIZON-CL6-2021-BIODIV-01-08: Supporting the development of a coherent and resilient Trans-European Nature Network	47
HORIZON-CL6-2021-BIODIV-01-09: Assessing and consolidating recent scientific advances on freshwater ecosystem restoration.....	50
HORIZON-CL6-2021-BIODIV-01-10: Demonstration of measures and management for coastal and marine ecosystems restoration and resilience in simplified socio-ecological systems.	51
HORIZON-CL6-2021-BIODIV-01-11: What else is out there? Exploring the connection between biodiversity, ecosystems services, pandemics and epidemic risk.....	54
HORIZON-CL6-2021-BIODIV-01-12: Improved science based maritime spatial planning and identification of marine protected areas	56
Managing biodiversity in primary production	59
HORIZON-CL6-2021-BIODIV-01-13: Breeding for resilience: focus on root-based traits.....	59
HORIZON-CL6-2021-BIODIV-01-14: Fostering organic crop breeding.....	60
HORIZON-CL6-2021-BIODIV-01-15: Protection and sustainable management of forest genetic resources of high interest for biodiversity, climate change adaptation, and forest reproductive materials	63
Enabling transformative change on biodiversity	64

HORIZON-CL6-2021-BIODIV-01-16: Quantify impacts of the trade in raw and processed biomass on ecosystems, for offering new leverage points for biodiversity conservation, along supply chains, to reduce leakage effects.....	65
HORIZON-CL6-2021-BIODIV-01-17: Biodiversity, water, food, energy, transport, climate and health nexus in the context of transformative change	68
HORIZON-CL6-2021-BIODIV-01-18: Policy mixes, governance (including financing) and decision-making tools for transformative action for biodiversity	71
Interconnecting biodiversity research and supporting policies	73
HORIZON-CL6-2021-BIODIV-01-19: Rescuing Biodiversity to Safeguard Life on Earth73	
HORIZON-CL6-2021-BIODIV-01-20: A mechanism for science to inform implementation, monitoring, review and ratcheting up of the new EU Biodiversity Strategy for 2030 (“Science Service”).....	78
HORIZON-CL6-2021-BIODIV-01-21: Support to processes triggered by IPBES and IPCC	82
HORIZON-CL6-2021-BIODIV-01-22: Impact and dependence of business on biodiversity	84
Call - Biodiversity and Ecosystem Services	88
Conditions for the Call	88
Understanding biodiversity decline.....	89
HORIZON-CL6-2022-BIODIV-01-01: Observing and mapping biodiversity and ecosystems, with particular focus on coastal and marine ecosystems	89
HORIZON-CL6-2022-BIODIV-01-02: Building taxonomic research capacity near biodiversity hotspots and for protected areas by networking natural history museums and other taxonomic facilities	93
Valuing and restoring biodiversity and ecosystem services.....	95
HORIZON-CL6-2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions.....	96
HORIZON-CL6-2022-BIODIV-01-04: Natural capital accounting: Measuring the biodiversity footprint of products and organizations	99
Managing biodiversity in primary production	102
HORIZON-CL6-2022-BIODIV-01-05: Intercropping – understanding and using the benefits of complexity in farming and value chains	103
HORIZON-CL6-2022-BIODIV-01-06: Monitoring and effective measures for agrobiodiversity.....	105
Enabling transformative change on biodiversity.....	107
HORIZON-CL6-2022-BIODIV-01-07: Assessing the nexus of extraction, production, consumption, trade and behaviour patterns and of climate change action on biodiversity in the context of transformative change	107
HORIZON-CL6-2022-BIODIV-01-08: Understanding the role of behaviour, gender specifics, lifestyle, religious and cultural values, and addressing the role of enabling players (civil society, policy makers, financing and business leaders, retailers) in decision making	111

HORIZON-CL6-2022-BIODIV-01-09: Understanding the impacts of and the opportunities offered by digital transformation, new emerging technologies and social innovation with respect to biodiversity	113
Interconnecting biodiversity research and supporting policies	116
HORIZON-CL6-2022-BIODIV-01-10: Cooperation with the Convention on Biological Diversity	117
Call - Biodiversity and Ecosystem Services	118
Conditions for the Call	119
Managing biodiversity in primary production	120
HORIZON-CL6-2022-BIODIV-02-01-two-stage: Maintaining and restoring pollinators and pollination services in European agricultural landscapes.....	120
HORIZON-CL6-2022-BIODIV-02-02-two-stage: Boosting breeding for a sustainable, resilient and competitive European legume sector	125
HORIZON-CL6-2022-BIODIV-02-03-two-stage: Resilient beekeeping.....	127
Destination 2 – Fair, healthy and environmentally-friendly food systems from primary production to consumption.....	130
Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption.....	134
Conditions for the Call	134
Enabling sustainable farming	135
HORIZON-CL6-2021-FARM2FORK-01-01: Reaching the Farm to Fork target: R&I scenarios for boosting organic farming and organic aquaculture in Europe.....	135
HORIZON-CL6-2021-FARM2FORK-01-02: Developing sustainable and competitive land-based protein crop systems and value chains.....	137
HORIZON-CL6-2021-FARM2FORK-01-03: Digitalisation as an enabler of agroecological farming systems.....	140
HORIZON-CL6-2021-FARM2FORK-01-04: Tackling outbreaks of plant pests.....	142
HORIZON-CL6-2021-FARM2FORK-01-05: Animal welfare 2.0	143
HORIZON-CL6-2021-FARM2FORK-01-06: Vaccines and diagnostics for priority animal diseases.....	145
HORIZON-CL6-2021-FARM2FORK-01-07: Research & innovation roadmap for blockchain technologies in the agri-food sector.....	147
HORIZON-CL6-2021-FARM2FORK-01-08: Uncovering lock-ins and levers to encourage farmers to move to and stay in climate-neutral and sustainable food production systems: from experiments to systemic mechanisms.....	150
Enabling sustainable fisheries and aquaculture.....	153
HORIZON-CL6-2021-FARM2FORK-01-09: Sea to Fork transparency and consumer engagement.....	153
HORIZON-CL6-2021-FARM2FORK-01-10: Digital transition supporting inspection and control for sustainable fisheries.....	155
Transforming food systems for health, sustainability and inclusion.....	157

HORIZON-CL6-2021-FARM2FORK-01-11: Filling knowledge gaps on nutritional, safety, allergenicity and environmental assessment of alternative proteins and dietary shift	157
HORIZON-CL6-2021-FARM2FORK-01-12: Evidence-based decision-making to change social norms towards zero food waste.....	160
HORIZON-CL6-2021-FARM2FORK-01-13: Microbes for healthy and sustainable food and diets.....	163
HORIZON-CL6-2021-FARM2FORK-01-14: Transition to healthy and sustainable dietary behaviour	166
HORIZON-CL6-2021-FARM2FORK-01-15: Identification, assessment and management of existing and emerging food safety issues.....	169
HORIZON-CL6-2021-FARM2FORK-01-16: Increasing the transparency of EU food systems to boost health, sustainability and safety of products, processes and diets	171
Targeted international cooperation.....	175
HORIZON-CL6-2021-FARM2FORK-01-17: One health approach for Food Nutrition Security and Sustainable Agriculture (FNSSA).....	175
HORIZON-CL6-2021-FARM2FORK-01-18: EU-China international cooperation on integrated pest management in agriculture.....	176
Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption.....	178
Conditions for the Call	178
Enabling sustainable farming	180
HORIZON-CL6-2022-FARM2FORK-01-01: Risk assessment of new low risk pesticides	180
HORIZON-CL6-2022-FARM2FORK-01-02: Socio-economics of pesticide use in agriculture.....	182
HORIZON-CL6-2022-FARM2FORK-01-03: Enhancing biosecurity in terrestrial livestock production.....	183
HORIZON-CL6-2022-FARM2FORK-01-04: Towards an EU approach to assess and internalise positive and negative externalities of agri-food products for incentivising sustainable choices	185
HORIZON-CL6-2022-FARM2FORK-01-05: Innovative solutions to prevent adulteration of food bearing quality labels: focus on organic food and geographical indications.....	188
Enabling sustainable fisheries and aquaculture.....	190
HORIZON-CL6-2022-FARM2FORK-01-06: Integrated and sustainable freshwater bioeconomy: Combining aquaculture, biodiversity preservation, biotechnology and other uses	190
HORIZON-CL6-2022-FARM2FORK-01-07: Biosecurity, hygiene, disease prevention and animal welfare in aquaculture	192
Transforming food systems for health, sustainability and inclusion.....	194
HORIZON-CL6-2022-FARM2FORK-01-08: Building alternative protein-friendly sustainable and healthy food environments.....	194
HORIZON-CL6-2022-FARM2FORK-01-09: Research and innovation for food loss and waste prevention and reduction through harmonised measurement and monitoring.....	197

HORIZON-CL6-2022-FARM2FORK-01-10: Microbiomes in food production systems	199
HORIZON-CL6-2022-FARM2FORK-01-11: Integrated surveillance system to prevent and reduce diet-related Non Communicable Diseases (NCDs)	202
HORIZON-CL6-2022-FARM2FORK-01-12: Effective systems for authenticity and traceability in the food system	205
Targeted international cooperation	208
HORIZON-CL6-2022-FARM2FORK-01-13: Agro-ecological approaches in African agriculture systems	208
HORIZON-CL6-2022-FARM2FORK-01-14: AU-EU Combatting all forms of malnutrition	210
HORIZON-CL6-2022-FARM2FORK-01-15: African Food cities	212
HORIZON-CL6-2022-FARM2FORK-01-16: Support for international research on infectious animal diseases	215
Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption	216
Conditions for the Call	216
Enabling sustainable farming	217
HORIZON-CL6-2022-FARM2FORK-02-01-two-stage: Agroecological approaches for sustainable weed management	218
HORIZON-CL6-2022-FARM2FORK-02-02-two-stage: Emerging and future risks to plant health	220
HORIZON-CL6-2022-FARM2FORK-02-03-two-stage: Animal disease ecology	221
HORIZON-CL6-2022-FARM2FORK-02-04-two-stage: Smart solutions for the use of digital technologies for small- and medium-sized, farms and farm structures	223
Enabling sustainable fisheries and aquaculture	225
HORIZON-CL6-2022-FARM2FORK-02-05-two-stage: Innovative food from marine and freshwater ecosystems	225
Destination 3 – Circular economy and bioeconomy sectors	228
Call - Circular economy and bioeconomy sectors	233
Conditions for the Call	233
Enabling a circular economy transition	234
HORIZON-CL6-2021-CircBio-01-01: Circular Cities and Regions Initiative (CCRI)’s circular systemic solutions	234
HORIZON-CL6-2021-CircBio-01-02: Circular Cities and Regions Initiative’s Project Development Assistance (CCRI-PDA)	236
HORIZON-CL6-2021-CircBio-01-03: Innovative solutions to over-packaging and single-use plastics, and related microplastic pollution	239
Innovating sustainable bio-based systems and the bioeconomy	241
HORIZON-CL6-2021-CircBio-01-04: Novel, non-plant biomass feedstocks for industrial applications	241

HORIZON-CL6-2021-CircBio-01-05: Contained biomass solutions for sustainable and zero-Indirect Land Use Change (ILUC) production systems for high value applications .	243
HORIZON-CL6-2021-CircBio-01-06: Microbiomes for bio-based innovation and environmental applications	246
HORIZON-CL6-2021-CircBio-01-07: Mainstreaming inclusive small-scale bio-based solutions in European rural areas	248
Innovating for blue bioeconomy and biotechnology value chains.....	250
HORIZON-CL6-2021-CircBio-01-08: Unlocking the potential of algae potential for a thriving European blue bioeconomy	250
Call - Circular economy and bioeconomy sectors	252
Conditions for the Call	252
Enabling a circular economy transition.....	253
HORIZON-CL6-2022-CircBio-01-01: Circular Cities and Regions Initiative’s Project Development Assistance (CCRI-PDA)	253
Innovating sustainable bio-based systems and the bioeconomy	256
HORIZON-CL6-2022-CircBio-01-02: Marginal lands and climate-resilient and biodiversity-friendly crops for sustainable industrial feedstocks and related value chains	256
HORIZON-CL6-2022-CircBio-01-03: Benefits of the transition towards sustainable circular bio-based systems from linear fossil-based	259
HORIZON-CL6-2022-CircBio-01-04: Maximizing economic, environmental and social synergies in the provision of feedstock for bio-based sectors through diversification and increased sustainability of agricultural production systems.....	261
HORIZON-CL6-2022-CircBio-01-05: EU-China international cooperation on unlocking the potential of agricultural residues and wastes for circular and sustainable bio-based solutions	262
Safeguarding the multiple functions of EU forests	265
HORIZON-CL6-2022-CircBio-01-06: Strengthening the European forest-based research and innovation ecosystem	265
Innovating for blue bioeconomy and biotechnology value chains.....	267
HORIZON-CL6-2022-CircBio-01-07: Marine microbiome for healthy oceans and a sustainable blue bioeconomy	267
Call - Circular economy and bioeconomy sectors	269
Conditions for the Call	269
Enabling a circular economy transition.....	271
HORIZON-CL6-2022-CircBio-02-01-two-stage: Increasing the circularity in textiles, plastics and/or electronics value chains	271
HORIZON-CL6-2022-CircBio-02-02-two-stage: Integrated solutions for circularity in buildings and the construction sector	273
Innovating sustainable bio-based systems and the bioeconomy	275
HORIZON-CL6-2022-CircBio-02-03-two-stage: Exploring extreme environments: novel adaptation strategies at molecular level for bio-based innovation	275

HORIZON-CL6-2022-CircBio-02-04-two-stage: Sustainable biodegradable novel bio-based plastics: innovation for sustainability and end-of-life options of plastics.....	277
HORIZON-CL6-2022-CircBio-02-05-two-stage: Photosynthesis revisited: climate emergency, “no pollution and zero-emission” challenge and industrial application	279
HORIZON-CL6-2022-CircBio-02-06-two-stage: Life sciences and their convergence with digital technologies for prospecting, understanding and sustainably using biological resources.....	281
Safeguarding the multiple functions of EU forests	283
HORIZON-CL6-2022-CircBio-02-07-two-stage: Harnessing the digital revolution in the forest-based sector.....	284
Destination 4 – Clean environment and zero pollution	286
Call - Clean environment and zero pollution.....	290
Conditions for the Call	290
Halting emissions of pollutants to soils and waters	291
HORIZON-CL6-2021-ZEROPOLLUTION-01-01: Regional nitrogen and phosphorus load reduction approach within safe ecological boundaries.....	291
HORIZON-CL6-2021-ZEROPOLLUTION-01-02: Optimization of nutrient budget in primary production.....	294
Protecting drinking water and managing urban water pollution	296
HORIZON-CL6-2021-ZEROPOLLUTION-01-03: Preventing and managing diffuse pollution in urban water runoff	296
Addressing pollution on seas and oceans	298
HORIZON-CL6-2021-ZEROPOLLUTION-01-04: Achieving zero polluted seas and oceans.....	299
Increasing environmental performances and sustainability of processes and products	300
HORIZON-CL6-2021-ZEROPOLLUTION-01-05: Environmental sustainability criteria for biological feedstock production and trade in bio-based systems: impacts and trade-offs .	300
HORIZON-CL6-2021-ZEROPOLLUTION-01-06: Increasing the environmental performance of industrial processes in bio-based sectors: construction, woodworking, textiles, pulp and paper and bio-chemicals	301
HORIZON-CL6-2021-ZEROPOLLUTION-01-07: International and EU sustainability certification schemes for bio-based systems	303
HORIZON-CL6-2021-ZEROPOLLUTION-01-08: New genomic techniques (NGT): understanding benefits and risks – focus on bio-based innovation.....	305
HORIZON-CL6-2021-ZEROPOLLUTION-01-09: Environmental impacts and trade-offs of alternative fertilising products at global/local scale.....	308
HORIZON-CL6-2021-ZEROPOLLUTION-01-10: Environmental services: improved bioremediation and revitalization strategies for soil, sediments and water.....	309
Call - Clean environment and zero pollution.....	312
Conditions for the Call	312
Halting emissions of pollutants to soils and waters	313

HORIZON-CL6-2022-ZEROPOLLUTION-01-01: Preventing groundwater contamination and protecting its quality against harmful impacts of global and climate change	313
HORIZON-CL6-2022-ZEROPOLLUTION-01-02: Piloting innovative governance solutions to limit nitrogen and phosphorus emissions at the interface of rural/coastal and urban/industrial environments.....	316
HORIZON-CL6-2022-ZEROPOLLUTION-01-03: EU-China international cooperation on nature-based solutions for nutrient management.....	318
Protecting drinking water and managing urban water pollution	320
HORIZON-CL6-2022-ZEROPOLLUTION-01-04: Securing drinking water quality by protecting water sources against pollution, providing innovative monitoring and treatment solutions and ensuring safe distribution	320
Destination 5 – Land, oceans and water for climate action	324
Call - Land, oceans and water for climate action.....	328
Conditions for the Call	328
HORIZON-CL6-2021-CLIMATE-01-01: Improved understanding, observation and monitoring of water resources availability.....	329
HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet (Water4All)	332
HORIZON-CL6-2021-CLIMATE-01-03: Key polar processes driving regional & global climate change.....	336
HORIZON-CL6-2021-CLIMATE-01-04: Demonstration network on climate-smart farming – linking pilot farms	340
HORIZON-CL6-2021-CLIMATE-01-05: Agroecological approaches for climate change mitigation, resilient agricultural production and enhanced biodiversity	342
HORIZON-CL6-2021-CLIMATE-01-06: Resilient livestock farming systems under climate change.....	344
HORIZON-CL6-2021-CLIMATE-01-07: International Research Consortium on (agricultural) soil carbon	346
HORIZON-CL6-2021-CLIMATE-01-08: Agroforestry to meet climate, biodiversity and farming sustainability goals	347
HORIZON-CL6-2021-CLIMATE-01-09: Enhancing science-based knowledge on EU forests’, including old-growth forests, capacities to mitigate climate change	350
HORIZON-CL6-2021-CLIMATE-01-10: EU-China international cooperation on increasing the resilience of forests	352
Call - Land, oceans and water for climate action.....	354
Conditions for the Call	354
HORIZON-CL6-2022-CLIMATE-01-01: Climate sensitive water allocation systems and economic instruments.....	356
HORIZON-CL6-2022-CLIMATE-01-02: Understanding the oceanic carbon cycle	358
HORIZON-CL6-2022-CLIMATE-01-03: Demonstration network on climate-smart farming – boosting the role of advisory services	361

HORIZON-CL6-2022-CLIMATE-01-04: Fostering the resilience of food security: from observation of changes to the development of resilience strategies.....	363
HORIZON-CL6-2022-CLIMATE-01-05: Forestry - European observatory of climate change impacts and demonstration network of climate smart restoration pilots	364

Destination 6 – Resilient, inclusive, healthy and green rural, coastal and urban communities..... 367

Call - Resilient, inclusive, healthy and green rural, coastal and urban communities.... 370

Conditions for the Call	370
HORIZON-CL6-2021-COMMUNITIES-01-01: Grasping rural diversity and strengthening evidence for tailored policies enhancing the contribution of rural communities to ecological, digital and social transitions	371
HORIZON-CL6-2021-COMMUNITIES-01-02: Expertise and training centre on rural innovation.....	375
HORIZON-CL6-2021-COMMUNITIES-01-03: Smart XG, last-mile and edge solutions for remote farming, forestry and rural areas	378
HORIZON-CL6-2021-COMMUNITIES-01-04: Socio-economic empowerment of the users of the sea	380
HORIZON-CL6-2021-COMMUNITIES-01-05: Integrated urban food system policies – how cities and towns can transform food systems for co-benefits.....	383
HORIZON-CL6-2021-COMMUNITIES-01-06: Inside and outside: educational innovation with nature-based solutions.....	385

Call - Resilient, inclusive, healthy and green rural, coastal and urban communities.... 388

Conditions for the Call	388
HORIZON-CL6-2022-COMMUNITIES-01-01: Boosting women-led innovation in farming and rural areas.....	389
HORIZON-CL6-2022-COMMUNITIES-01-02: Assessing and improving labour conditions and health and safety at work in farming	392
HORIZON-CL6-2022-COMMUNITIES-01-03: Integration of marine ecosystem service valuation, conservation and restoration in socio-economic models.....	394
HORIZON-CL6-2022-COMMUNITIES-01-04: Social innovation in food sharing to strengthen urban communities’ food resilience.....	396
HORIZON-CL6-2022-COMMUNITIES-01-05: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities.....	399

Call - Resilient, inclusive, healthy and green rural, coastal and urban communities.... 402

Conditions for the Call	402
HORIZON-CL6-2022-COMMUNITIES-02-01-two-stage: Smart solutions for smart rural communities: empowering rural communities and smart villages to innovate for societal change.....	403
HORIZON-CL6-2022-COMMUNITIES-02-02-two-stage: Developing nature-based therapy for health and well-being.....	406

Destination 7 – Innovative governance, environmental observations and digital solutions in support of the Green Deal..... 410

Call - Innovative governance, environmental observations and digital solutions in support of the Green Deal 413

Conditions for the Call	413
Innovating with governance models and supporting policies	415
HORIZON-CL6-2021-GOVERNANCE-01-01: Mobilising the network of National Contact Points in Cluster 6.....	415
HORIZON-CL6-2021-GOVERNANCE-01-02: Furthering food systems science and federating researchers.....	417
HORIZON-CL6-2021-GOVERNANCE-01-03: Preparatory action for the Horizon Europe Food System Partnership.....	420
HORIZON-CL6-2021-GOVERNANCE-01-04: Strengthening bioeconomy innovation and deployment across sectors and all governance levels	422
HORIZON-CL6-2021-GOVERNANCE-01-05: Fostering strategic advice and synergies between national and EU Research and Innovation agendas, including SCAR foresight	425
HORIZON-CL6-2021-GOVERNANCE-01-06: Environmental and social cross-compliance of marine policies.....	426
HORIZON-CL6-2021-GOVERNANCE-01-07: Regional governance models in the bioeconomy	430
HORIZON-CL6-2021-GOVERNANCE-01-08: Improving understanding of and engagement in bio-based systems with training and skills development.....	432
HORIZON-CL6-2021-GOVERNANCE-01-09: Revitalisation of European local communities with innovative bio-based business models and social innovation	434
HORIZON-CL6-2021-GOVERNANCE-01-10: Raising awareness of circular and sustainable bioeconomy in support of Member States to develop bioeconomy strategies and/or action plans	436
HORIZON-CL6-2021-GOVERNANCE-01-11: Education on the bioeconomy including bio-based sectors for young people in primary and secondary education in Europe.....	438
HORIZON-CL6-2021-GOVERNANCE-01-12: EU agriculture within a safe and just operating space and planetary boundaries.....	439
HORIZON-CL6-2021-GOVERNANCE-01-13: Modelling land use and land management in the context of climate change.....	441
Deploying and adding value to Environmental Observations.....	443
HORIZON-CL6-2021-GOVERNANCE-01-14: User-oriented solutions building on environmental observation to monitor critical ecosystems and biodiversity loss and vulnerability in the European Union	443
HORIZON-CL6-2021-GOVERNANCE-01-15: Preparing for pre-commercial procurement (PCP) for end-user services based on Environmental Observation in the area Climate Change Adaptation and Mitigation	445
HORIZON-CL6-2021-GOVERNANCE-01-16: Tools to support the uptake and accessibility/exploitability of environmental observation information at European and global level	447

HORIZON-CL6-2021-GOVERNANCE-01-17: Common European Green Deal data space to provide more accessible and exploitable environmental observation data in support of the European Green Deal priority actions	449
Digital and data technologies as key enablers.....	451
HORIZON-CL6-2021-GOVERNANCE-01-18: Mapping and improving the data economy for food systems	451
HORIZON-CL6-2021-GOVERNANCE-01-19: Development of the markets and use of digital technologies and infrastructure in agriculture – State of play and foresight: Digital- and Data technologies for the agricultural sector in a fast changing regulatory, trade and technical environment	454
HORIZON-CL6-2021-GOVERNANCE-01-20: Data economy in the field of agriculture – Effects of data sharing and big data	456
Strengthening agricultural knowledge and innovation systems	458
HORIZON-CL6-2021-GOVERNANCE-01-21: Broaden EIP Operational Group outcomes across borders by means of Thematic networks, compiling and sharing knowledge ready for practice	458
HORIZON-CL6-2021-GOVERNANCE-01-22: Supporting knowledge exchange between all AKIS actors in the Member States by means of an EU-wide interactive knowledge reservoir.....	460
HORIZON-CL6-2021-GOVERNANCE-01-23: Improving national AKIS organisation in a co-creative process across the EU	463
HORIZON-CL6-2021-GOVERNANCE-01-24: Deepening the functioning of innovation support.....	465
HORIZON-CL6-2021-GOVERNANCE-01-25: Developing EU advisory networks on consumer-producer chains.....	468
Call - Innovative governance, environmental observations and digital solutions in support of the Green Deal	470
Conditions for the Call	471
Innovating with governance models and supporting policies	472
HORIZON-CL6-2022-GOVERNANCE-01-01: Mobilization of society to transform food systems for co-benefits.....	473
HORIZON-CL6-2022-GOVERNANCE-01-02: European Partnership for a climate neutral, sustainable and productive Blue Economy	474
HORIZON-CL6-2022-GOVERNANCE-01-03: Multi-layer governance performance of marine policies	479
HORIZON-CL6-2022-GOVERNANCE-01-04: Consumer-focused labelling options for bio-based products.....	481
HORIZON-CL6-2022-GOVERNANCE-01-05: Innovative tools and methods to evaluate the design and support, monitoring and implementation of effective CAP Strategic Plans	483
Deploying and adding value to Environmental Observations.....	485
HORIZON-CL6-2022-GOVERNANCE-01-06: New technologies for acquiring in-situ observation datasets to address climate change effects.....	485

HORIZON-CL6-2022-GOVERNANCE-01-07: Uptake and validation of citizen observations to complement authoritative measurement within the urban environment and boost related citizen engagement	486
HORIZON-CL6-2022-GOVERNANCE-01-08: Environmental observations solutions contributing to meeting “One Health” challenges.....	489
Digital and data technologies as key enablers.....	490
HORIZON-CL6-2022-GOVERNANCE-01-09: Piloting approaches and tools to empower citizens to exercise their “data rights” in the area of food and nutrition	491
HORIZON-CL6-2022-GOVERNANCE-01-10: Upscaling (real-time) sensor data for EU-wide monitoring of production and agri-environmental conditions.....	493
Strengthening agricultural knowledge and innovation systems.....	495
HORIZON-CL6-2022-GOVERNANCE-01-11: Thematic networks to compile and share knowledge ready for practice	495
HORIZON-CL6-2022-GOVERNANCE-01-12: Broaden EIP Operational Group outcomes across borders by means of Thematic networks, compiling and sharing knowledge ready for practice	497
HORIZON-CL6-2022-GOVERNANCE-01-13: Improving preparation of multi-actor projects to enable the relevant actors to work in a co-creative way.....	500
HORIZON-CL6-2022-GOVERNANCE-01-14: Developing EU advisory networks on water use.....	502
Call - Innovative governance, environmental observations and digital solutions in support of the Green Deal	504
Conditions for the Call	505
Innovating with governance models and supporting policies	506
HORIZON-CL6-2022-GOVERNANCE-02-01-two-stage: Water governance, economic and financial sustainability of water systems	506
Digital and data technologies as key enablers.....	508
HORIZON-CL6-2022-GOVERNANCE-02-02-two-stage: Potential of drones as multi-purpose vehicle – risks and added values.....	508
HORIZON-CL6-2022-GOVERNANCE-02-03-two-stage: Assessing the impacts of digital technologies in agriculture – Cost, benefits, and potential for sustainability gains	510
Other actions not subject to calls for proposals	514
Grant to identified beneficiary according to Financial Regulation Article 195(e).....	514
1. Dedicated support for the IPBES secretariat.....	514
Indirect Management.....	514
1. Circular City Centre (C3).....	514
2. Circular Economy Technical Assistance Facility (CETAF) for local and regional circular economy investments	517
3. Organisation for Economic Co-operation and Development (OECD)’s ‘Programme on the Circular Economy in Cities and Regions’	519

Public Procurements	520
1. Indicators and methods for measuring the transition to climate-neutral circularity, its benefits, challenges and trade-offs	520
2. Circular value chain analysis focusing on intra- and inter-value chain collaboration ...	522
3. Development of life-cycle information	524
4. Support the transition towards circular economy at local and regional scale	525
5. Strategic analysis and support for enhanced research cooperation in agriculture and food systems	526
6. Studies, conferences, events and outreach activities	526
Subscription Actions	527
1. GEO subscription 2021-2022	527
Scientific and technical services by the Joint Research Centre	527
1. Leveraging European data-sharing and exploitation practices within GEOSS (Global Earth Observation System of Systems)	527
Expert contract actions	528
Budget	529

Introduction

The Horizon Europe mandate to Cluster 6 is to provide opportunities to enhance and balance environmental, social and economic goals and to set human economic activities on a path towards sustainability. The underlying paradigm of Cluster 6 is therefore the need for a transformative change of the EU economy and society aimed at reducing environmental degradation, halting and reversing the decline of biodiversity and to better manage natural resources while serving the EU's climate objectives and ensuring food and water security. The Strategic Plan [include foot-note when text adopted] has identified six long term targeted impacts where Cluster 6 will make a difference.

These impacts are:

- Climate neutrality is achieved by reducing GHG emissions, maintaining natural carbon sinks, and enhancing the sequestration and storage of carbon in ecosystems, including by unfolding the potential of nature based solution, production systems on land and at sea as well as rural and coastal areas, where adaptations to climate change are also being fostered.
- Biodiversity is back on a path to recovery, and ecosystems and their services are preserved and sustainably restored on land, inland water and at sea through improved knowledge and innovation
- Sustainable and circular management and use of natural resources as well as prevention and removal of pollution are mainstreamed, unlocking the potential of the bioeconomy, ensuring competitiveness and guaranteeing healthy soil, air, fresh and marine water for all, through better understanding of planetary boundaries and deployment of innovative technologies and other solutions, notably in primary production, forestry and bio-based systems
- Food and nutrition security for all within planetary boundaries is ensured through knowledge, innovation and digitalisation in agriculture, fisheries, aquaculture and food systems, which are sustainable, resilient, inclusive, safe and healthy from farm to fork
- Rural, coastal and urban areas are developed in a sustainable, balanced and inclusive manner thanks to a better understanding of the environmental, socio-economic, behavioural and demographic drivers of change as well as deployment of digital, social and community-led innovations
- Innovative governance models enabling sustainability and resilience are established and monitored through enhanced and shared use of new knowledge, tools, foresight, and environmental observations as well as digital, modelling and forecasting capabilities

R&I in this Cluster will contribute to the UN's Sustainable Development Goals and accelerate the ecological transition required by the European Green Deal. Of particular relevance will be SDG 2 – Zero Hunger; SDG 3 – Good Health and Well-Being; SDG 6 - Clean Water and

Sanitation; SDG 8 – Decent Work and Economic Growth; SDG 9 – Industry, Innovation, and Infrastructure; SDG 11 – Sustainable Cities and Communities; SDG 12 - Responsible Consumption and Production; SDG 13 – Climate Action, SDG 14 – Life Below Water and SDG 15 - Life on Land". Activities under Cluster 6 will contribute to accelerating the ecological transition required by the European Green Deal in order to achieve climate neutrality by 2050, by enhancing Earth's natural carbon sinks such as soils and plants, forests, farmed lands and wetlands, reducing GHG emissions from the agricultural sector markedly and transforming the food system. In addition, activities will foster innovation to develop the circular economy and exploit the potential of biological resources for renewable products, thus reducing the EU's dependence on non-renewable resources, helping to reduce emissions/waste from industrial processes by the use of more sustainable bio-based systems and at the same time avoiding trade-offs for damage of biodiversity and promoting synergistic measures to protect it. R&I will support the objectives the EU Biodiversity Strategy for 2030, of the Circular Economy Action Plan, the EU Industrial Strategy, the Bioeconomy Strategy, the EU Forest Strategy, the Blue Growth Strategy, the Chemicals Strategy for Sustainability and the EU Plastics Strategy, in addition to the EU climate policy.

Protecting and restoring the integrity of ecosystems and their capacity to deliver a wide range of essential services, thus putting Europe's biodiversity on the path to recovery by 2030 as required by the EU Biodiversity Strategy is fundamental to achieving the European Green Deal objectives. Avoiding loss of biodiversity also has the potential to help avoid threats to human health in the future. R&I will address the multiple challenges in this area, including by enabling transformative changes. This Cluster will improve the knowledge on the causes of biodiversity decline, the role of ecosystems and their services and support their restoration. It deals with agriculture, forestry, aquaculture and fisheries, food and bio-based systems, animal and human health, which directly depend on ecosystem services. They have profound environmental impacts and at the same time are particularly affected by the global environmental changes. Their transformation will have to consider in particular climate adaptation and biodiversity needs. R&I activities will include solutions addressing indirect drivers of biodiversity loss, which at the same time impact climate and our resilience to adapt to it.

Cluster 6 will steer and accelerate the transition to sustainable, healthy and inclusive food systems, to achieve effectively the objectives of the Farm to Fork Strategy. It will empower farmers, fishermen and aquaculture producers to transform their production methods more quickly and efficiently and make the best use of nature-based, technological, digital and social innovations. This will deliver better climate mitigation and environmental results, increase climate resilience, reduce dependency on the use of pesticides and antimicrobials, while providing consumers with affordable, safe, nutritious, healthy and sustainable food. R&I will also stimulate practices at all stages of the food system from processing to services, up to use and valorisation of wastes and by-products and surplus management, ensuring safe and sustainable food and facilitating a shift to sustainable and healthy diets. R&I will also support the design, implementation and monitoring of the Common Agricultural Policy, the Common Fisheries Policy and the EU General Food Law.

Improved knowledge and innovations will be key to the success of the Zero-Pollution Ambition of the European Green Deal, to halt and prevent pollution, thereby addressing issues concerning fresh and marine waters, soils, nutrients as well as the environmental performance of processes. R&I will support EU environmental legislation and policies targeting a higher level of protection for biodiversity, soil, water, air and marine resources, including the Birds Directive and the Habitats directive, the Pollinators Initiative, the revised Soil Thematic Strategy and the EU Water Framework Directive as well as the Maritime Policy and the EU Arctic Policy.

The Cluster will support the development of resilient and vibrant rural, coastal, urban, and peri-urban areas in line with the Commission priority “An economy that works for people”. It will develop new governance models ensuring that no one is left behind to implement the Green Deal initiatives, necessary to ensure a fair and just transition. Advantage will be taken of the use, uptake and deployment of Environmental Observation as well as digital solutions in coherence with the EU priority “A Europe fit for the digital age”. Opportunities offered by the post-Covid-19 crisis recovery package will be grasped to set the economy on a path to sustainable development in line with the UN 2030 Agenda.

Research on societal and political framework is necessary to achieve the transformation expected and therefore R&I investments under Cluster 6 will emphasise the role of Social Sciences and Humanities, gender, inter/transdisciplinary and systems approaches. R&I will build on existing research infrastructures.

In line with the European Green Deal objectives, research and innovation activities should comply with the ‘do no significant harm’ principle¹, that should be assessed both for activities carried out during the course of the project as well as the expected life cycle impact of the innovation at a commercialisation stage. The potential harm of Innovation Actions contributing to the European Green Deal will be monitored throughout the project duration.

Cluster 6 activities will sustain the ambition of the EU on international fora in areas of paramount importance such as biodiversity, climate change, the management of natural resources, sustainable agriculture, food safety and food and nutrition security.

Specific requirements for multi-actor projects:

Proposals submitted for topics requesting to follow the multi-actor approach² should meet all of the following requirements. The multi-actor approach described herein, which is a form of responsible research and innovation aims to make the R&I process and its outcomes more demand-driven, reliable and relevant to society. This is more than just widely disseminating the results of a project, or listening to the views of a stakeholder board. A multi-actor project should ensure genuine and sufficient involvement of a targeted diversity of actors depending on the context of the topic. Relevant key actors to participate will depend on the objective of

¹ as defined in Articles 3(b) and 17 of Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment of the European Parliament and of the Council of 18 June 2020 (see Annex XY

² See topics (list of topic identifiers).

the proposal. They are essentially the (end-) **users³ of the project results** completed with some useful intermediaries who can bring in further useful knowledge, such as farmers / farmers' groups, foresters / foresters' groups, fishermen / fishermen's groups, advisors, food processors, businesses, consumer associations, local communities, citizens, civil society organisations including NGOs etc. The genuine and sufficient involvement of such actors should take place all along the project: from participation in the planning of the project and experiments, to implementation, the dissemination of results and a possible demonstration phase. Building blocks for the project proposal are expected to come from science as well as from practice and from intermediaries ("co-creation"). End-users and practitioners are to be involved, not as a study-object, but with a view to using their local knowledge and/or entrepreneurial skills for developing solutions and creating "co-ownership" of results, which speeds up the acceptance and take-up of new ideas. Therefore, a multi-actor project proposal should demonstrate:

- how the project proposal's objectives and planning are targeting needs/problems and opportunities of end-users of project results;
- how the composition of the consortium and the description of the project concept reflects a balanced choice of key relevant actors with complementary types of knowledge (scientific and practical), with a view to broad implementation of useful project results for practice;
- how the project includes existing (sometimes tacit) knowledge in scientific work. This should be illustrated in the project proposal with sufficient quantity of high-quality knowledge exchange activities and indicating the precise and active roles of the different non-scientific actors in the work. This should generate innovative findings and solutions that are more likely to be applied thanks to the cross-fertilisation of competencies and ideas between actors;
- how the project will facilitate the multi actor engagement process making use of the most appropriate methodologies
- the project's added value: how the project complements existing research and best practices;
- how the project results in practical knowledge, made easily understandable and accessible, and how this knowledge feeds into the existing dissemination channels most consulted by the users of the project results in the countries and regions;
- for EU-wide communication, this knowledge should also be assembled in a substantial number of 'practice abstracts' in the common EIP format⁴ of the European Innovation Partnership (EIP) 'Agricultural Productivity and Sustainability' (EIP-AGRI). For all

³ An "(end-) user" of project result is a person who is him/herself putting the project results into practice

⁴ The EIP common format for "practice abstracts" is available at: <https://ec.europa.eu/eip/agriculture/en/content/eip-agri-common-format>

other areas not covered by the EIP-AGRI⁵ - for instance, projects on fisheries, aquaculture, marine and inland water issues - other similarly effective solutions for dissemination through the main existing dissemination channels should be used;

- involvement, as much as possible, of interactive innovation groups operating in the EIP-AGRI context, such as EIP-AGRI Operational Groups funded under Rural Development Programmes⁶. It is strongly recommended that projects use skilled persons knowledgeable on the subject to facilitate discussions and mediate between the different types of actors joining the project.

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⁵ For the areas of innovative action of the EIP-AGRI: see EIP Commission Communication COM(2012) 79 final, chapter 8

⁶ <https://ec.europa.eu/eip/agriculture/en/eip-agri-projects/projects/operational-groups>
<https://ec.europa.eu/eip/agriculture/en/eip-agri-projects>
<http://ec.europa.eu/eip/agriculture/en/content/links-existing-operational-groups?stakeholder=3394>

Destination 1 – Biodiversity and Ecosystem Services

The EU Biodiversity Strategy for 2030 is a cornerstone of the European Green Deal that will put Europe's biodiversity on the path to recovery by 2030, for the benefit of people, climate and the planet. It will also prepare the EU to take a leading role in the upcoming international negotiations on a new global framework to halt biodiversity loss. With the Green Deal's 'do no harm' vision, all EU policies will become more biodiversity-friendly, focusing more on the sustainable use of ecosystems, supporting the recovery in a post-pandemic world⁷. This policy vision is fully supported in the Strategic Plan of Horizon Europe for 2021-2024 in its first key strategic orientation 'Protecting and restoring ecosystems and biodiversity and managing sustainably natural resources on land and at sea, and achieving climate neutrality and adaptation'. Consequently, Destination 1 "Biodiversity and Ecosystem Services" intends to achieve the following expected impact from Cluster 6 **"Biodiversity is back on a path to recovery, and ecosystems and their services are preserved and sustainably restored on land, inland water and at sea through improved knowledge and innovation"**. All actions funded under this destination must therefore contribute to deliver this main impact.

Research and innovation is key to delivering important impacts in the nexus biodiversity-food-health-water-climate and to achieving the goal of healthy and resilient ecosystems by 2030. It will also enable transformational change engaging European society and economy and their global impacts, making decisions more biodiversity-friendly. R&I will support policy targets, develop nature-based solutions⁸ and holistic approaches to address the main causes of biodiversity loss, particularly in connection to production systems, bringing all sectors to be integrated in ecosystem-based management. Investments in R&I will help to protect and restore the integrity of terrestrial, aquatic and marine ecosystems, currently under multiple pressures, and their capacity to deliver a wide range of essential services. Under Horizon Europe, a **long-term strategic research agenda for biodiversity** will also be developed.

The sixth mass extinction is taking place: one million species are at the risk of extinction, and degradation of ecosystems severely affects the fabric of life that enables the survival of humankind⁹. None of the globally agreed targets of the Strategic Plan for Biodiversity 2011-2020 has been fully achieved¹⁰, with the biodiversity crisis even deepening. Our knowledge on biodiversity status, pressures, impacts and responses needs to be improved, this requires even basic taxonomic work in certain ecosystems. **Understanding biodiversity decline** and addressing its main drivers through data-driven science, integrated multidisciplinary knowledge, new tools, models and scenarios, will support Europe's policy needs and boost

⁷ COM/2020/380 EU Biodiversity Strategy for 2030: Bringing nature back into our lives

⁸ Nature-based solutions are "inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services."

⁹ IPBES global assessment (2019). Summary for policy-makers.

¹⁰ United Nation's 5th Global Biodiversity Outlook (2020).

global biodiversity science. Solutions for preventing and addressing the individual and cumulative effect of direct drivers of biodiversity loss (land use change, overexploitation, climate change, invasive species, pollution) need to be further developed and made available to policy makers and practitioners, such as through the new Knowledge Centre for Biodiversity to be set up. For more impact on society and economic sectors, citizen science and crowdsourcing also require big data analysis, artificial intelligence, social sciences, communications and policy tools.

Valuing and restoring biodiversity and ecosystem services is necessary to develop tools to guide decisions, inform and implement policies on environment, water, health, climate, disaster risk reduction, agriculture, forests and other land use types, protected areas management, bioeconomy, blue economy, maritime spatial planning, and responsible business practices. The continued degradation of the ecosystems and their services affects biodiversity, climate change¹¹, and enhance the risk of severe ecological disasters and pandemics. The European Green Deal and its Biodiversity Strategy request urgent restoration efforts for damaged aquatic and terrestrial ecosystems to increase biodiversity and deliver a wide range of ecosystem services.

The contribution of ecosystems to human wellbeing and the economy is not properly accounted for in market transactions, planning, and investment decisions: social and economic co-benefits of healthy ecosystems are often disregarded. Natural capital accounts need to be developed and mainstreamed. Investments on R&I will also prepare the ground for scaling up and speeding up the implementation of technological, societal and nature-based solutions (NBS). NBS support vital ecosystem services, biodiversity and biomass provision, as well as access to fresh water, clean soil, improved livelihoods, healthy diets and food safety and security from sustainable food systems. NBS deployment will also create green jobs and build resilience to climate change and natural disasters. Citizens, authorities, businesses, social partners and the research community must be engaged at local, regional, national and European levels.

Managing biodiversity in primary production: Biodiversity is the basis for sustainable and resilient agriculture, fisheries, aquaculture and forestry, as also recognised in the Farm to Fork and Biodiversity strategies under the Green Deal. Diverse genetic resources allow to use in primary production plants and animals adapted to different environments and meeting diverse needs. Furthermore, the interplay between species below and above ground delivers important ecosystem services, such as pollination, soil fertility and pest control. Despite these recognised benefits, current production systems tend to be specialised and rely on a limited number of crops, breeds and forest tree species with a narrow genetic basis. Reversing this trend and increasing their resilience is critical and of global concern in particular in the current context of accelerated climate change and a growing population with an increasing footprint of production and consumption.

¹¹ <https://www.nature.com/articles/s41558-020-0738-8>

Enabling transformative change¹² on biodiversity: Science (IPBES and IPCC) and Policy (the global post-2020 biodiversity framework and the EU Biodiversity Strategy) clearly underline that biodiversity loss can only be successfully addressed if transformative changes will be initiated, accelerated, and up-scaled. There is however hardly any knowledge on potentials and challenges arising from transitions focused on biodiversity. System-level change of this kind starts through social innovation, for example, regulations, incentives, local and participatory processes, and through the introduction of new technologies, new processes of production, or consumer products, which change how socio-technical and socio-ecological systems operate and impact their environment. Such transformative change must decrease the impacts of indirect drivers of biodiversity loss, which are in turn, underpinned by societal values and behaviours. Indirect drivers of biodiversity loss are understood here as: Production and consumption patterns, human population dynamics and trends (including their footprints), trade, technological innovations, local to global governance (including financing). Research and innovation can enable these transformative changes to happen and initiate processes, behaviour changes and actions which are transforming the way we impact biodiversity. Socio-economic and multidisciplinary research, including on the role of education, will develop knowledge and tools to understand the role of transformative change for biodiversity policy making, address the indirect drivers for biodiversity loss, and accelerate biodiversity-relevant transformative changes in our society.

Interconnecting biodiversity research and supporting policies refers to the establishment of the European Partnership “Rescuing biodiversity to safeguard life on Earth” and to the support to other science-policy interfaces. The European Partnership on Biodiversity will connect national, local and European research, innovation and environmental programmes, combining resources in support of one goal - by 2030 biodiversity in Europe is back on a path of recovery. It will co-develop multidisciplinary research and innovation programmes with stakeholders, set up a European network of coordinated observatories for biodiversity monitoring, and implement a broad range of activities to increase the relevance, impact and visibility of EU research and innovation in tackling the biodiversity crisis in line with the [EU Biodiversity Strategy for 2030](#).

Science-policy interfaces on biodiversity and nature-based solutions have made good progress in the last years¹³, and must be stepped up to achieve targeted impacts on biodiversity-relevant policies, and to get in turn structured policy input into the research cycle. They are also key to guide biodiversity governance, and to implement the EU Green Deal and international conventions¹⁴. In line with the Commission priority 'A stronger Europe in the world', the European Union must take and demonstrate leadership in this field, notably by increasing its support to IPBES¹⁵ -to heave it to the same level as the IPCC-, and to the Convention on

¹² **Transformative change has been defined by IPBES as “A fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values”. IPBES global assessment (2019). Summary for policy-makers.**

¹³ Good leverage effects have been achieved, notably through EKLIPSE, Oppla, the NBS platform, the EU4IPBES support action 2018-2021.

¹⁴ In particular, the UN Convention on Biodiversity, and the Sustainable Development Agenda 2030

¹⁵ The Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services

Biological Diversity. All topics will directly contribute to the EU Biodiversity Strategy for 2030 and to the Sustainable Development Goals (SDGs) 13, 14, 15, 17.

Several Missions will also help to achieving biodiversity-related impacts, notably in the areas of “Adaptation to climate change including societal transformation”, “Climate-neutral and smart cities”, “Ocean, seas and waters” and “Soil health and food”.

Expected impact

Proposals for topics under this Destination should set out a credible pathway contributing to Biodiversity and Ecosystem Services, and more specifically to one or several of the following impacts:

- **Biodiversity decline, its main direct drivers and their interrelations are better understood and addressed** through the production, integration and use of open data, knowledge, education and training, innovative technologies, solutions and control measures, in collaboration with European and international initiatives.
- **Biodiversity and natural capital are integrated into public and business decision-making at all levels for the protection and restoration of ecosystems and their services;** science base is provided for planning and increasing protected areas, and sustainably managing ecosystems.
- **Europe builds competitive sustainability and tackles climate change and natural disasters through the deployment of nature-based solutions,** fully reaping their economic, social and environmental benefits for a green recovery across all European regions.
- **The interrelations between biodiversity, health, food, soil, water and climate are better known** and communicated to citizens and policy-makers; in particular, risks associated with microbiomes and biodiversity-friendly prevention/mitigation measures, and opportunities for biodiversity recovery are identified.
- **Practices in agriculture and forestry support biodiversity and the provision of other ecosystems services** based on a) a better understanding of functional biodiversity (above and below ground), b) effective knowledge and innovation systems and c) ready-to use solutions for land managers, adapted to specific conditions.
- **Access to a wider range of crops and breeds with a broadened genetic base is improved in line with global biodiversity commitments** through increased insight into the characteristics of genetic resources and enhancing capacities for their preservation and use in breeding and in primary production (farming, forestry, fisheries, aquaculture). More (bio)diverse, resilient production systems will have positive knock-on effects on value chains, consumption, healthy diets and the wider, non-managed biodiversity.
- **Approaches for enabling transformative changes in society** for biodiversity and ecosystems recovery are identified, tested and implemented in policy, governance, law

business and society; all indirect drivers of biodiversity loss are addressed and ‘do not harm’ biodiversity policies are mainstreamed across sectors.

- **Biodiversity research is interconnected** across Europe, supporting and enhancing the ambition of national, EU and international environmental policies and conventions.

The portfolio of actions under this destination will have impacts in the following areas: “Enhancing ecosystems and biodiversity on land and in waters”; “Climate change mitigation and adaptation”; “Clean and healthy air, water and soil”; “Sustainable food systems and nutrition security”; “A resilient EU prepared for emerging threats”

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2021	2022	
HORIZON-CL6-2021- BIODIV-01	218.50	20.00	01 Sep 2021
HORIZON-CL6-2022- BIODIV-01		90.00	15 Feb 2022
HORIZON-CL6-2022- BIODIV-02-two-stage		46.00	15 Feb 2022 (First Stage) 01 Sep 2022 (Second Stage)
Overall indicative budget	218.50	156.00	

Call - Biodiversity and Ecosystem Services

HORIZON-CL6-2021-BIODIV-01

Conditions for the Call

Indicative budget(s)¹⁶

Topics	Type of Action	Budgets (EUR million)		Expected EU contribution per project (EUR million) ¹⁷	Number of projects expected to be funded
		2021	2022		
Opening: 15 Apr 2021 Deadline(s): 01 Sep 2021					
HORIZON-CL6-2021-BIODIV-01-01	RIA	20.00		10.00 to 20.00	2
HORIZON-CL6-2021-BIODIV-01-02	RIA	10.00		3.00 to 5.00	2
HORIZON-CL6-2021-BIODIV-01-03	RIA	16.00		Around 16.00	1
HORIZON-CL6-2021-BIODIV-01-04	RIA	10.00		Around 10.00	1
HORIZON-CL6-2021-BIODIV-01-05	RIA	5.00		Around 5.00	1
HORIZON-CL6-2021-BIODIV-01-06	CSA	5.00		Around 5.00	1
HORIZON-CL6-2021-BIODIV-01-07	RIA	13.00		Around 13.00	1
HORIZON-CL6-2021-BIODIV-01-08	IA	10.00		Around	1

¹⁶ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

¹⁷ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

				7.00	
HORIZON-CL6-2021-BIODIV-01-09	CSA	0.50		Around 0.50	1
HORIZON-CL6-2021-BIODIV-01-10	IA	10.00		Around 10.00	1
HORIZON-CL6-2021-BIODIV-01-11	IA	12.00		4.00 to 12.00	2
HORIZON-CL6-2021-BIODIV-01-12	RIA	7.00		3.00 to 4.00	2
HORIZON-CL6-2021-BIODIV-01-13	RIA	16.00		Around 7.00	2
HORIZON-CL6-2021-BIODIV-01-14	IA	10.00		Around 5.00	2
HORIZON-CL6-2021-BIODIV-01-15	RIA	8.00		Around 8.00	1
HORIZON-CL6-2021-BIODIV-01-16	RIA	10.00		2.00 to 3.00	4
HORIZON-CL6-2021-BIODIV-01-17	RIA	5.00		Around 5.00	1
HORIZON-CL6-2021-BIODIV-01-18	RIA	8.00		2.00 to 3.00	3
HORIZON-CL6-2021-BIODIV-01-19	COFUND	20.00	20.00	Around 40.00	1
HORIZON-CL6-2021-BIODIV-01-20	CSA	13.00		11.00 to 13.00	1
HORIZON-CL6-2021-BIODIV-01-21	CSA	5.00		Around 5.00	1
HORIZON-CL6-2021-BIODIV-01-22	RIA	5.00		2.00 to 3.00	2
Overall indicative budget		218.50	20.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.

<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Understanding biodiversity decline

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-BIODIV-01-01: European participation in global biodiversity genomics endeavours aimed at identifying all biodiversity on Earth .¹⁸

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 10.00 and 20.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 20.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	<p>The conditions are described in General Annex B. The following exceptions apply:</p> <p>If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).</p> <p>In application of article 18(10) “Entities eligible for participation” of the Common Understanding, for this Call for Proposals, the international research organisations with headquarters in a Member State or associated</p>

¹⁸ Such as the International Barcode of Life (iBOL) consortium, <https://ibol.org/>, and the Earth BioGenome Project global consortium, <https://www.earthbiogenome.org/>

	country and whose principal objective is to promote scientific and technological cooperation, shall be deemed to be established in this Member State or associated country and are eligible for funding.
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Expected Outcome: In support of the implementation of the Green Deal and the EU Biodiversity Strategy for 2030, successful proposals will contribute to create and maintain European nodes and networks integrated into global biodiversity genomics initiatives, to better understand biodiversity decline, its main direct drivers and their interrelations.

Projects results are expected to contribute to at least four out of the six following expected outcomes:

- Creation and management of the European node of the International Barcode of Life.
- Creation of a European hub affiliated to the Earth Biogenome Project, with a common goal and clear targets.
- Set up the necessary networks, technologies, quality standards, reference atlas and taxonomic expertise through Europe to systematically, and comprehensively identify specific, intra-specific and ecosystem diversity through genomics techniques, such as full-genome sequencing, barcoding and metabarcoding.
- Advances in the assessment of pan-European biodiversity via genome sequencing and/or DNA barcoding of threatened/endangered species, ecologically through barcoding and/or genome sequencing (animals, plants, fungi and microorganisms), ecological keystone species and economically important species, (e.g. pollinators and their biome, soil, forest, and marine and/or freshwater communities as well as invasive species and/or disease vectors).
- Pan-European barcoding of pollinators by completing the Barcode of Life for European bees, butterflies, moths and hoverflies.
- Leverage active support and cooperation of citizen scientists and other non-professional taxonomists.

Scope: DNA-based identification systems can track biodiversity change at large geographic scales and reveal the interactions among the species in a biome. On the other hand, fully sequencing life, including, when relevant, information on symbiotic organisms, microbiomes and parasites, will provide new tools for the conservation, preservation and regeneration of biodiversity, drug discovery and advanced biotechnology.

The International Barcode of Life (iBOL) consortium has set up high-throughput barcoding infrastructure with the aim to barcode all biodiversity on earth by 2045 with the help of the international community and several new infrastructures across the world. Several European countries do currently participate in the barcoding endeavour, but there is no pan-European node of iBOL as such.

Similarly, the Earth BioGenome Project (EBP), initiated in 2018, aims to sequence and catalogue the genomes of all of Earth's currently described eukaryotic species over a period of ten years. Several European groups have joined the endeavour but no European target or project has been proposed yet.

Proposals should set up one or both European hubs for iBoL and/or EBP, and leverage resources and expertise to advance in the completion the barcoding and/or sequencing of European biodiversity in a smart and efficient way, taking advantage of existing networks, infrastructures and expertise. Specific groups of ecological or economic importance, or species under threat, such as pollinators, mycorrhizal fungi, invasive species or disease vectors, , should be adequately prioritised.

Projects should adequately plan their barcoding effort to maximise possible applications, such as, for example: registering patterns of biodiversity across ecoregions to forecast changes in response to anthropogenic drivers of biodiversity loss; discovering new species; tracking invasive alien species by metabarcoding forest soil samples, freshwaters or coastal waters; revealing symbiomes and trophic chains, etc. Proposals should contribute to the EU Biodiversity Strategy for 2030 by generating the reference genomes of the representative species across the tree of life, leveraging the existing genome sequencing facilities. Sample collection standards and protocols should be developed, validated and adopted, as well as engagement actions and tools to allow the participation of citizens and other non-professional-taxonomist stakeholders at different stages of the activities.

Data, results and methodologies from projects funded under this topic should contribute to the European Knowledge Centre for Biodiversity, and be permanently and openly accessible in any relevant repositories. International cooperation with strategic third country partners is particularly encouraged, for example with Canada.

HORIZON-CL6-2021-BIODIV-01-02: Data and technologies for the inventory, fast identification and monitoring of endangered wildlife and other species groups

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 3.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of

	Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
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Expected Outcome: In support of the implementation of the Green Deal, the EU Biodiversity Strategy 2030 and the Birds and Habitats Directives, successful proposals will contribute to bridge taxonomic and monitoring gaps, by providing methods, data, knowledge and models on the conservation status and ecological requirements of species and habitats, to better understand and address biodiversity decline, its main direct drivers and their interrelations.

Projects results are expected to contribute to some of the following expected outcomes:

- Systemic, integrated and (open-)standardised data, knowledge and models on the conservation status and ecological requirements of species and habitats, with a focus on those covered by the Birds and Habitats Directives and IUCN Red List. This will lead to better management of protected sites and species, in particular with a view to setting conservation objectives and developing appropriately designed and effective management plans
- Bridge taxonomic and monitoring gaps by developing, testing and implementing enabling tools, technologies and fast identification methodologies and the development of integrated monitoring systems across Europe on wildlife species that can help identify among others biodiversity threats, emergence of disease threats, conflict situations with production animals and or human communities etc.
- Models upscaling results of biodiversity assessments to wider areas, based on existing datasets of environmental descriptors.
- Integrative taxonomy to inventory pollinator species (bees, butterflies, moths and hoverflies), soil fauna (mites, springtails, woodlice, millipedes and earthworms) and/or other threatened species groups.

Scope: The EU Biodiversity Strategy contains concrete objectives to protect and restore biodiversity and to address the main pressures and threats to biodiversity. In order to reach them, basic research is required to better understand, monitor, observe and manage biodiversity, including in protected areas. Such knowledge is also indispensable to support the protection and restoration of natural capital and ecosystems.

Better data on species, biodiversity and ecosystems will also facilitate the mainstreaming of biodiversity preservation into other sectors, such as agriculture, transport, energy or the bioeconomy. There is a need for systemic and standardized biodiversity data on the ground, with a view to build up our knowledge on the status and trends of habitats and species and ecosystems, and on the drivers of decline.

The quality, relevance and cost-effectiveness of monitoring needs to be increased, inter alia by developing, testing and implementing new (long-term) approaches making use of recent technological advances and existing data from multiple origins (e.g. observation data, remote

sensing, DNA technologies, big data analysis, AI, deep learning, historical records, use of citizen science and volunteer expert data). Projects should integrate data, knowledge and models on the conservation status of species and habitats, with a focus on those covered by the Birds and Habitats Directives.

Particular regard needs to be paid to those species and habitats, for which still knowledge gaps exist, and to those that will be prioritised for conservation action in line with the EU Biodiversity Strategy 2030, such as pollinators, sea birds, marine mammals, invertebrates, amphibians, reptiles, bats, mosses, lichens, wetlands, coastal and marine areas, grasslands, mires, bogs and fens, heathland and shrubs.

The biogeographical approach of the Natura 2000 network needs to be taken into account. In the case the proposal decides to address the expected pollinator-related outcomes, projects should produce an inventory of pollinator species through integrative taxonomy, and bridge taxonomic gaps by developing tools (field guides, identification keys, national reference collections and checklists, European online ID platform, image recognition/apps, digitalized collections, etc.) with regard to bees, butterflies, moths and hoverflies.

Projects should contribute their data to and earmark the necessary resources for cooperation with the Knowledge Centre for Biodiversity and should promote synergies with the European co-funded Partnership on Biodiversity¹⁹ (HORIZON-CL6-2021-BIODIV-01-19) and its activities. Cooperation is also expected with other relevant projects and initiatives, such as EUROPABON awarded under the call “SC5-33-2020: Monitoring ecosystems through research, innovation and technology” or projects resulting from this and other EU-funded calls. Strong collaboration and networking is expected with the future taxonomy CSA resulting from topic HORIZON-CL62022-BIODIV-01-02: “Building taxonomic research capacity near biodiversity hotspots and for protected areas by networking natural history museums and other taxonomic facilities”.

HORIZON-CL6-2021-BIODIV-01-03: Understanding and valuing coastal and marine biodiversity and ecosystems services

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 16.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 16.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply:

¹⁹ <https://www.biodiversa.org/1759>

	If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In support of the implementation of the Green Deal and the Biodiversity Strategy, successful proposals will contribute to all the following expected outcomes notably to better understand biodiversity decline, its main direct drivers and their interrelations:

- Closing the gap in knowledge and exploration of marine biodiversity at the level of species, the intraspecific/genetic level, ecosystems, functionalities, trophic-interactions and interconnections across temporal and spatial scales;
- New theoretical frameworks of the organisation of marine biotic communities, with key species, from microbiome to megafauna, from benthic to pelagic, especially invertebrates and apex predators, and considering sex segregation determined by environmental parameters, in space and time and the ecosystems processes linking them (energy and biogeochemical cycles, including the role of migratory species behaviour), from deep sea to coastal biotopes including intertidal areas
- Ocean health prediction (including climate change vulnerability), decision making and policy implementation supported by the full integration of ecological with physical and geochemical components in four dimensions (surface, water columns, seafloor, time) into improved global and regional high-resolution models of ecosystems conditions and dynamics;
- Improved monitoring and detection of invasive alien species and conservation monitoring of endangered species;
- Natural capital accounting with estimation of the value and co-benefits of services from healthy deep sea to coastal ecosystems, including non-financial such as well-being, social and cultural values for policy and decision making;

Improved science-based maritime spatial planning and identification of Ecologically or Biologically Significant Marine Areas and design of Marine Protected Areas.

Scope: Studies estimate there may be 0.7 to 1.0 million eukaryotic marine species, of which about only 226,000 are described.. The EEA State of Nature Report 2013-2018 found a general lack of marine species data which hampers the elaboration of conservation and restoration measures, the sustainable management of ecosystems and, therefore, the achievement of favourable conservation status. For instance, invertebrates supporting lower level of food chain or marine mammals are amongst those species with the highest proportion of unknown assessments (over 78 %). In the deep sea, over 90% of the species may be new to

science. Additionally, very little is known about the effects of modern biogenic structures related to feeding types and morphological traits which may play a major role in biogeochemical cycles. Marine biodiversity hotspots in tropical and subtropical shallow areas host species and processes that are yet undescribed. The lack of biodiversity knowledge and appropriate monitoring are critical limiting factors in the definition and implementation of measures, where the range, population size and suitable habitat area are unknown in the majority of Member States and for the majority of vulnerable marine species and ecosystems. The main reasons are the limited access and high cost of explorations of the diversity of biotopes in the vast marine and coastal realm, in particular the deep sea, and the resources available to identify organisms across all size range (from microorganisms to megafauna).

Acidification, deoxygenation, global warming and climate change, including seasonal patterns, are affecting marine ecosystems faster than terrestrial ecosystems, with their cumulative and long term effects amplifying the unprecedented pressures of the rapidly evolving ocean economy, driven by human needs for food, energy, transportation and recreation as underlined by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment Report on Biodiversity and Ecosystem Services (IPBES GA, 2019). The effects have been documented on mobile and habitat building species over the past two decades and reveal an accelerating trend (IPBES GA, IPCC 2019). In addition, the marine realm hosts numerous species for which sex determination is dependent upon environmental conditions such as temperature, seasonal patterns, and other geochemical parameters. For these species, environmental changes may cause different responses and effects on species populations and related ecosystems functions that are not shown when studying the species indiscriminately of sex and population dynamics.

With so much still unknown, ecosystem processes cannot be fully understood. This weakens models of marine ecosystems and their responses to pressures and our capacity to predict and take the best measures. Since biodiversity is declining at an unprecedented rate in Earth's history, there is an urgent need to take conservation measures and develop holistic ecosystem-based management approaches to enable these ecosystems to be resilient to environmental changes and able to provide services for humankind and the planet's life support system. In order to do so, it is critical to improve knowledge, understand and model marine biodiversity as soon as possible.

- Increase understanding of the dynamics of marine biodiversity and ecosystems processes and functioning (incl. primary production and biogeochemical cycles) in Europe, including its Outermost Regions and Overseas Countries and Territories, for which the participation is encouraged, and also in areas beyond national jurisdictions. Integrate new and existing biodiversity data and knowledge from other EU, international and national projects and Long-Term Ecosystem and socio-ecological Research Infrastructure on species, biotopes and ecosystems processes including into new modelling and scenario approaches.
- Genomics and taxonomic technologies for the inventory and fast identification of marine species from microbes, plankton, invertebrates to migratory species, apex predators such

as sharks and mammals, corals and other habitat building species, generating reference datasets from identified voucher specimens and novel methods to improve biodiversity monitoring and inventory.

- Increase understanding of how input from freshwater and estuarine systems influence coastal marine communities and their ecosystem functionality.
- Use of acoustic monitoring as an integral component of any marine ecosystem exploration and assessment.
- Methods and indicators for regular and timely integrated assessments of the state / health of marine biodiversity and its key ecosystem services, in the EU and Associated countries marine waters (Good Environmental Status) and in areas beyond national jurisdiction.
- Contribution to the Global Taxonomy Initiative of the CBD and to free and open access to biodiversity data of the Global Biodiversity Information Facility.
- Opportunities for cooperation with relevant projects, such as EUROPABON awarded under the call “SC5-33-2020: Monitoring ecosystems through research, innovation and technology”, or the projects resulting from topics of HORIZON-CL6-DEC and from Destination 2 (aquaculture, fisheries), Destination 3 (biotechnologies, microbiome), Destination 5 (Carbon cycle and natural processes) and Destination 7 (environmental observation) should be identified. Furthermore, cooperation is expected with the Biodiversity partnership and other relevant Horizon Europe Missions and partnerships. Proposals should set out a clear plan on how they will collaborate with other projects selected under any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.
- Where relevant, creating links, contributing to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS), European Space Agency Earth Observation Programme and in particular the Flagship Actions on Biodiversity and Ocean Health of the EC-ESA Joint Earth system science initiative, is expected.
- Improvement of professional skills and competences on marine taxonomy and system thinking.
- Cooperation with the Knowledge Centre for Biodiversity.
- Contribution to enhancing the overall societal and public understanding of link between biodiversity and ecosystem functioning through education and training (school & ocean literacy, art and citizen science platforms).

In order to achieve the expected outcomes, international cooperation is advised.

HORIZON-CL6-2021-BIODIV-01-04: Assess and predict integrated impacts of cumulative direct and indirect stressors on coastal and marine biodiversity, ecosystems and their services

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In support of the implementation of the Green Deal and the Biodiversity Strategy, successful proposals will contribute to all following expected outcomes notably to better understand biodiversity decline, its main direct drivers and their interrelations:

- Policy makers and implementing authorities at national and regional level can assess and predict impacts (incl. tipping points) of multiple stressors on coastal and marine biodiversity (cf. sensitive species and habitats), ecosystems functioning and all its services (including climate change adaptation, resilience and human health)
- Better management of invasive species, harmful algal and jellyfish blooms
- Implementation of the Marine Strategy Framework Directive by determining pressure levels that clearly equate to acceptable levels of environmental impact on the Good Environmental Status.
- Ecosystem based management approaches and policy measures for activities both at sea and on land to reduce pressures to ensure Good Environmental Status and will enable the sustainability of coastal and marine ecosystems to deliver services and be resilient to rapid climate and environmental changes.

Scope: The European Environment - State and Outlook 2020²⁰ (EEA, SOER) underscore the fact that the current trajectories of social and economic development are destroying the ecosystems that ultimately sustain humankind. The Mapping and Assessment of Ecosystems and their Services: An EU Ecosystem assessment (Maes et al., 2020)²¹ points out the knowledge gaps in marine data and highlights that the data coverage in space and time is still insufficient to provide an exhaustive assessment of the condition of marine ecosystems and their services in Europe (incl. the outermost regions and overseas territories). The Marine Strategy Framework Directive (MSFD) Implementation Report (2020)²² underlines the lagging targets and actions to reach the Good Environmental Status in European seas. Consistently with the knowledge review in the latest IPCC SROCC²³ and IPBES GA²⁴ reports, shifting onto sustainable pathways will require urgent rapid and large-scale reductions in human and environmental pressures, going far beyond the current reductions. Europe is not making enough progress in addressing environmental challenges, that natural capital is not yet being protected, conserved and enhanced in accordance with the ambitions of the Seventh Environment Action Programme (7th EAP²⁵).

Pressures on marine biodiversity and ecosystems are increasing at a faster rate than the efforts to protect them. Adding to human direct pressures, the integrity of marine ecosystems and their capacity to deliver a wide range of multiple essential services and benefits to people is already and will be further undermined by the effects of climate and environmental changes which occurs faster in the ocean (like warming, stratification, sea level rise, extreme events, pollution, eutrophication, deoxygenation, and acidification).

There are still many stressors whose negative effects are not well defined, as their effects may only appear upon interacting with others stressors, creating unknown synergies. Identifying and defining direct and indirect anthropogenic and environmental stressors and their interactions should be the first step towards correctly quantifying their effects and feeding the models (forecast).

With increasing industrial use of the ocean space, there is a growing need for the development of tools for impact monitoring.

Conceptual and numerical models are crucial tools to understand how multiple factors interact and could affect non-linear systems such as natural ecosystems. They cannot be fully substituted by observations and monitoring, but empirical data is essential to validate model results and provide levels of uncertainty.

²⁰ The European environment — state and outlook 2020 (EEA SOER 2020) <https://www.eea.europa.eu/soer>

²¹ Maes et al., 2020

²² COM(2020)259 - MSFD Article 20 implementation report (https://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm)

²³ Special Report on the Ocean and Cryosphere in a Changing Climate (<https://www.ipcc.ch/srocc/>)

²⁴ Global Assessment Report on Biodiversity and Ecosystem Services (<https://ipbes.net/global-assessment>)

²⁵ The 7th Environment Action Programme (EAP) (<https://ec.europa.eu/environment/action-programme/>)

Models but also design and use of biodiversity scenarios are important approaches to perform ‘what if’ scenarios, in order to forecast potential impacts of different management options affecting the status of stressed ecosystems under evolving environmental conditions.

In order to facilitate and speed up the development of measures and holistic ecosystem-based management approaches that will promote the sustainability of coastal and marine ecosystems enable them to deliver services and be resilient to rapid climate and environmental changes, it is necessary to:

- Develop a systemic approach for the integrated impact assessment of cumulative direct and indirect stressors on coastal and marine ecosystems processes and services (from benthic to pelagic systems, from food to human health) and assessment of the state of coastal and marine ecosystems “health” or condition, and resilience to cumulative pressures.
- Characterise, measure, and understand the combined impact of different types of pressures or perturbations (chemicals and energy pollution, bioaccumulation, invasive species, extraction activities, river inflows and supplies of sediments and nutrients, hypoxia, pH, warming, etc.) on coastal and marine biodiversity and ecosystems condition (biotic communities, structure, biotope, and functions) from small cells to large ecosystems cells, from invertebrates to predators, and considering sex segregation of species determined by environmental parameters, in space and time including estimates of the extinction risks of species and structures, which might play key roles in the functioning of an ecosystem and in the conservation of marine biodiversity.
- Increased understanding of the biological mechanisms that determine the response of organisms and ecosystems to environmental changes (including components of stability, such as resistance, resilience and recovery), as well as the limits of their response adaptation capacity (tipping points), and the implications for the management of marine areas, habitats and species
- State of the Art Biologging technology and molecular methods, in combination with knowledge on oceanographic processes to understand the effects of agents of change on the ecology and population dynamics through different levels of marine food chains.
- Rationalise and advance strategies for monitoring European populations of marine species at the top of food chains, especially those that can indicate important changes in the oceanic environment, and have life histories that make them especially susceptible to change.
- Integrate existing and new biodiversity data and knowledge from multiple origins, including other EU (Horizon 2020 and previous framework Programmes), international and national research projects. Proposals should take into account all the relevant knowledge and data from the IPCC, IPBES, JRC, LIFE projects, MAES, the IUCN Guidelines and other relevant initiatives.

- Develop technologies, methods and models that can quantify and forecast how cumulative anthropogenic perturbations can affect ecosystem’s sustainability, productivity and resilience against environmental stressors.
- Where relevant, creating links, contributing to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS), European Space Agency Earth Observation Programme and in particular the Flagship Actions on Biodiversity and Ocean Health of the EC-ESA Joint Earth system science initiative, is expected.
- Contribution to enhancing the overall societal and public understanding of link between marine biodiversity and ecosystem functioning and human health through education and training (school & adult education, citizen science platforms)
- Cooperate with the Knowledge Centre for Biodiversity by providing and harnessing data and applying an integrated conceptual framework
- Opportunities for cooperation with the Biodiversity partnership and other relevant Horizon Europe Missions and partnerships, as well as synergies with relevant projects in Destination 2 (aquaculture, fisheries), Destination 4 (pollution), Destination 5 (climate) and Destination 6 (land sea connection, coastal areas) should be identified. Proposals should set out a clear plan on how they will collaborate with other projects selected under any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

In order to achieve the expected outcomes, international cooperation is advised.

Valuing and restoring biodiversity and ecosystem services

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.

<i>Type of Action</i>	Research and Innovation Actions
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Expected Outcome: A successful proposal will support the development of policies, business models and market conditions to scale up and speed up the implementation of nature-based solutions (NBS)²⁶. It will contribute to the wider deployment of NBS and to fully reaping their economic, social and environmental benefits in order to build a competitive sustainability in Europe and to tackle climate change. NBS contribute to the EU Biodiversity Strategy for 2030 and other Green Deal priorities, by supporting biodiversity and vital ecosystem services: climate change mitigation and enhancement of carbon sinks, biomass provision, access to fresh water, clean soil, healthy diets and lifestyles and sustainable food systems. NBS deployment will also create green jobs and build resilience to climate change and natural disasters.

Successful proposals will contribute to all following expected outcomes:

- Better understanding of the economic and financial performance of NBS, contributing to a greater promotion of investments in NBS and to an acceleration of market uptake.
- NBS markets are further developed and better structured.
- Actors involved in NBS markets are better equipped to conduct cost-benefit analysis and monetisation of NBS, and to address their funding needs, for greater implementation of NBS.
- NBS business cases are strengthened, contributing to greater adoption of NBS and awareness of their benefits.
- Regional and Europe-wide advisory services are equipped with better tools and create multi-stakeholder networks to more effectively support NBS project development and investment vehicles.
- NBS investment community is set-up where potential partners, entrepreneurs, investors, and innovation stakeholders can meet to discuss and advance investment in NBS based on informed decision-making.
- Informing Mission “A Climate Resilient Europe”, the EU Adaptation Strategy and the EU Taxonomy on Sustainable Finance.

Scope: Developing markets for NBS has proved a continuing challenge. NBS investments are many and varied, with their benefits and costs differing by project type and context. They produce a range of benefits, many of which are public goods with limited revenue streams

²⁶ As defined by the European Commission: Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services. In <https://ec.europa.eu/research/environment/index.cfm?pg=nbs>.

that may accrue to different stakeholder groups. Detailed understanding of these benefits is lacking. The same is true for potential economic benefits resulting from avoidance or reduction of costs due to NBS intervention (such as those related to insurance, penalty or capital costs). In addition, the variety of NBS and their context-specific nature across urban, periurban and rural realms, makes it difficult to predict reliably their commercial prospects. These features make financing of NBS projects challenging and investment from the private sector particularly so. As a result, funding of NBS has typically focused on a narrow range of public sources. Addressing knowledge gaps about the economic and financial performance of NBS investments, in combination with trialling the development of business cases and models for NBS implementation²⁷ is particularly urgent in the current context where NBS need to be exponentially scaled up to meet the policy priorities of the European Green Deal. Despite growing interest in NBS, upscaling NBS investment would require better understanding of different return on investment (ROI) models while accounting for indirect revenue streams associated with NBS (e.g. lower insurance costs for local government from investment in flood defences). The successful proposal will:

- Provide guidance for project developers and decision makers to take informed decisions about NBS: e.g. comparison of strengths and weaknesses of green and grey solutions in climate change adaptation; cost-benefit assessments for NBS (including both the initial capital investment and maintenance stage); resilience and insurance values of NBS²⁸; assessment of other co-benefits of NBS, including non-monetary ones;
- Analyse the potential for development of specific demand and supply chains in NBS;
- Provide methodological guidance on assembling NBS business cases, applying a Total Economic Value framework, of practical use to practitioners in making the case for NBS investments;
- Develop a coaching programme on NBS readiness assistance where businesses and projects selected for Investment Readiness Assistance will receive coaching packages tailored specifically to their readiness levels and business objectives to advance the maturity of projects;
- Create new or assess, streamline and provide access to existing toolboxes to support regional needs related to NBS financing and implementation; Consider the diversification of financing arrangements and mixes: co-financing and benefit sharing options with the private sector; PPPs; innovative financing mechanisms; and innovative arrangements, e.g. to involve and compensate the land owners who provide the space for NBS implementation;

²⁷ The socio-political and cultural aspects of NBS are, in turn, the focus of HORIZON-CL6-2022-COMMUNITIES-01-07: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities.

²⁸ Synergies should be considered with the dedicated topic HORIZON-CL6-2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector.

- Engage with financing organizations to support the development of and access to NBS-related financing facilities.
- Assess the impacts and opportunities for NBS associated with the EU Taxonomy on Sustainable Finance and support the practical implementation of the Taxonomy by stakeholders;
- Analyse innovative financing approaches, including NBS ‘green bonds’ and blended finance at appropriate levels (e.g. European cities), while envisioning synergies with the European Investment Bank and any other relevant actors;
- Identify the potential for private investment in different NBS typologies and identify the critical conditions/actions necessary for upscaling, including research related needs. Provide a strategy for greater finance mobilisation through, for example, a NBS investment community or marketplace where potential project partners, entrepreneurs, investors, and innovation stakeholders can meet to discuss and advance investment in NBS;
- Identify and analyse case studies of multiple-benefit, co-governance/co-ownership projects with participation of the private sector, exploring their costs and benefits, analysing their financing strategies and identifying critical success factors;
- Explore synergies and interconnection of different EU initiatives (such as INTERREG, LEADER, URBACT, Covenant of Mayors, etc.) in terms of financing and potential for more coordinated actions and aggregated impact on NBS;
- Develop additional training and tailored courses, networking and B2B matchmaking sessions and other relevant events.

Proposals should address all of the above points.

Proposals should bring together from the start multiple types of scientific expertise in both natural sciences and social sciences and humanities (in particular economics), as well as market experts and business representatives.

Collaboration with the Biodiversity Partnership (HORIZON-CF-PARTNERSHIP-BIODIVERSITY-2021-01) is expected in the context of reinforcing the knowledge base for assessing, developing and deploying Nature-based solutions.

The proposals will set out a clear plan on how they will collaborate with other projects selected under other relevant topics/calls²⁹, by participating in joint activities, workshops, as

²⁹ Notably the Horizon 2020 NBS project portfolio and its relevant task forces; HORIZON-CL6-2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector; HORIZON-CL6-2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions; HORIZON-CL6-2022-FARM2FORK-01-16: EU-China international cooperation on nature-based solutions for nutrient management; HORIZON-CL6-2022-COMMUNITIES-01-07: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities; HORIZON-CL6-2022-COMMUNITIES-01-06: Developing nature-based

well as common communication and dissemination activities and networking activities. In addition, the project will adopt an open access and open data approach whereby research outcomes will be freely shared following FAIR data principles³⁰. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission. Proposals must ensure that all evidence, information and project outputs will be accessible through the Oppla portal (the EU repository for NBS)³¹.

HORIZON-CL6-2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: This topic aims to support the development of policies, business models and market conditions to scale up and speed up the implementation of nature-based solutions (NBS)³². It will contribute to the wider deployment of NBS and to fully reaping their economic, social and environmental benefits in order to build a competitive sustainability in Europe and to tackle climate change. NBS contribute to the EU Biodiversity Strategy for 2030 and other Green Deal priorities, by supporting biodiversity and vital ecosystem services, notably building resilience to climate change and natural disasters.

Successful proposals will contribute to all following expected outcomes:

- More robust and integrated NBS for climate change adaptation and disaster risk reduction at local, regional, national and European level, notably contributing to the EU Sendai Framework, the EU Adaptation Strategy and Mission “A Climate Resilient Europe”.

therapy for health and well-being; HORIZON-CL6-2021-COMMUNITIES-01-06: Inside and outside: educational innovation with nature-based solutions.

³⁰ https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_0.pdf.

³¹ <https://oppla.eu/>.

³² As defined by the European Commission: Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services. In <https://ec.europa.eu/research/environment/index.cfm?pg=nbs>.

- Wider recognition and implementation of NBS as their benefits (avoided damages) are fully recognized when compared to the costs of inaction, thus contributing to greater resilience and competitiveness of the European economy and society.
- Greater engagement of the insurance sector in NBS markets and NBS funding and collaboration with other actors across different countries, regions, and cities.

Scope: The costs from climate-related hazards in Europe are increasing and are likely to rise even further and faster over the coming century due to a projected increase in the severity and frequency of events brought about by climate change. This will exacerbate other changes related to land use and urbanisation. While encompassing the whole cycle of disaster risk management, in line with the implementation of the EU Sendai Framework over the next ten years (2015-2030) and the new EU Adaptation Strategy, special attention on the role of prevention and risk reduction in Europe is needed, notably through nature-based solutions (NBS). The role that the insurance and reinsurance industry can play in resilience and risk reduction is not sufficiently explored. Previous research highlights that the insurance sector can support action as institutional investors, insurance providers, innovators of new insurance products or as partners bringing their risk management expertise³³. Data collected by insurance companies can help municipalities in their understanding of risk and to better prioritize climate adaptation measures³⁴. However, several barriers remain insufficiently addressed to further engage the insurance sector in the particular case of NBS – from data management issues to overcoming the uncertainty of investments, or finding adequate regulatory incentives³⁵.

The successful proposal will:

- Establish a network and the needed collaborative and participatory arrangements and spaces between all relevant stakeholders in risk reduction across scales: insurers and re-insurers (including insurance associations), public authorities (local, regional and/or national), financing bodies (e.g. the EIB and other investors), farmers associations, relevant actors from the scientific community and potential links to other relevant initiatives (such as the Covenant of Mayors);
- Facilitate a dialogue at different levels of such a network of stakeholders on potential opportunities, strategies or mechanisms to foster collaborative action for a more robust decision-making and for increased risk prevention through NBS;

³³ Weinberg, J., Thakar K., Marchal, R., Nanu, F. and Lopez Gunn, E. (2019). DELIVERABLE 8.3; Second Roundtable Report and Policy Brief. EU Horizon 2020 NAIAD Project, Grant Agreement N°730497.

³⁴ Ebeltoft, M. (2016). Private-Public-Project: sharing insurance loss data to local and national authorities, (and scientists) in DRR and resilience work. NORDRESS Island, January 2016.

³⁵ Marchal, R., Piton, G. Lopez-Gunn, E., Zorrilla-Miras, P. Van der Keur, P. Dartée, K. Pengal, P. et al. (2019). The (Re)Insurance Industry's Roles in the Integration of Nature-Based Solutions for Prevention in Disaster Risk Reduction—Insights from a European Survey. Sustainability 11 (22): 6212. <https://doi.org/10.3390/su11226212>.

- Identify risk-related data requirements, mechanisms, existing tools, and opportunities for better data sharing (and data crowdsourcing) to identify areas at risk and potential areas of intervention through NBS or hybrid approaches;
- Support the establishment of secure and efficient data sharing mechanisms between local authorities, insurers and the private sector, taking into appropriate consideration data privacy issues;
- Develop agreed and robust metrics for the quantification of risk reduction performance, and/or ways to assess risk mitigation potential from NBS, including better integration of NBS models and catastrophe models, damage estimates under climate change scenarios and avoided damages;
- Identify financing options and existing success stories for NBS investments from insurance companies, including through blending mechanisms;
- Identify new insurance products that are transparent and affordable in terms of risk premiums and/or pooling of risks;
- Highlight best practices, and remaining gaps, related to the use of NBS to reduce and control risks, considering the type of hazard, location, and scale of intervention;
- Identify specific case studies related to NBS and reduction of risk in EU policies (e.g. the EU Adaptation Strategy, the EU Sendai Framework, the Common Agricultural Policy, the EU Forestry policy, the Water Framework Directive, the Floods Directive, restoration objectives in the EU Biodiversity Strategy, etc.).

Proposals should address all of the above points.

Complementary activities such as interviews, research reviews and small research/experimentation-oriented actions may be envisaged. The stocktaking of previous Horizon 2020 projects on NBS and how these results can be integrated in future insurance sector involvement should also be addressed.

The proposals will set out a clear plan on how the project will collaborate with other projects selected under any other relevant topic/call³⁶, by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals will adopt an open access and open data approach whereby research outcomes will be freely shared following FAIR data principles³⁷. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the

³⁶ Notably the Horizon 2020 NBS project portfolio and its relevant task forces; HORIZON-CL6-2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding; HORIZON-CL6-2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions; HORIZON-CL6-2022-COMMUNITIES-01-07: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities.

³⁷ https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_0.pdf.

Commission. Proposals must ensure that project outputs will be accessible through the Oppla portal (the EU repository for NBS)³⁸.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2021-BIODIV-01-07: Ecosystems and their services for an evidence-based policy and decision-making

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 13.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 13.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: In support to the EU Biodiversity Strategy for 2030 the successful proposal will provide knowledge to support EU and its Member States as well as relevant Associated Countries in the implementation of its actions and commitments by contributing to the integration of biodiversity and natural capital into public and business decision-making at all levels for the protection and restoration of ecosystems and their services. Successful proposals will contribute to all of the following expected outcomes:

- Inform the policy decisions affecting the environment through a better understanding of the condition of ecosystems and their services in Europe, helping fill the current knowledge gaps.
- Contribute to the evidence and awareness of the importance of biodiversity, healthy ecosystems and the social and economic values that emerge from them through a better understanding of ecosystems services in relation with ecosystems condition.
- Support restoration targets and secure the sustainability of human activities and human well-being through the definition of the minimum criteria for ecosystems to achieve or maintain a healthy state or a good condition.

³⁸ <https://oppla.eu/>.

Scope: The first EU-wide Ecosystem Assessment report states that Europe's ecosystems, on which we depend for instance for food, timber, clean air, clean water, climate regulation and recreation, suffer from unrelenting pressures caused by intensive use of land or sea, climate change, pollution, overexploitation of natural resources and invasive alien species. Ensuring that ecosystems achieve or maintain a healthy state or a good condition is a key requirement to secure the sustainability of human activities and human well-being.

This proposal will cover the main knowledge gaps identified by the EU Ecosystem assessment³⁹ report to improve the assessment of the condition of ecosystems while providing uptake of the assessment's outcomes in policy. It must develop and test indicators not yet available for support of the ecosystem assessment. This includes developing the minimum criteria, reference levels and aggregation schemes to define good ecosystem condition. This definition is not restricted to protected areas, but should encompass also forests, agroecosystems, urban areas, soil ecosystems, wetlands, fresh water and marine ecosystems. The proposal should address regional diversity and the corresponding decision level.

The proposal should investigate how good ecosystem condition is related to the capacity of ecosystems to deliver ecosystem services and focus on quantification of ecosystem services and on data derived from biodiversity and ecosystem monitoring in combination with models to study these. The proposal must develop and test methods and tools (in particular methods developed for natural capital accounting) to consistently report harmonised and verified ecosystem data at EU and Member State and Associated Country level that can be used to regularly report or assess the pressures and condition of ecosystems, dynamics, trends and changes over time.

The proposal should bring the individual MAES components 1) map ecosystems, 2) map and assess condition of ecosystems, 3) map and assess ecosystem services delivered by ecosystems together in integrated ecosystem assessments to better understand how the condition of various ecosystem types influences the delivery of different ecosystem services.

The proposal should demonstrate how to apply the MAES⁴⁰ outputs and other relevant ecosystem knowledge in practical policy, including its implementation, and other decision-making process (public and private) at various spatial and temporal scales while involving relevant stakeholders and citizens.

³⁹ Maes, J., Teller, A., Erhard, M., Condé, S., Vallecillo, S., Barredo, J.I., Paracchini, M.L., Abdul Malak, D., Trombetti, M., Vigiak, O., Zulian, G., Addamo, A.M., Grizzetti, B., Somma, F., Hagyo, A., Vogt, P., Polce, C., Jones, A., Marin, A.I., Ivits, E., Mauri, A., Rega, C., Czúcz, B., Ceccherini, G., Pisoni, E., Ceglar, A., De Palma, P., Cerrani, I., Meroni, M., Caudullo, G., Lugato, E., Vogt, J.V., Spinoni, J., Cammalleri, C., Bastrup-Birk, A., San Miguel, J., San Román, S., Kristensen, P., Christiansen, T., Zal, N., de Roo, A., Cardoso, A.C., Pistocchi, A., Del Barrio Alvarelos, I., Tsiamis, K., Gervasini, E., Deriu, I., La Notte, A., Abad Viñas, R., Vizzarri, M., Camia, A., Robert, N., Kakoulaki, G., Garcia Bendito, E., Panagos, P., Ballabio, C., Scarpa, S., Montanarella, L., Orgiazzi, A., Fernandez Ugalde, O., Santos-Martín, F., *Mapping and Assessment of Ecosystems and their Services: An EU ecosystem assessment*, EUR 30161 EN, Publications Office of the European Union, Ispra, 2020, ISBN 978-92-76-17833-0, doi: 10.2760/757183, JRC120383.

⁴⁰ https://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm

The proposal should follow up on European and global projects and networks to facilitate dialogue among the relevant scientific communities, funding bodies, relevant stakeholders and user communities in Europe throughout the duration of Horizon Europe.

The proposal should test and demonstrate the links between biodiversity, ecosystems and macro-economic policies and national policies for instance on agriculture, fisheries, forestry and climate. The proposal should develop and test practical applications seeking to harness the full potential of ecosystem services for evidence-based decision making. Ecosystem services need to be uptake and better integrated in different sectoral policies including, amongst others, urban and regional development, the common agricultural policy, conservation planning or marine spatial planning.

Proposals should dedicate appropriate resources to develop joint deliverables (e.g. activities, workshops, as well as common communication and dissemination) with relevant projects funded under this call. Furthermore, cooperation is expected with the Biodiversity Partnership and the Science Service⁴¹. The proposal should set practical policy recommendations for the EU Biodiversity Strategy for 2030 targets, commitments, and ecosystem services-related policies, thereby contributing to the implementation, monitoring of progress and ratcheting up of the strategy's commitments as part of the European Green Deal.

Proposals should show how their results might provide timely information on relevant project outcomes⁴². for major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), as well as the Convention on Biological Diversity.

Proposals must ensure that all evidence, data and information will be accessible through the Oppla portal, and prepare the inclusion of its results to the Knowledge Centre for Biodiversity. The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

Where relevant, creating links to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) is expected.

HORIZON-CL6-2021-BIODIV-01-08: Supporting the development of a coherent and resilient Trans-European Nature Network

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately.

⁴¹

“HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)”

⁴²

Cooperation is requested with projects “HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC” and “HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity”

<i>project</i>	Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G. The following exceptions apply: Beneficiaries will be subject to the following additional obligations regarding open science practices: Proposals must ensure that all evidence, data and information will be accessible through the inclusion of its results to the Knowledge Centre for Biodiversity. The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

Expected Outcome: Contributing to the implementation of the EU Biodiversity Strategy for 2030, this topic aims to give support to building a coherent and resilient trans-European nature network (TEN-N) of protected areas, including through the set-up of ecological corridors, thereby contributing to the protection and restoration of ecosystems and their services in Europe.

Successful proposals will contribute to all of the following outcomes:

- Development of a coherent and resilient trans-European nature network of protected areas, by supporting Member States on the key commitments for protecting at least 30% of EU land area, and strictly protecting at least 10% of EU land area.
- Setting up of ecological corridors – within and outside the network - to prevent genetic isolation, allowing for species migration including the response to climate change, and maintaining and enhancing healthy ecosystems, and delivering multiple ecosystem services.

Promote, support and demonstrate innovative and replicable financing solutions for the upscaling investments in green and blue infrastructure⁴³ (GI) and nature-based solutions (NBS)

Scope: The EU biodiversity strategy for 2030 addresses the on-going biodiversity decline through an EU Nature Protection and Restoration Plan across land and sea, including through the deployment of a truly coherent TEN-N increasing and interconnecting the current network of protected areas. The strategy includes key commitments for 2030 for legally protecting a minimum of 30% of the EU's land area and 30% of the EU's sea area and strictly protecting one third of the EU's protected areas, including all remaining EU primary and old-growth forests. Additionally, setting up and integrating ecological corridors will be important to prevent genetic isolation, allowing for species migration and dispersal, and for maintaining and enhancing healthy ecosystems. This is particularly relevant for increasing resilience of the network with respect to climate change⁴⁴.

The proposal will set up a strategic plan to support national authorities in identifying and selecting the relevant priority areas for EU land protection and the set-up of ecological corridors. It should be built on the existing EU network of protected areas and based on the the EU Guidance to Member States⁴⁵, referred in the EU Biodiversity Strategy for 2030.

The proposal should consider various climate change scenarios, propose solutions for strengthening ecological connectivity under these different scenarios, through additional protected areas and ecological corridors. In this context, the proposal should also consider the role of Green Urban Spaces and intensively managed ecosystems.

The proposal will promote, support and demonstrate innovative and replicable financing solutions in GI and NBS and innovative cooperation and participatory approaches across borders among Member States on different levels involving a wide range of stakeholders across sectors.

Proposals should set out a clear plan and dedicate appropriate resources to collaborate with national authorities and stakeholders, other projects selected under any other relevant topic/call⁴⁶. Furthermore, cooperation is expected with the Biodiversity Partnership, the EU Natura 2000 Biogeographical Process⁴⁷ and the Science Service⁴⁸. Joint activities, workshops,

⁴³ Green Infrastructure is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings.” (European Commission, 2013)

⁴⁴ Climate change impacts on ecosystems are now evident across all ecosystems, for example, where climate change is increasing the risk of forest fires and other ecosystem degradation. Furthermore, climate change is projected to drive species to higher latitudes. A more coherent network of nature is one of the solutions to mitigate impacts of and adapt to climate change and allow species to migrate.

⁴⁵ This Guidance is currently under discussion in the frame of the EU Nature Directives Expert Group (NADEG) and should be finalized by the end of 2021 at the latest.

⁴⁶

⁴⁷ The Biogeographical Process is guided and monitored by the Expert Group on Natura 2000 Management, and Steering Committees composed of representatives of the Member States, the

as well as common communication and dissemination of the outcomes and outputs should be included. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

The proposal should provide knowledge to CBD (e.g. SBSTTA/SBI) and IPBES processes where relevant.

Proposals must ensure that all evidence, data and information will be accessible through the inclusion of its results to the Knowledge Centre for Biodiversity. The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

Where relevant, creating links to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) is expected.

HORIZON-CL6-2021-BIODIV-01-09: Assessing and consolidating recent scientific advances on freshwater ecosystem restoration.

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 0.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 0.50 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the implementation of the Green Deal and the Biodiversity Strategy, a successful proposal will improve the knowledge to restore ecosystems and halt biodiversity loss, in particular Destination 1 impact “Biodiversity in Europe is back on a path of recovery by 2030; ecosystems and their services are preserved and sustainably restored on land, in inland water and at sea through improved knowledge and innovation

The project will contribute to all of the following expected outcomes

- Support public authorities and other organisations engaged in ecosystem restoration to implement and prioritise innovative restoration approaches.
- Increase evidence of the potential of innovative restoration approaches to halt biodiversity loss and contribute to carbon storage in sediments and soils.

48 European Commission, the European Environment Agency, the European Topic Centre on Biological Diversity, the European Habitats Forum and the Natura 2000 Users Forum.
 “HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)

- Build the foundations for large scale restoration projects and related investments.

Scope: Freshwater ecosystems are degraded due to barriers and other morphological changes, loss of wetlands and floodplains, over abstraction of surface and ground waters, land management that reduces infiltration and generates pollution in land and seas. In responding to the climate and biodiversity crises and acknowledging that healthy water ecosystems are essential for climate adaptation there is an opportunity to determine how to prioritise and deliver aquatic and terrestrial ecosystem restoration at scale throughout Europe, both in rural and urban areas. There is a need to build on recent research from disparate research communities and approaches like the mapping and assessment of ecosystem services to identify how restoration can deliver on multiple objectives (ecosystem services, biodiversity protection, sediment management, climate adaptation, mitigation) and deliver value for citizens.

The objective of this topic is to determine how to implement the restoration of freshwater ecosystems and remove hydromorphological barriers to ensure sustainable environmental flows and to support achievement of good status in both surface and ground waters, long-term water resource management, biodiversity and climate resilience.

This topic will result in a comprehensive review of the knowledge about and past experience with effective approaches to freshwater ecosystem restoration. The scope will include methods for detection and identification of ecosystem degradation, assessment and restoration potential, methods for prioritisation including ones based on mapping of ecosystem services, options for restoration including ones for heavily modified water bodies, approaches to long-term management of restored ecosystems and approaches for monitoring and evaluation including proper evaluation of contribution to climate mitigation. The governance aspects will play important role including strengthening relevant institutions, cross-sectoral collaboration between water and other relevant authorities, financing models for restoration measures, and long term maintenance and protection of restored bodies, economic analysis of costs and benefits, including citizens engagement.

HORIZON-CL6-2021-BIODIV-01-10: Demonstration of measures and management for coastal and marine ecosystems restoration and resilience in simplified socio-ecological systems.

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions

<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: In support of the implementation of the Green Deal and the Biodiversity Strategy, a successful proposal will improve the knowledge to restore ecosystems and halt biodiversity loss, supporting notably the following impact in Destination 1: “Biodiversity decline, its main direct drivers and their interrelations are better understood and addressed”

Projects results are expected to contribute to all following expected outcomes:

- Demonstration of the best combinations of interventions and approaches in a simple socio-ecological system; guidelines to upscale them to more complex systems, for the restoration and protection of coastal and marine biodiversity and ecosystem services and their resilience to environmental changes in both protected and non-protected areas.
- Formulation and implementation of European & international marine related policies

Scope: Pressures on marine biodiversity, and the ecosystems they form a part of, are increasing at a faster rate than the efforts at protection. Adding to human direct pressures, the effects of climate and environmental changes are becoming main drivers affecting the integrity of marine ecosystems and their capacity to deliver a wide range of multiple essential services and benefits to people. Those global changes are occurring already and have a more rapid affect in the ocean than on land (like warming, stratification, sea level rise, extreme events, pollution, eutrophication, deoxygenation, and acidification).

There is an increasing need for a holistic ecosystem-based and knowledge-based overarching approach that ensures the sustainability and resilience of coastal and marine ecosystems with a Multi Actor Approach involving the four levers of transformation (science & innovation; economy & finance; individual & collective action; governance). This approach must at the same time integrate and balance different ocean uses and relevant land-based activities to optimize the overall sustainability of the ocean economy.

This topic aims at speeding up the identification, the development and integration of ad hoc measures and holistic ecosystem-based management approaches at larger scale, considering as well the land-sea interactions, especially connected inland waters, that will restore coastal and marine ecosystems and enable the sustainable delivery of services and resilience to rapid climate and environmental changes. To do so, it is necessary to test with no delay several types of interventions, tools and targets (conservation, restoration, holistic ecosystem-based management, marine Nature-based Solutions, social innovation) at realistic scales, with

spatially well-defined socio-ecological system boundaries before upscaling to larger and more complex socio-ecological systems.

- In this topic simplified socio-ecological systems are systems where the number of socio-economic activities, governance levels and range of ecosystems diversity are such that they allow for the experiment to be conducted within the duration of a project and the range of funding available. They should already include MPA and/or other area based management tools to allow for a quick start of the project's testing approaches. For example, but not exclusively, the system composed by Azores, Madeira, Canary Islands and Capo Verde (Macaronesia) or a system of Mediterranean islands (e.g., the Tuscan Archipelago) could provide an example of a large scale but simplified socio-economic system that could be used for assessing cumulated impacts and identifying solutions. Similarly, the Greenland- Iceland-Faeroe region could offer a site in sub-polar Arctic region for identifying integrated solutions for marine biodiversity management under rapid climate change conditions.
- This topic would allow projects in different simplified socio-ecological system so several measures and approaches could be conducted in parallel with a shared method enabling both highly system specific as well as shared challenges and solutions to be identified cross-islands / interregional cooperation and policy implementation. Social innovation and co-creation of the approaches and solutions by involving the four levers of transformation in the local communities would be central to enable proper scientifically sound and societally acceptable interventions.
- Innovative approaches and lessons learnt for upscaling measures and holistic socio-ecological management of marine and coastal ecosystems recognising the need to preserve the inherently dynamic nature of coastal ecosystems and their associated landforms. Projects should build on existing knowledge to avoid duplications and overlaps with past or ongoing research and integrate results from multiple origins, including other EU or national projects.
- Where relevant, creating links to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) is expected.
- Proposals should set out a clear plan on how they will collaborate with other projects selected under any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. Furthermore, cooperation is expected with the Biodiversity partnership and other relevant Horizon Europe Missions and partnerships. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

- Contribution to enhancing the overall societal and public understanding of link between biodiversity and ecosystem functioning through education and training (school & adult education, citizen science platforms)
- In order to achieve the expected outcomes, international cooperation is advised.

HORIZON-CL6-2021-BIODIV-01-11: What else is out there? Exploring the connection between biodiversity, ecosystems services, pandemics and epidemic risk

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 4.00 and 12.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-6 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to European Green Deal priorities and the EU Biodiversity Strategy for 2030, whilst supporting the EU’s response to the coronavirus outbreak, in the context of EU’s goal of leading just digital, economic and ecological transitions that will leave no one behind, One Health approaches, and the future European Health Union. It will explore the evolution and spread of microbiomes in the wild and their relationship with biodiversity loss, ecosystems dynamics and epidemics risk, in a broad societal, climate change and global context. By doing so, the interrelations between biodiversity, health and climate will be better known and communicated to citizens and policy-makers. In particular, risks associated with microbiomes and biodiversity-friendly prevention/mitigation measures, and opportunities for biodiversity recovery will be identified. This topic is also expected to have impacts related to “Climate change mitigation and adaptation” and “A resilient EU prepared for emerging threats”.

Projects results are expected to contribute to some or all of the following expected outcomes:

- The evolution and spread of microbiomes in the wild and their relationship with biodiversity loss and ecosystems dynamics is understood and modelled, within the

broader context of socio-economic driving forces, climate change, public health, and increasing resilience.

- Epidemics risks are understood, mapped and forecasted on the basis of relationships between factors such as land use, ecology, climate, biodiversity, and socio-economic factors, including wildlife trade, that determine the pace at which new pathogens emerge and then spread once transmission between humans occurs.
- Contribution to ecosystem services: use of novel technologies for better land use increasing biodiversity under unfavourable environmental/climatic conditions.
- Sustainable prevention/mitigation measures improving microbiomes and biodiversity recovery are proposed.
- Molecular and phylogenetic characterisation of potential emerging and novel pathogens and their hosts in natural areas for use as pre-leads in future vaccines and antimicrobials.
- Pathogen detection and surveillance strategies based on rapid, on-site, genomic tools allowing a fast and early response when facing potential outbreaks.
- New multidisciplinary collaborations that embody the One Health concept as a way to prevent pandemics, sustain biodiversity, promote human, animal and ecosystem health and nature conservation, as well as support the needed transformative change.
- Effective participation of indigenous and local communities in pandemics prevention strategies: risks management and opportunities for biodiversity recovery.

Scope: Wildlife microbiomes, whether symbiotic, commensal or pathogenic, and their potential to spread by crossing interspecies barriers, eventually reaching humans, are still largely unknown. Complex links between increased human disturbance, land-use change, habitat loss/degradation/fragmentation and biodiversity loss have all been linked to increases in the prevalence and risk of zoonotic disease for a variety of pathogens, mostly driven by human activities that modify the environment or spread pathogens into new ecological niches⁴⁹. Zoonotic diseases are significant threats to human health, with vector-borne diseases accounting for approximately 17 per cent of all infectious diseases and causing an estimated 700,000 deaths globally⁵⁰ in a normal year, which can more than double in pandemic years⁵¹.

The magnitude and direction of altered disease incidence due to anthropogenic disturbance differ globally and between ecosystems. Some described mechanisms and drivers that especially affect infectious disease risk are⁵² habitat alteration, depletion of predators,

⁴⁹ Whitmee et al. 2015 and CBD SoK 2015

⁵⁰ IPBES Global Assessment on Biodiversity and Ecosystem Services & IPBES The assessment report on land degradation and restoration.

⁵¹ In 2020, more than 1.64 million COVID-19 deaths have been officially registered worldwide (worldometers.info/coronavirus, 15 December 2020).

⁵² Patz & Confalonieri (2005) Human Health: Ecosystem Regulation of Infectious Diseases. Ecosystems and Human Well-being: Current State and Trends. 1. cited in IPBES global assessment report, 2019

deforestation, niche invasion, host transfer, biodiversity change, human-driven genetic changes, bushmeat hunting, environmental contamination by infectious agents, etc.

This call aims to recover biodiversity and ecosystems services whilst predicting and preventing future pandemics and epidemic outbreaks, especially in tropical areas and biodiversity hotspots, through collaboration between environmental, biomedical and social sciences. Projects should map, identify and characterise with molecular techniques potential emerging pathogens (especially viral) and their hosts in carefully selected natural areas, explore the relationship of biodiversity and ecosystems dynamics with microbiomes' evolution and spread, within the broader context of socio-economic driving forces, climate change and public health.

Pathogen discovery, profilaxis and surveillance strategies should be developed to search for new pathogens, especially viral, within natural ecosystems and hosts as well as in cases of human infectious diseases of unknown etiology, to prevent, detect and contain their outbreaks. Risk maps and predictive models should be built based on development trends, the presence of probable host species, and socio-economic factors.

The impacts of land use and climate change on biodiversity, ecosystem services and pandemics should be also taken into account, as well as any recent IPBES reports on the links between biodiversity and pandemics⁵³.

Ecologists, infectious-disease researchers, medical doctors, environmental researchers and authorities, public-health and animal-health experts, and the private sector, particularly SMEs, should contribute among others to devise an early warning mechanism, track environmental change, assess the risk of pathogens crossing over and reduce risky human activities.

Efforts to preserve biodiversity should address the economic and cultural factors that drive deforestation and the rural poor's dependency on hunting and trading wild animals. International cooperation with non-EU countries where new pathogens have emerged is encouraged.

Projects should contribute their data to and earmark the necessary resources for cooperation with the Knowledge Centre for Biodiversity. Collaboration with the Biodiversity Partnership (HORIZON-CL6-2021-BIODIV-01-19) and creating links to its activities is expected⁵⁴.

HORIZON-CL6-2021-BIODIV-01-12: Improved science based maritime spatial planning and identification of marine protected areas

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of between EUR 3.00 and 4.00 million would allow these outcomes to be addressed appropriately.

⁵³ IPBES (2020) Workshop Report on Biodiversity and Pandemics. Daszak, P. et al. doi:10.5281/zenodo.4147317 <https://ipbes.net/pandemics>

⁵⁴ <https://www.biodiversa.org/1759>

<i>project</i>	Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 7.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In support of the implementation of the Green Deal and the Biodiversity Strategy, a successful proposal will improve the knowledge to restore ecosystems and halt biodiversity loss, supporting notably the following impact in Destination 1: “Biodiversity and natural capital are integrated into public and business decision-making at all levels for the protection and restoration of ecosystems and their services; science base is provided for planning and increasing protected areas, and sustainably managing ecosystems”

Projects results are expected to contribute to all the following expected outcomes:

- Prioritisation of future protected areas, restoration areas, and science-based maritime spatial planning (including in larger scale hot spots identified in maritime national plans in order to develop ad hoc plans addressing specific scenarios so as to ameliorate the high impact of human activities over the ecosystem services).
- Implementation of the EU Biodiversity Strategy for 2030 (legally protect a minimum of 30% of the EU’s sea area of which 10% is strictly protected, and integrate ecological corridors, as part of a true Trans-European Nature Network, maritime spatial planning and ecosystem-based management covering all sectors and activities at sea, as well as area-based conservation-management measures) and the Convention on Biological Diversity post-2020 framework.
- Improved science based for the description of Ecologically or Biologically Significant marine Areas (EBSA)

Scope: Restored and properly protected coastal and marine ecosystems bring substantial health, social and economic benefits to coastal communities and the EU and Associated Countries as a whole. The need for stronger action is all the more acute as marine and coastal ecosystem biodiversity loss is severely exacerbated by global warming.

Achieving a good environmental status of marine ecosystems, will be accomplished not only through protected areas and the restoration of important ecosystems but also by the ways we use the sea so that we no longer endanger food security, fishers' livelihoods, and the fisheries and seafood sectors. The EU Biodiversity Strategy for 2030 underlines the application of an ecosystem-based management approach to reduce the adverse impacts of fishing, extraction, mining and other human maritime activities, taking into account pressures from land-based activities, especially on sensitive species and seabed habitats. To support this, national maritime spatial plans should aim to cover all blue economy sectors and take into account the natural ecological features and the link between them.

Experience and lessons learnt from existing marine protected areas (MPAs) show that our capacity to identify ideal locations for MPAs, their sizes, borders, management practices and their connectivity fails to consider the different aspects of biodiversity attributes, to recognise climate change impacts and lacks a sound scientific base in relation to certain aspects. The optimal locations, connectivity and restrictions in MPAs required to achieve the protection of biodiversity and ecosystem services remain uncertain and are likely to become even more dynamic as the marine environmental conditions are changing fast.

So far, there has been a predominance of MPAs and projects concerned with genes and species and less with individual traits and inter-specific processes, and very few addressing large-scale habitats and ecosystem level processes. Knowledge and scientific approaches are still lacking to address all biodiversity attributes using a coherent and systemic approach. Links and feedbacks between and within biodiversity attributes, ecosystem services and policy implications are lacking.

By building on and integrating existing knowledge and results from multiple origins, including other EU and national projects, research and innovation could pave the way to fill present gaps on marine biodiversity and its management by better linking spatially ecological features with socio-economic elements. It can also have potential links with activities funded by the European Maritime and Fisheries Fund, in particular calls and projects on Maritime Spatial Planning.

- Design of ad hoc innovative flexible socio-ecological management to cope with a rapidly changing environment for coastal, offshore and deep-sea marine ecosystems, taking into account their connectivity, including through deep-sea migratory species, and the need to preserve their inherent natural dynamics.
- Where relevant, creating links to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) is expected
- Proposals should set out a clear plan on how they will collaborate with other projects selected under any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. Furthermore, cooperation is expected with the Biodiversity partnership and other relevant Horizon Europe Missions and partnerships. Applicants should plan the

necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

- Provide approaches for greater policy coherence between the Water Framework Directive, Marine Strategy Framework Directive, Maritime Spatial Planning and the EU Biodiversity Strategy for 2030 and how these policies can better assist in the preservation of inherently and spatially dynamic systems.
- In order to achieve the expected outcomes, international cooperation is advised.

Managing biodiversity in primary production

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-BIODIV-01-13: Breeding for resilience: focus on root-based traits

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 16.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the objectives of the Biodiversity and Farm to Fork Strategies, a successful proposal will support the transition to more sustainable practices in agriculture and enhance the diversity of agroecosystems.

Project results are expected to contribute to all following expected outcomes:

- A better understanding of root-based traits (including the capacity to establish beneficial interactions with soil biota) and their genotypic variability as well as increased insight into the (adaptive) phenotypic plasticity of roots;
- Enhanced capacities for root phenotyping under controlled and on-field conditions
- ; Strategies for breeding for below-ground traits capitalising on more effective interactions between plants and microorganisms in the rhizosphere.
- Enhanced use and valorisation of genetic resources (in situ and ex situ) for root based traits.
- On the longer term: the development of crops (annual and perennial) and forest trees that are more tolerant to abiotic stress conditions and show an increased capacity for carbon

sequestration, thereby contributing to adaptation of agriculture and forestry to climate change.

Scope: With increasing effects of climate change and a shift towards low(er) input production systems, crops are needed that are capable of capturing resources more efficiently and are resilient to abiotic stress.

The root system and its interaction with soil biota is crucial for nutrient and water acquisition as well as for the capacity of plants to adapt to changing environments. Its phenotypic plasticity is key for plants to respond to varying soil conditions and highly dynamic distribution of soil resources. The size of the root system and its architecture also determine allocation of carbon in the soil. Breeding for root traits is therefore a promising strategy to increase plant stress resilience alongside soil carbon sequestration.

Proposals will:

- Identify root traits that enhance resource efficiency of plants in different environments, taking into account beneficial plant – microbe interactions and restitution of plant-fixed carbon to the soil;
- Increase our knowledge on the (molecular and biochemical) plasticity of root responses and their metabolic mechanisms to environmental cues;
- Improve existing and/or develop new root phenotyping tools (including image analysis protocols) to be used in controlled and on-field conditions, thereby overcoming the root data bottleneck; Develop strategies to implement “root breeding”, i.e. select for desirable root characteristics and exploit the genetic variation in root traits.

Activities shall be carried out in a range of agronomically relevant soil conditions.

HORIZON-CL6-2021-BIODIV-01-14: Fostering organic crop breeding

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5-7 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will support the objective of the Farm to Fork strategy to transition to fair, healthy and environmentally-friendly food systems from primary

production to consumption, notably the objective to increase organic farming. They will do so by increasing the availability of and access to suitable plant reproductive material for organic crops and by increasing the competitiveness of the organic crop breeding sector. As such, activities funded under this topic will support achieving the target of at least 25% of the EU's agricultural land under organic farming by 2030. Project results are expected to contribute to all the following expected outcomes:

- Increased knowledge of relevant traits for organic crop production
- Improved and open access to a wider pool of high-quality plant reproductive material for the organic crop sector
- Improved adaptation of new organic crop varieties and organic heterogeneous material to organic farming conditions (e.g. agronomic performance under organic cultivation practices, disease resistance, resilience to drought, longevity, adaptation to different pedo-climatic conditions, etc)
- Enhanced identification and traceability of organic heterogeneous material (OHM)
- Increased competitiveness of the organic crop breeding sector achieved through (i) improved availability of breeding strategies for organic crop production; (ii) novel governance and financing models supporting new breeding initiatives for organic crop production; (iii) increased relevance of the organic sector for commercial plant breeders and seed producers resulting in increased demand for organic seed and breeding; (iv) improved quality and transparency in the organic plant reproductive material market; (v) training, demonstration and networking.

Scope: Promoting the use of more sustainable farming practices is an EU policy objective enshrined in the European Green Deal and its related strategies. Boosting organic farming in Europe, being one objective of the Farm to Fork Strategy, can greatly contribute to achieving the ambition to reduce significantly the use and risk of inputs in farming while making agriculture more resilient, including through increased (bio)diversity. Increasing the availability of organic varieties for the organic sector that are better adapted to different and variable conditions is important in order to improve the performance of the organic crop sector. The application of the new organic regulation⁵⁵ (EU) 2018/848 has the potential to support increasing levels of biodiversity and greater resilience in the organic sector through new tools such as the definition of organic heterogeneous material (OHM) and organic varieties. The possibility to use landraces can also revive traditional and regional crops. However, achieving adequate and timely upscaling of organic breeding and seed production that meet growing market demands can bring difficulties to the sector. Strong involvement from public and private actors, novel governance and financing models for breeding, variety testing and seed production, as well as training, are needed.

⁵⁵ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.150.01.0001.01.ENG

Projects will contribute to improving the availability and quality of plant reproductive material and selection of varieties suited to the specific conditions of organic farming, in line with the objectives and requirements for organic plant reproductive material as set out in the Regulation (EU) 2018/848 and the transformation of the European breeding sector. Projects will fall under the concept of ‘multi-actor approach’⁵⁶ and ensure a value chain approach with adequate involvement of the farming sector. Activities will take into account the diversity of the European seed systems. The topic is open to all types of organic farming systems in various geographical and pedo-climatic conditions.

Projects will develop measures to support the preservation of genetic resources and increase the availability of plant reproductive material for the organic sector, including through pre-breeding and breeding activities and new approaches to seed sourcing.

Projects will develop measures contributing to the development of organic heterogeneous material⁵⁷ and varieties suitable for organic cultivation for an increasing range of crops, including arable, forage and horticultural crops.

Projects will develop specific protocols for testing new organic varieties. Measures will consider the adaptability of OHM and organic varieties to different climatic and edaphic conditions, and resistance to pests and diseases, as well as combining these assets with crop stability and productivity in order to maintain a level of competitiveness of the organic plant reproductive material. The potential of OHM to foster and improve the use of traditional material in organic crop farming will be analysed. •

Projects will develop a toolbox to identify OHM and a system to ensure OHM breeding traceability and maintenance. Case studies of innovative engagement of value chain partners in organic plant breeding in different contexts will be analysed and key factors of success will be identified. Projects will develop governance and financial models to support organic plant breeding that are inclusive for all actors in the value chain. Projects will conceive marketing and value chain development strategies to introduce improved varieties for seed multiplication and treatment, ensuring quality and transparency in the organic seed market. Projects will set up new networks, and expand existing ones where relevant, for demonstration and testing of organic crop breeding in different pedo-climatic regions across Europe, with an emphasis on regions where the organic sector is less developed. Due attention will be given to participatory on-farm demonstrations. Projects will design training packages tailored to the specific needs of different actors of the organic breeding and seed business to strengthen their capacities and increase breeding gains.

Projects should develop scientifically robust and transparent methodologies, building on achievements from previous research activities. To ensure trustworthiness, swift and wide

⁵⁶ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

⁵⁷ ‘Organic heterogeneous material’ ‘Organic heterogeneous material’ means a plant grouping within a single botanical taxon of the lowest known rank which: (a) presents common phenotypic characteristics; (b) is characterised by a high level of genetic and phenotypic diversity between individual reproductive units, so that that plant grouping is represented by the material as a whole, and not by a small number of units; (c) is not a variety within the meaning of Article 5(2) of Council Regulation (EC) No 2100/94 (1); (d) is not a mixture of varieties; and (e) has been produced in accordance with this Regulation.

adoption by user communities, and to support EU and national policy-makers, actions should adopt high standards of transparency and openness, going beyond ex-post documentation of results and extending to aspects such as assumptions, models and data quality during the life of projects.

HORIZON-CL6-2021-BIODIV-01-15: Protection and sustainable management of forest genetic resources of high interest for biodiversity, climate change adaptation, and forest reproductive materials

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the EU biodiversity and climate change objectives, successful proposals will support the protection and sustainable use of forest genetic resources by contributing to a better insight into the characteristics of genetic resources in the climate change context, adaptive and biodiversity supporting practices in forestry and the enhancement of Europe’s ambition in the international biodiversity agenda and international conventions. Project results are expected to contribute to all of the following expected outcomes:

- Enhanced cooperation and knowledge sharing on deployment and conservation of forest genetic resources in Europe.
- Better conservation of unique tree lineages for forest ecosystem restoration and management.
- Sustainable use of genetic resources within the forest community in a climate change context.
- Efficient implementation of the ABS (access and benefit sharing) regulation in the EU.

Scope: Diversity of forest genetic resources provides the adaptive potential for tree species and populations to cope with climatic changes and future challenges. The adaptive potential of forests depends on their demographic history and the forces of natural selection. It also depends on forestry activities and the choice of species and populations that show better potential for adaptation to climate change or to subsequent effects of climate change. Provenance trials and common garden trials allow the assessment of phenotypic responses in various environmental conditions and genomic backgrounds and thus, genotype X environment interactions. New provenance trials in new environments including populations

from range and habitat margins, coupled with genomic analysis of the provenances will provide insights to improve adaptive forest management.

Proposals will:

- Conduct research and networking on provenance trials or common gardens, with new trials and reassessment of older provenance tests using phenotypic traits related to climate change adaptation. This analysis will guide adaptive forest management to choose appropriate forest reproductive material, including its use through assisted migration. This may also lead to a requirement for research into adaptive silvicultural management of stands to support the efficient and sustainable deployment of FGR.
- Evaluate the impact of forestry activities on forest genetic diversity, develop new cultural trajectories to protect and sustainably use forest genetic resources in naturally regenerated forests, and quantify the ecosystem services provided by forest genetic resources.
- Focus on methods and strategies to breed forest reproductive material with a higher genetic diversity, to diversify tree species composition when establishing new forests and regenerating existing forests. Biomass properties, essential for wood-based products as well as properties related to resilience to climate change induced disturbances, need to be safeguarded or enhanced in the new reproductive material.
- Develop methods and tools to expand the production capacity of nurseries and the diversity of forest reproductive material produced to anticipate and mitigate the impact of extreme weather events, stimulate the development of nurseries in regions where forest reproductive material with useful characteristics is available, establish an EU network of forest nurseries assisting each other with the provision of forest reproductive material, and ensure the traceability of the material from the nursery to the final planting site.
- Expand the EU Forest Reproductive Material Information System (FOREMATIS) and link it with existing information systems to provide information on genetic conservation units with useful properties, to serve as a decision-support tool on where to best source and/or plant forest reproductive material. This would take into account current/future climatic conditions, and create an archive for future generations that will allow the tracking of exact planting site and performance of forest reproductive material.
- Cover different climate/biogeographical regions in Europe.

Enabling transformative change on biodiversity

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-BIODIV-01-16: Quantify impacts of the trade in raw and processed biomass on ecosystems, for offering new leverage points for biodiversity conservation, along supply chains, to reduce leakage effects

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the EU Biodiversity Strategy, a successful proposal will develop knowledge and tools to understand the role of transformative change for biodiversity policy making, address the indirect drivers of biodiversity loss, and initiate, accelerate and upscale biodiversity-relevant transformative changes in our society.

Projects should address all following outcomes:

- Impacts of the trade in raw and processed non-food biomass⁵⁸ from land and sea on biodiversity and on the wide range of services ecosystems can deliver, including in relation to climate change mitigation and adaptation, are better understood and quantified.
- New leverage points for biodiversity conservation are identified⁵⁹, for example along supply chains, within and beyond the retailing sector, leakage effects are reduced (including carbon), and recommendations on how to address these leverage points at corporate and institutional level are provided.
- (Local) solutions for retailers and their leverage effects on (global aspects of) patterns of biomass production and consumption are available and used, rebuilding our economy in a biodiversity-friendly way within planetary boundaries, including through sustainable corporate governance.
- The meaning of transformational change in practice is laid out, based on case studies

⁵⁸

See https://knowledge4policy.ec.europa.eu/bioeconomy/topic/biomass_en (for energy, feed, fibre, textile production or carbon storage)

⁵⁹

As referred to in the understanding of transformative change in IPBES and GBO-5, EEA

- The understanding of the biodiversity inter-dependencies of the SDGs has improved; IPBES and IPCC are strengthened by the contribution of European research and innovation. .
- Approaches, tools and knowledge influence policies at the adequate level on transformative change for biodiversity – the key elements for this change are delivered by the portfolio of cooperating projects (of which these projects are part of).

With the focus on quantifying impacts of trade of raw and processed biomass on ecosystems, for offering new leverage points for biodiversity conservation, along supply chains, for reducing leakage effects for the EU and Associated Countries⁶⁰, international cooperation in particular with African countries, Brazil, CELAC or the Mediterranean region is encouraged.

Scope: Beyond the attention which is paid to limiting impacts from biomass on biodiversity at the production and consumption level, proposals should look at the whole trade-related value chain, at the relevant scale in order to give increased leverage to protect and restore biodiversity. Proposals should analyse how the biomass sector could increase its positive impact on biodiversity. It should furthermore support biodiversity to deliver a wide range of ecosystem services, including on mitigation of and adaptation to climate change.

Proposals should increase evidence through systematic approaches that take account of the links between activities and leakage effects at different parts of the value chain or link production and consumption explicitly, including with institutions, businesses, retailers and investors, civil society, and to address more than one product at the time.

The knowledge gained should help with establishing an ‘ecological footprint’ of biomass and the manufactured goods based on biomass, within planetary boundaries as stipulated in the EU Bioeconomy Strategy⁶¹ and be usable for any science-industry cooperation on the bioeconomy⁶², taking into account climate neutrality targets, as well as respecting due diligence and human rights, towards a just transition, for the service industry and the financial sector.

Proposals should take into account the role of governments as large consumers of goods and services (and any leverage through procurement processes), and of manufacturers and retailers as consumers of primary resources.

The outcomes of this project should help to integrate biodiversity values into the circular economy, such as through cutting waste from the biomass chain, reducing leakage effects, telecoupling, and carbon and nitrogen footprints in production processes and minimise the use

⁶⁰ Including telecoupling effects on and from Europe

⁶¹

See https://ec.europa.eu/commission/news/new-bioeconomy-strategy-sustainable-europe-2018-oct-11-0_en and biomass assessment studies https://ec.europa.eu/knowledge4policy/projects-activities/jrc-biomass-study_en

⁶²

Such as the BBI Joint Undertaking and later the Circular bio-based Europe (CBE) Partnership

of plastic in the economy, with the explicit valuing and accounting of these benefits for biodiversity.

Proposals should look at how to further mainstream biodiversity into socio-economic and environmental agendas, from the transformative aspect of minimising impacts of trade in raw and processed biomass for protecting, sustainably managing and restoring biodiversity and the wide range of ecosystem services it can deliver, in order to spur pathways towards fair and equitable development and just transitions (1) across the European Union and Associated Countries, and (2) globally.

Proposals should build their analysis upon the synergies between various sustainable development goals, to deliver directly and indirectly biodiversity benefits, and highlight the role of biodiversity in attaining the set of sustainable development goals, when related to trade in raw and processed biomass.

Proposals should deliver case studies and collect good and failed examples which could inform these transformations and inform and motivate transformative change through learning, co-creation and dialogue.

Proposals should foresee appropriate resources to develop joint deliverables (e.g. activities, workshops, as well as common communication and dissemination) with all projects on transformative change related to biodiversity. This concerns projects funded under this Destination that will aim to deliver various co-benefits, including on the reduction of biodiversity loss⁶³. Proposals should use existing platforms and information sharing mechanisms relevant for transformational change and on biodiversity knowledge⁶⁴. Furthermore, cooperation is expected with the European Partnership on Biodiversity⁶⁵ and the Science Service⁶⁶. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles. Proposals should show how their results might provide timely information for relevant IPBES and IPCC functions, and cooperate with the CBD⁶⁷.

⁶³ Additionally cooperation with projects from call Horizon 2020 LC-CLA-14-2020 Understanding climate-water-energy-food nexus and streamlining water-related policies

⁶⁴ BISE, Knowledge Centre for Biodiversity, BiodivERSA, Oppla, NetworkNature and their joint work streams

⁶⁵ <https://www.biodiversa.org/1759>

⁶⁶ “HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)

⁶⁷

Cooperation is requested with projects “HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC”, “HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity” and HORIZON-CL6-DIV-2021-00-00: Impact and dependence of business on biodiversity

HORIZON-CL6-2021-BIODIV-01-17: Biodiversity, water, food, energy, transport, climate and health nexus in the context of transformative change

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the EU Biodiversity Strategy, a successful proposal will develop knowledge and tools to understand the role of transformative change for biodiversity policy making, address the indirect drivers of biodiversity loss, and initiate, accelerate and upscale biodiversity-relevant transformative changes in our society.

Proposals should look at how to further mainstream biodiversity into policy making and governance (including financing) for achieving transformative actions within and beyond socio-economic and environmental agendas.

The project should address all following outcomes:

- The interlinkages (nexus) among biodiversity, water, food, energy, transport and health in the context of climate change and the underlying causes of biodiversity loss and the determinants of transformative change to achieve the 2050 Vision for biodiversity are assessed⁶⁸.
- Options for change to societal factors (including policy competences, markets and stakeholder interests) that determine transformative changes positive for biodiversity, and those that drive transitions which negatively impact upon biodiversity in the short-, medium- and long-term, are identified, understood, and co-developed by the relevant actors.
- Guidance to facilitate possible just transition pathways and actions at European level is available for systemic policy decisions. This includes how to enhance synergies between biodiversity preservation and actions towards climate-neutrality, and how to avoid trade-offs.
- The meaning of transformational change in practice is laid out, based on case studies to illustrate how transformational change can be put into action, to create specific narratives, business models and policies, including on nature-based solutions for climate

68

mitigation and adaptation, water and health, for the transition to a biodiversity- and climate friendly, sustainable Europe.

- Knowledge is produced (e.g. metastudies⁶⁹, publications) and made available by 2023-2024, fit for the production of IPBES assessments on transformational change and on the nexus of biodiversity, climate, water, food and health. Capacity building, policy support, and science brokerage of the projects results is put in place, including beyond the release dates of the IPBES assessments, through effective and impactful dissemination.
- Scientists dispose of a network, facilitating and promoting research on transformational change for biodiversity across natural and social sciences⁷⁰.
- Approaches, tools and knowledge influence policies at the adequate level on transformative change for biodiversity – the key elements for this change are delivered by the portfolio of cooperating projects (of which this project is part of).

Scope: The European Green Deal and its Biodiversity Strategy call for enabling transformative change, but the policy and tools to bring transformative change still need to be provided. The post-2020 biodiversity goals risks to be missed from the outset if the required policy decisions are not taken and their implementation is not secured. Policy makers find the task to translate science on transformative change to policy daunting and challenging. This is where European research and innovation together with the community outside academia (business, government organisations etc.) must urgently demonstrate what transformative change could actually mean and achieve for biodiversity, and to give practical guidance to policy makers and society on the impacts of the necessary structural, ecological, social and economic transformations the European Green Deal could achieve.

The European Union and Associated Countries still need to identify the key factors in society that can stimulate or hinder this transition across the continent and share such findings with other regions of the world. This includes behavioural, social, cultural, economic, institutional, infrastructure, technical and technological dimensions.

Proposals should focus on indirect drivers of biodiversity loss: production and consumption patterns, human population dynamics and trends, trade, technological innovations, local to global governance (incl. financing), which in turn push the direct drivers (land and sea use change, over-exploitation, climate change, pollution, invasive species).

⁶⁹

Based on available knowledge, such as in GBO-5, EEA reports on transformative change, EU workshop on transformational change for biodiversity (https://ec.europa.eu/info/events/workshop-transformative-change-global-post-2020-biodiversity-framework-2020-mar-18_en), FP7 and H2020 projects on urban and climate transformations, including from LC-CLA-14-2020 Understanding climate-water-energy-food nexus and streamlining water-related policies

⁷⁰

STEAM and SSH

Proposals should examine, with the focus on biodiversity, linking it to the human dimension, how transformative changes take place in different societal and cultural contexts, what triggers them and which (behavioural, financial, policy, institutional, power setting etc) obstacles exist; measure and model their impact; and what are the options for action (at individual, business and society level) to promote and enable transformative changes, including through nature-based solutions. Social innovation and the gender dimension should be explored when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake. Attention should be devoted to gender dynamics and diversity to investigate how different identities and social groups are tangibly promoting transformative changes through bottom-up transition initiatives for sustainable lifestyles where of major relevance for biodiversity.

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is for biodiversity and ecosystems services what IPCC is for climate change. In this context, this topic must support the upcoming IPBES assessments, expected to deliver in 2023-24, on transformational change and on the nexus of biodiversity, climate, water, food and health, with an additional focus on energy and transport. The IPBES assessment will examine, inter alia: (a) Values (relational, utilitarian, etc.) and how they influence behaviour; (b) Notions of good quality of life, worldviews and cultures, models of interaction between nature and people and social narratives; (c) The role of social norms and regulations, and of economic incentives and other institutions in leveraging behavioural change in individuals, businesses, communities and societies; (d) The role of technologies and technology assessment; (e) The role of collective action; (f) The role of complex systems and transitions theory (g) Obstacles to achieving transformative change; (h) Equity and the need for “just transitions”; (i) Lessons from previous transitions. The project should inform this assessment, critically examining the usability of the IPBES conceptual framework in this respect.

Proposals should deliver case studies and collect good and failed examples, including existing relevant business models, the role of citizen science, and scenarios that could inform these transformations and inform and motivate transformative change through learning, co-creation and dialogue.

Proposals should build their analysis upon the synergies of various sustainable development goals to deliver directly and indirectly biodiversity benefits, and of the role of biodiversity in reaching the set of sustainable development goals, when related to the interlinkages (nexus) among biodiversity, water, food, energy, transport and health⁷¹ in the context of climate change and the underlying causes of biodiversity loss, and to determinants of transformative change.

Proposals should foresee appropriate resources to develop joint deliverables (e.g. activities, workshops, as well as common communication and dissemination) with all projects on transformative change related to biodiversity funded under this Destination, and should use

71

Integrating lessons from global One Health and One Health European Joint Programme, IPBES workshop report on biodiversity and pandemics, , Reference to Topic on biodiversity and health

existing platforms and information sharing mechanisms relevant for transformational change and on biodiversity knowledge⁷². Furthermore, cooperation is expected with the Biodiversity Partnership and the Science Service⁷³, as well with the Convention on Biological Diversity⁷⁴. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

HORIZON-CL6-2021-BIODIV-01-18: Policy mixes, governance (including financing) and decision-making tools for transformative action for biodiversity

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome:

In line with the EU Biodiversity Strategy, a successful proposal will develop knowledge and tools to understand the role of transformative change for biodiversity policy making, address the indirect drivers of biodiversity loss, and initiate, accelerate and upscale biodiversity-relevant transformative changes in our society.

Projects should address all following outcomes:

- Tools for addressing biodiversity benefits are taken up policy makers, industries, civil society organisations including NGOs, financing entities, businesses and retailers.. These solutions can include stocktaking of good practices beyond natural capital accounting and reporting, standards, agreements, charters, commitments, regulations, financing streams (positive incentives vs harmful subsidies), engaging society and incorporating lifelong learning.

⁷² BISE, Knowledge Centre for Biodiversity, BiodivERSa, Oppla, NetworkNature and their joint work streams

⁷³ “HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)

⁷⁴ Cooperation is requested with projects “HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC” and “HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity”

- The use of ‘Green over grey’ approaches, in particular through nature-based solutions on land and at sea further develops and mainstreams the Green Deal’s ‘do no harm’ principle.
- The application of systemic, sustainable policy mixes and governance approaches, based on different policy tools, economic instruments or regulations is facilitated.
- Approaches on (1) mitigating existing and future risks to biodiversity and on (2) better reflecting how biodiversity loss affects companies’ business models, value chains, profitability and long-term prospects are developed and tested, so that methods and tools can be integrated into decisions, whilst considering societal and democratic processes (citizen engagement, political campaigns, science denialism).
- Options are available on how to further develop the practical implementation of the Renewed Sustainable Finance Strategy towards a positive impact of the financial system on biodiversity.
- The promotion of tax systems and pricing that reflect environmental costs, including biodiversity loss, allows to shift the tax burden from labour to pollution, and that address under-priced resources and other environmental externalities.
- Case studies on what transformational change⁷⁵ means in practice are accessible.
- The understanding of the biodiversity inter-dependencies of the SDGs has improved; IPBES and IPCC are strengthened by the contribution of European research and innovation. Approaches, tools and knowledge influence policies at the adequate level on transformative change for biodiversity – the key elements for this change are delivered by the portfolio of cooperating projects (of which these projects focusing on developing the toolbox of transformative changes on positively affecting biodiversity, providing policy mixes, science-policy communication, governance and decision-making tools are part of).

Scope: Policy mixes, governance (including financing) and decision-making tools for achieving the necessary ecological, climate, economic and social transition for biodiversity are not widely available yet, and must still be developed. Proposals will take up work of the Renewed Sustainable Finance Strategy (planned for 2020) which will help ensure that the financial system contributes to mitigating existing and future risks to biodiversity.

Proposals should look at how to further mainstream biodiversity into policy making, science, and governance (including financing) for achieving transformative actions within and beyond socio-economic, climate and environmental agendas.

⁷⁵ Referring to, and critically assessing, the understanding of transformative change in IPBES and GBO-5, EEA and based on existing tools such as <https://www.sustainable-prosperity.eu/> or workshops https://ec.europa.eu/info/events/workshop-transformative-change-global-post-2020-biodiversity-framework-2020-mar-18_en

Proposals should build their analysis upon the synergies of various sustainable development goals, to deliver directly and indirectly biodiversity benefits, and of the role of biodiversity in reaching the set of sustainable development goals.

Proposals should deliver case studies and collect good and failed examples from the development and implementation of policy tools, best practices and instruments, which could inform just transformations and inform and motivate transformative change through learning, co-creation and dialogue.

Proposals should foresee appropriate resources to develop joint deliverables (e.g. activities, workshops, as well as common communication and dissemination) with all projects on transformative change related to biodiversity funded under this Destination, and should use existing platforms and information sharing mechanisms relevant for transformational change and on biodiversity knowledge⁷⁶. Furthermore, cooperation is expected with the European Partnership on Biodiversity⁷⁷ and the Science Service⁷⁸. Proposals should show how their results might provide timely information for major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), as well as the Convention on Biological Diversity on project outcomes⁷⁹. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

Interconnecting biodiversity research and supporting policies

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-BIODIV-01-19: Rescuing Biodiversity to Safeguard Life on Earth

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 40.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting

⁷⁶ BISE, Knowledge Centre for Biodiversity, BiodivERSa, Oppla, NetworkNature and their joint work streams

⁷⁷ <https://www.biodiversa.org/1759>

⁷⁸

“HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)”

⁷⁹ In particular the policy support function of IPBES, <https://ipbes.net/policy-support>. Cooperation is requested with projects “HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC” and “HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity”.

	different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 40.00 million.
<i>Type of Action</i>	Cofund Actions
<i>Total indicative budget</i>	The total indicative budget for the topic is EUR 165 million committed in annual instalments over the 7 years, 2021-2027 (EUR 20 million from the 2021 budget and EUR 20 million from the 2022 budget).
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: The partnership is expected to contribute to all of the following expected outcomes:

In line with the European Green Deal and the Convention on Biological Diversity, this partnership will contribute to the objectives and targets of the EU Biodiversity Strategy for 2030 under the overarching objective that, by 2030, biodiversity in Europe is back on a path of recovery. A successful proposal will contribute to the EU Green Deal priorities, the Birds and Habitats Directives, in addition to EU Climate and Agricultural policies. Biodiversity research will be interconnected across Europe, supporting and enhancing the ambition of national, EU and international environmental policies and conventions⁸⁰. The expected outcomes of the topic will also contribute to other impacts of Destination 1, as well as to the Commission priority 'A stronger Europe in the world', and the Sustainable Development Goals (SDGs) 13, 14, 15, 17.

- Biodiversity research and environmental policy institutions build up coherent initiatives through a co-funded European partnership.
- National/local and European Research & Innovation programmes share information among them and with environmental ministries and agencies, combining in-cash and in-kind resources. EU and Member State / Associated Country biodiversity research agendas are complementary; a long-term pan-European strategic research agenda is co-created and implemented.
- Biodiversity monitoring in Europe is structured in a network of coordinated observatories delivering accessible knowledge on biodiversity and ecosystem services to users through the EU Knowledge Centre for Biodiversity.,.

⁸⁰ In particular, the UN Convention on Biodiversity, and the Sustainable Development Agenda 2030

- Relevance, impact and visibility of R&I and European leadership in tackling the biodiversity crisis are increased.
- Biodiversity is mainstreamed across sectors and policies across Europe through the use of tools such as natural capital accounting and through the deployment of Nature-based Solutions, including traditional and new technologies, which provide multifunctional and resilient solutions to complex societal challenges.

Scope: The European partnership on Biodiversity “Rescuing Biodiversity to Safeguard Life on Earth” is one of the actions included in the EU Biodiversity Strategy for 2030. It will coordinate research programmes between EU and its Member States and Associated Countries and trigger combined action, mobilising for the first time environmental authorities as key partners for implementing biodiversity research and innovation, along with ministries of research, funding agencies, and environmental protection agencies. The Partnership’s co-created strategic research and innovation agenda for seven years will include calls for research projects, biodiversity- and ecosystems monitoring and science-based policy advising activities.

The Partnership and its members should be committed to the Global 2050 Vision of ‘Living in harmony with nature’ adopted under the Convention on Biological Diversity - by 2050, biodiversity and its benefits to people will be protected, valued and restored. Long-term goals in the zero-draft of the post-2020 global biodiversity framework, adding up to this 2050 Vision include:

- no net ecosystem loss by 2030, with species extinction risks decreasing, and abundances of endangered species and their genetic diversity increasing;
- deployment of nature-based solutions at adequate scale to contribute to people’s needs across Europe;
- good biodiversity status fully acknowledged as one of the basis for sustainable development and a green economy, and the EU/AC leadership is recognized in this context.

To reach these long-term goals, the Biodiversity Partnership will support the contribution of R&I to the EU Biodiversity Strategy to 2030 to enable transformative change putting biodiversity on a path to recovery by 2030 for the benefit of climate and people.

The Partnership should aim to achieve five overarching objectives:

1. **Produce actionable knowledge to tackle direct and indirect drivers of biodiversity loss;** knowledge on biodiversity status, trends and dynamics, and for integrating drivers, pressures, impacts and responses; knowledge on trade-offs and synergies between multiple drivers of biodiversity change; **and assessment of novel tools and approaches** to biodiversity/ecosystem conservation and restoration;

2. **Enhance the evidence base, accelerate the development and wide deployment of nature-based solutions** to societal challenges across Europe in a sustainable and resilient way, hence contributing to conserve biodiversity while addressing multiple agendas such as fighting the climate crisis while also enhancing food and nutrition security, and water supply, flooding and scarcity, among other societal priorities.
3. **Making the business case for the conservation and restoration of ecosystems**, by contributing science-based methodologies to account for and possibly value ecosystem services and the natural capital, and to assess the dependency and impact of businesses on biodiversity.
4. **Improved monitoring of biodiversity and ecosystem services across Europe** (status and trends), building on existing national/regional monitoring schemes, new capacity for setting up new schemes, and promoting new efficient technologies and experience from MAES-related processes with regard to enhancing and standardizing tools for mapping and assessment.
5. **Science-based support for EU, Member States and Associated Countries policy-making**, including for strengthening environmental policies and laws and their implementation, and reinforcing horizontal synergies with the other European sectoral policies. More generally, R&I programmes should be better linked to the policy arena, allowing better informed policy-making and better assessment of policy efficiency.

The European Partnership for Biodiversity should be implemented through a joint programme of activities ranging from research to coordination and networking activities, including training, demonstration and dissemination activities, to be structured along the following main building blocks of activities:

- **Activities to promote and support R&I programs and projects across the European Research Area**, including the launch of ambitious joint calls to fund transnational R&I projects and implementing mobility schemes for example for young scientists or between academia and business;
- **Activities to build capacity of R&I actors and increase the impact of R&I programs and projects, including science-based policy support;**
- **Activities to support, harmonise and implement biodiversity monitoring;**
- **Activities to enhance the uptake, the demonstration and deployment of solutions to address the above mentioned objectives of the partnership**
- **Activities to reinforce the excellence, visibility and impact of European R&I at the international level.**
- **Activities to regularly update the Partnership vision and strategy.**

The partner composition must at least include a geographically representative distribution of national and regional research and innovation authorities and funding agencies, environmental authorities, and environmental agencies from EU Member States, associated countries and their regions. The number of partners and their contribution should be enough to attain a critical mass in the field. Partners are expected to provide financial and/or in-kind contribution, in accordance to the ambition of activities proposed. The partnership should be open to the addition of new partners during the lifetime of the partnership. Its governance should create a clear and transparent process for the engagement with a broad range of stakeholders, together with the full members of the Partnership, to ensure that a wide range of views in the field of biodiversity, nature-based solutions and ecosystem services are strategically covered through the lifetime of the partnership.

To ensure the coherence and complementarity of activities, and to leverage knowledge investment possibilities, the partnership is expected to foster close cooperation and synergies with the Horizon Missions on Soils; Ocean, seas and waters; Climate Adaptation and Cities; and with the future European Partnerships Agroecology, Urban Transitions, Agriculture of Data, Water, Blue Economy, and Circular/Bio-based economy.. The Partnership should collaborate closely with the ‘Knowledge Centre for Biodiversity’⁸¹ recently launched by the EU with the JRC and EEA to build the expertise in Europe to inform, track and assess progress in implementing the EU 2030 Biodiversity Strategy and to underpin further biodiversity policy developments. It should equally foresee cooperation with the Science Service project under Horizon Europe⁸², which aims facilitating the inclusion of research results into the implementation of Biodiversity policies.

The Partnership should foresee resources to cooperate with existing projects, initiatives, platforms, science-policy interfaces, institutional processes at EU level, and at other levels where relevant for the Partnership’s goals. Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joints call for transnational proposals resulting in grants to third parties.

Proposers are expected to describe in details the way to implement such collaborations.

Given the global dimension of biodiversity, membership and other modalities of participation from institutions in extra-European countries is encouraged. In particular, participation of legal entities from international countries and/or regions including those not automatically eligible for funding in accordance with General Annex A is encouraged in the joint calls.

Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joint call for transnational proposals resulting in grants to third parties.

Financial support provided by the participants to third parties is one of the primary activities of this action to allow the partnership to achieve its objectives. Therefore, the EUR 60 000 threshold provided for in Article 204 (a) of the Financial Regulation No 2018/1046 does not

⁸¹ https://knowledge4policy.ec.europa.eu/biodiversity_en

⁸² To be funded through the topic HORIZON-CL6-2021-BIODIV-01-20

apply. It is expected that the partnership will organise joint calls on an annual base from 2022-2027 and will consider ample time for the implementation of the co-funded projects.

HORIZON-CL6-2021-BIODIV-01-20: A mechanism for science to inform implementation, monitoring, review and ratcheting up of the new EU Biodiversity Strategy for 2030 (“Science Service”).

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 11.00 and 13.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 13.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Biodiversity research is interconnected across Europe, supporting and enhancing the ambition of national, European and international environmental policies and conventions.

Contributing to the EU Biodiversity Strategy for 2030, the topic aims to give support to the development and implementation of this and other EU policies through knowledge generation, to guide biodiversity governance, and to implement the EU Green Deal. It supports the development of a long-term strategic research agenda for biodiversity.

Projects results are expected to contribute to all of the following expected outcomes:

- A single entry point linking European research and biodiversity policymaking that will be embedded in the Knowledge Centre for Biodiversity (KCBD) of the European Commission as its ‘scientific pillar’ organising knowledge resulting from science relevant for the implementation of the EU Biodiversity Strategy, in particular from EU-funded R&I projects, and relevant infrastructures and platforms.
- Feeding the monitoring, reporting and review mechanism of the EU Biodiversity Strategy for 2030 with relevant research-based assessments and options which could inform in the short- and medium-term any corrective action if necessary (“ratcheting up”).
- Full integration into, and support to the governance framework for the EU Biodiversity Strategy for 2030 to steer the implementation of its biodiversity commitments agreed at national, European or international level.
- A functional, early delivering Science Service at EU level is set up, considering also Associated Countries where appropriate, to bolster at global level the EU’s ambitions for its research dimension in biodiversity-relevant areas.

Scope: The EU Biodiversity Strategy for 2030 announces a science policy mechanism for research-based options for ratcheting up the implementation of biodiversity commitments. This call provides a Science Service as a dedicated tool to regularly insert science into EU biodiversity policy-making regarding the needs for the implementation of the strategy. It will address the continued and critical gap on knowledge sharing and complement other EU-funded initiatives⁸³. At the same time, it will provide a single entry point linking research and innovation with biodiversity policymaking. The possible establishment of a science-based mechanism or regional knowledge hub for the post-2020 Global Biodiversity Framework is currently in early discussions. Hence, Europe could test and lead the way on how such an instrument, triggering research-based options for the implementation of the Biodiversity Strategy, works in practice.

The objective is to reformat and connect research results to the needs of environmental policy in a targeted dialogue between science and policy actors. This should include science resulting from the latest EU R&I activities and infrastructures, shape future R&I and be embedded in the long-term strategic research agenda on biodiversity. Proposals should develop a Science Service mechanism considering all of the following:

- a. Inspired by IPBES functions, it should provide relevant policy tools (e.g. indicators), knowledge generation to fill gaps, capacity-building within and beyond the EU, and contribution to science-based assessments at EU decision level.
- b. All interventions of the Science Service should be defined under strong and clear governance arrangements, including on prioritisation of requests, and designed to support the implementation of the EU Biodiversity Strategy. Governance should ideally involve the Environmental Knowledge Community (EKC)⁸⁴ and consider its needs and requests.
- c. The Science Service should involve the EU Knowledge Centre on Biodiversity⁸⁵ and support it to direct knowledge gaps and policy questions to science, and to communicate emerging issues identified by science to decision-makers in policy, business, NGOs, land users or site managers. This will include e.g. organising expert meetings requested by the EKC, and introducing knowledge into it. The Knowledge Centre on Biodiversity will pass on information on policy requests. The details of steering these coordination activities will be defined during the grant preparation phase with the Commission, based on the project proposal.

⁸³

Knowledge Centre for Biodiversity, Biodiversity Partnership, Horizon Europe's large-scale missions, further projects funded by R&I within this Work Programme.

⁸⁴

The Environmental Knowledge Community (EKC) is a collaboration between different services of the European Commission (EC) and the European Environment Agency (EEA) to exploit new ways of creating and exchanging knowledge that is related to environmental policy-making.

⁸⁵

https://ec.europa.eu/knowledge4policy/biodiversity_en

- d. Member States, and where appropriate Associated Countries, civil society and the Mission Boards under Horizon Europe, could also ask the Science Service to cover specific topics. The directing of requests for contents and format to the Science Service, and the means of introducing information, will need to be agreed with the relevant EU services.
- e. The Science Service should use tools and results funded by the EU research framework programmes⁸⁶, from further European funding⁸⁷, and further relevant sources⁸⁸, which it should help integrate into the Knowledge Centre for Biodiversity. It will cooperate with the European Partnership on Biodiversity⁸⁹.
- f. The Science Service will take up requests from biodiversity policy-making, including through the EKC and the Knowledge Centre on Biodiversity to the Biodiversity Partnership, and to the biodiversity-relevant missions in Horizon Europe. It will organise ad-hoc high-level expert advice to the European Commission's high-level decision-makers on specific issues related to biodiversity as needed.
- g. The work of the Science Service should be presented and discussed at the relevant expert or working groups according to the governance framework of the EU Biodiversity Strategy, and support European research policy related to biodiversity.
- h. The Science Service should support the orchestration of existing and future knowledge mechanisms to implement the long-term European strategic biodiversity research agenda including within the Biodiversity Partnership and other biodiversity-relevant partnerships; EKLIPSE; Oppla; NetworkNature; the EC Knowledge Centre for Biodiversity and further biodiversity-relevant science advisory mechanisms. It should also elaborate the global aspects of its services in the mid-term planning.
- i. Proposals should indicate concrete results the Science Service will initially deliver by the end of year one. This pilot exercise should be relevant and timely for the policy agenda of the EU Biodiversity Strategy, and optionally, for the global biodiversity agenda. The following annual work plans will, over the duration of the project, be aligned to the long-

⁸⁶

e.g. directly EU-funded or co-funded projects by Joint Programming Initiatives, ERA-Nets, the European Partnership on Biodiversity

⁸⁷

Such as from the Multi-annual financial framework (e.g. LIFE or COST, regional and cohesion, agricultural and rural development, fisheries and maritime, climate, social, just transition funding, neighbourhood, international cooperation), or from the Recovery Fund.

⁸⁸

This covers e.g. relevant ESFRI's research infrastructures and Global Biodiversity Information Facility (GBIF) national nodes, biodiversity-relevant knowledge and data from citizen science, businesses, NGO, earth observation (linked to Galileo and Copernicus), governance processes, in order to increase the value and return-of-investment of these.

⁸⁹

<https://www.biodiversa.org/1759>

term strategic research agenda (in preparation)⁹⁰.

- j. The Service should then deliver, communicate and disseminate regular (e.g. half-yearly) input in the form of options and scenarios relevant for the implementation of the Biodiversity Strategy for 2030 and beyond. This must aim at triggering reaction from those entities responsible for the implementation of the strategy (e.g. EU services, national and local authorities, business, civil society and the environmental knowledge community in general).
- k. It should deliver summaries and reviews of biodiversity research outputs and tools usable for the implementation and ratcheting up of the EU Biodiversity Strategy, in language and format tailored to the targeted users, such as:
 - i. foresight, analysis of new and emerging topics,
 - ii. indicators and valuation methods,
 - iii. analysis of behavioural, institutional and bio-physical factors for biodiversity conservation and restoration, including on tipping points and planetary boundaries,
 - iv. projections/forecasts, integrated models, scenarios and pathways which integrate socio-economic and cultural values, which avoid lock-in pathways, and which provide incentives for large-scale demonstration of nature-based solutions and testing of governance approaches, financing and business models to enable transformative change,
 - v. requests to existing science-policy services (such as EKLIPSE and Oppla) for dedicated biodiversity-relevant science-policy tasks which those services can deliver, and which the Science Service will channel into the biodiversity governance framework,
 - vi. support to science-based decision making for biodiversity against disinformation campaigns, and
 - vii. testing new ways of communicating biodiversity-related science to non-scientific audiences.
- l. Proposals should describe how the Science Service delivers in time for policy processes and for the implementation of the EU Biodiversity Strategy, with adequate resources, and within a flexible, lean mechanism according to principles on credibility, relevance and legitimacy, including whether internal assessments or peer reviews on its outputs will be organised.
- m. Proposals should evaluate the experience of comparable instruments covering some of the actions or procedures, which the Science Service should set up⁹¹, also in other fields,

⁹⁰

See EU Biodiversity Strategy

but focused on biodiversity and within the governance framework of the EU Biodiversity Strategy.

- n. The project should elaborate a plan on how the activities of this kick-starting service could be further financed and governed in the medium- and long-term and seek commitments to be in place which allow continuing the work of the Science Service after the funding of this topic ends, before 2027.

Proposals should ensure that an appropriate geographical balance across Europe is achieved. The JRC may participate as a member of the consortium but is not eligible for funding.

As an option, actions under points k) above may be supported through grants to third parties. In this case, the proposal must define the process of selecting entities for which financial support will be granted, within open calls for tender to be evaluated by external, independent experts in a fair and transparent process. The maximum amount to be granted to each third party is EUR 200 000, as actions under k) above are key activities which the Science Service must deliver through the approaches laid out in its other actions, and to which the broad science community should contribute. Maximum 30% of the requested EU contribution may be allocated to this purpose.

HORIZON-CL6-2021-BIODIV-01-21: Support to processes triggered by IPBES and IPCC

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In line with the Commission priority 'A stronger Europe in the world', to implement the EU Green Deal and demonstrated leadership as stipulated in the EU Biodiversity Strategy for 2030, a successful proposal will step up EU support to processes triggered by IPBES and IPCC⁹² to achieve targeted impacts on biodiversity-relevant policies, and to get in turn structured policy input into the research cycle. Projects should address all following outcomes:

⁹¹

such as IPBES, IPCC, EEA, SCAR, EPBRS, SfEP, SAM, EPRS or the UK's CCC.

⁹²

Considering Horizon Europe Cluster 5 – Destination 1 “Climate Science and Responses”

- EU projects and initiatives are aware of and use the knowledge generation, policy support and capacity building functions of IPBES, including recommendations of its task forces (for IPBES and IPCC).
- Better consideration and implementation of IPBES and IPCC findings and conclusions.
- Shortcomings of the uptake of IPBES assessments in sectorial policy making beyond biodiversity and business decisions at European, national and local level, when translating its outcomes into options for better protecting and restoring biodiversity and ecosystem services are addressed.

Scope: Science-policy interfaces on biodiversity and nature-based solutions have made good progress in the last years, but must be stepped up both to achieve targeted impacts on biodiversity-relevant policies, and to get structured policy input into the research cycle. They are also key in guiding biodiversity governance, and in implementing the EU Green Deal and international conventions. In line with the Commission priority 'A stronger Europe in the world', the European Union must take and demonstrate leadership in this field, notably by increasing its support to IPBES -to elevate it to the same level as the IPCC-, and to the Convention on Biological Diversity.

This action delivers targeted support to areas of specific interest for European research policy in using IPBES outputs. It also helps European researchers to play their role in IPBES assessments, in particular those from Southern European and CEE countries, and those from the Western Balkans, Central Asia, and from Africa⁹³, who remain highly underrepresented, due to lack of capacities to participate in meetings, networking or science input at global level. Three major functions of IPBES still need to be further developed to reach a proper level of uptake in Europe: knowledge generation, policy support and capacity building functions, including the task forces.

Projects should address the following points:

- a. Provide assistance to the EU and Associated Countries, and to Central Asian and African researchers, knowledge holders and local communities for input into IPBES and IPCC.
- b. Networking between scientific disciplines relevant for IPBES and IPCC (e.g. between SSH, STEM).
- c. Translate IPBES outputs into EU languages and target them to the use of EU citizens, interest groups, research and innovation projects, policy makers and businesses⁹⁴.
- d. Facilitate synergies through cooperation between IPBES and IPCC researchers;

⁹³ Europe and Central Asia form one region for IPBES purposes; cooperation with Africa is a priority for the policy agenda of the European Union

⁹⁴ In cooperation with “HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)

- e. Support European negotiators at IPBES plenary meetings and inter-sessional work (review of assessments, participation in task forces and groups)
- f. Improve coherence in how the EU and Associated Countries give input into both, CBD (e.g. SBSTTA/SBI) and IPBES processes ⁹⁵.

The project should elaborate a plan on how the activities could be further financed and governed in the medium- and long-term and seek commitments to be in place which allow continuing the work after the funding of this topic ends.

Proposals must not develop any new platforms but ensure that all relevant evidence, data and information will be accessible through e.g. the Oppla portal and cooperate with existing networks of national platforms⁹⁶, and prepare the inclusion of its results to the Knowledge Centre for Biodiversity.

The project will set out a clear plan on how it will collaborate with other projects selected under this and any other relevant topics⁹⁷, by participating in joint activities such as workshops or common communication and dissemination activities. , Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

Proposals shall ensure credibility, relevance, legitimacy and compliance of any data produced during the project with the FAIR data principles. In addition, the project will adopt an open access and open data approach whereby research outcomes and data will be freely shared.

HORIZON-CL6-2021-BIODIV-01-22: Impact and dependence of business on biodiversity

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.

⁹⁵ In cooperation with HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity

⁹⁶ Such as e.g. the ECA network, the Sub-global Assessment Network, BES-Net or EKLIPSE

⁹⁷

HORIZON-CL6-TRA-2021-00-00: Biodiversity, water, food, energy, transport, climate and health nexus in the context of transformative change and HORIZON-CL6-DIV-2021-00-00: Impact and dependence of business on biodiversity, and with the Biodiversity Partnership. This includes also linkages to ESFRI research infrastructures, to test whether they could host predictive models, visualization and analysis of their platform's, early warning systems, to respond to IPBES assessments and CBD requests.

<i>Type of Action</i>	Research and Innovation Actions
<i>Award criteria</i>	The criteria are described in General Annex D. The following exceptions apply: Proposals must present an interdisciplinary team of experts, including corporate practitioners, in accounting, ecology, business management and organization, social, political and environmental economics.

Expected Outcome: In line with the EU Biodiversity Strategy for 2030⁹⁸, the topic aims to support the development of policies, business decisions and knowledge generation, to address the indirect drivers for biodiversity loss, and accelerate biodiversity-relevant transformative changes in businesses and our society.

The successful proposals will help internalising biodiversity into business decisions to enhance

- the health and well-being of citizens and tackle inequalities, create possibilities for new jobs and sustainable growth in rural, post-industrial and coastal areas; strengthen resilience against environmental and climate stressors; minimize the risks of future diseases linked to business activities, with disastrous health, economic and social impacts, and
- corporate decision making and business resilience as well as minimise investment risk and thereby have a key role in the sustainable transition of the economy.

Projects should address all following outcomes:

- A better understanding and awareness of how businesses depend, and impact upon, biodiversity and ecosystem services, based on past and ongoing knowledge, also from practical business experience (by private corporates), informs business decision making.
- Knowledge (e.g. metastudies, publications) is available for the production of the IPBES methodological assessment on business and biodiversity, which is planned to be adopted in 2024-25, following a fast-track approach. Capacity building, policy support, and science brokerage of the projects results is put in place, including beyond the release dates of the IPBES assessment, through effective and impactful dissemination.
- Scientific evidence directly relevant to multiple Sustainable Development Goals, in particular closely related to Sustainable Development Goals 9 (build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation), 12 (ensure sustainable consumption and production patterns, i.e., issues of production and efficient use of natural resources), 13 (climate change), 14 (life below water) and 15 (life on land) is accessible.

⁹⁸ In particular its chapter 3.3 “Building on an integrated and whole of society approach”

Scope: Key economic sectors depend on and have a direct and indirect, positive or negative impact on biodiversity. Biodiversity is directly at the centre of many economic activities, and a healthy biodiverse planet is a precondition for humankind to exist – and thus for businesses to grow and for the economy to recover following a crisis such as the COVID-19 pandemic.

Keeping nature healthy is critical for the economy, both directly and indirectly. The World Economic Forum ranks biodiversity loss and ecosystem collapse as one of the top five threats humankind will face in the next ten years. Businesses rely on biodiversity as inputs into their production processes, with over half of global GDP – some €40 trillion – dependent on nature and the services it provides.

Conversely, if we continue doing the business as usual path of ecosystem destruction, the continued degradation of our natural capital will considerably limit business opportunities and socio-economic development potential. Internalising biodiversity into business decisions could enhance the health and well-being of all citizens and tackle inequalities, create possibilities for new jobs and sustainable growth in rural, post-industrial and coastal areas; strengthen resilience against environmental and climate stressors; minimize the risks of future outbreaks of infectious diseases with disastrous health, economic and social impacts. From the private corporate perspective such integration of natural capital and biodiversity impacts and dependencies will enhance corporate decision making and business resilience as well as minimise investment risks. It will better inform, transform and improve their corporates sustainable decision making including by removing key blind spots on their risk assessments.

The topic demands a highly interdisciplinary team of experts, including biodiversity and corporate practitioners. Biophysical and socio-economic aspects related to various sectors with different impacts and ways of managing and accounting need to be considered. Key expertise is needed in accounting, ecology, business management and organization, social, political and environmental economics. This topic is not developing natural capital accounts or measuring biodiversity footprints.

Proposals should address all the following points:

- Identification of criteria and indicators for measuring dependence, impact and contribution to the recovery of biodiversity and ecosystem services.
- Development of methods to reduce adverse impacts and related material and reputational risks, and to develop the business case for long-term sustainability, for business sectors beyond forestry, agriculture and fisheries, tourism, energy and mining, infrastructure and manufacturing and processing, which are directly dependent upon ecosystem services.
- Development of a tool box for appropriately measuring, assessing and monitoring the dependence and impact of the business sector on biodiversity, a better risk management linked to biodiversity, and the contribution of business to its recovery⁹⁹.

99

- Assessment of the broader impact of businesses on biodiversity, the cumulative impact and the indirect impact that occurs through supply chains, trade or substitution effects (such as telecoupling).
- Collation of targets and regulations (at any level within the EU and Associated Countries) that stimulate innovations with positive impact on biodiversity and on the decoupling of environmental pressures from growth in output.
- Promotion of (1) business cases contributing to the conservation, restoration and sustainable use of biodiversity and the wide range of ecosystem services and of (2) public accountability, informing regulatory agencies and guiding financial investments and in influencing producer, retailer and consumer behaviour.
- Analyse the added value of creating a Horizon Europe prize¹⁰⁰ for innovative businesses improving biodiversity and its wide range of ecosystem services, focused on nature-based solutions¹⁰¹.
- Deliver timely input to IPBES assessment on business, and the processes on IPBES objectives for building capacity, strengthening the knowledge foundation, supporting policy, and communicating and engaging, on impact and dependence of business on biodiversity, and the relevant IPBES task forces. Proposals should also show how their results could provide timely information for the Intergovernmental Panel on Climate Change (IPCC), as well as the Convention on Biological Diversity on project outcomes¹⁰².

Proposals must ensure that relevant evidence, data and information will be accessible through the Oppla portal, and prepare the inclusion of its results to the Knowledge Centre for Biodiversity.. Proposals shall ensure that any data produced during the project will comply with the FAIR principles. In addition, the project will adopt an open access and open data approach whereby research outcomes and data will be freely shared.

Based on, and/or in cooperation with relevant projects funded by the EU (such as ‘Aligning Biodiversity Metrics for Business and Support for Developing Generally Accepted Accounting Principles for Natural Capital’), under Horizon 2020 (‘WeValueNature’, ‘MAIA’) or LIFE (such as ‘Transparent’), and the EU and national Business@Biodiversity Platforms, and further EU and global networks and platforms

100

https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/prizes/horizon-prizes_en

101

Complementary, and in distinction to the European Business Award for the Environment <https://ec.europa.eu/environment/awards/index.html>

102

Cooperation is requested with projects “HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC” , “HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity” and HORIZON-CL6-RES-2021-00-00: Natural capital accounting: Measuring the biodiversity footprint of products and organizations on the environment

The project will set out a clear plan on how it will collaborate with other projects selected under this and any other relevant topics¹⁰³, by participating in joint activities such as workshops or common communication and dissemination activities. The project will also set out a clear plan on how it will collaborate with key business-related networks promoting the integration of biodiversity into corporate decision making. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

Call - Biodiversity and Ecosystem Services

HORIZON-CL6-2022-BIODIV-01

Conditions for the Call

Indicative budget(s)¹⁰⁴

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ¹⁰⁵	Number of projects expected to be funded
		2022		
Opening: na Deadline(s): 15 Feb 2022				
HORIZON-CL6-2022-BIODIV-01-01	RIA	14.00	4.00 to 14.00	2
HORIZON-CL6-2022-BIODIV-01-02	IA	5.00	Around 5.00	1
HORIZON-CL6-2022-BIODIV-01-03	CSA	5.00	Around 5.00	1
HORIZON-CL6-2022-BIODIV-01-04	IA	10.00	Around 8.00	1
HORIZON-CL6-2022-BIODIV-01-05	RIA	16.00	Around 8.00	2

¹⁰³

HORIZON-CL6-TRA-2021-00-00: Biodiversity, water, food, energy, transport, climate and health nexus in the context of transformative change, and with the European Partnership on Biodiversity HORIZON-CF-PARTNERSHIP-BIODIVERSITY-2021-01 Rescuing Biodiversity to Safeguard Life on Earth <https://www.biodiversa.org/1759>

¹⁰⁴

The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

All deadlines are at 17.00.00 Brussels local time.

The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

¹⁰⁵

Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

HORIZON-CL6-2022-BIODIV-01-06	RIA	8.00	Around 8.00	1
HORIZON-CL6-2022-BIODIV-01-07	RIA	12.00	Around 3.00	4
HORIZON-CL6-2022-BIODIV-01-08	RIA	10.00	3.00 to 4.00	3
HORIZON-CL6-2022-BIODIV-01-09	RIA	5.00	2.00 to 3.00	2
HORIZON-CL6-2022-BIODIV-01-10	CSA	5.00	Around 5.00	1
Overall indicative budget		90.00		

General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Understanding biodiversity decline

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-BIODIV-01-01: Observing and mapping biodiversity and ecosystems, with particular focus on coastal and marine ecosystems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 4.00 and 14.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal

	requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 14.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Procedure</i>	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering all types of ecosystems, grants will be awarded to applications not only in order of ranking but with at least two-third of the topic budget to projects highest ranked within marine/coastal ecosystems, and one third of the topic budget to the highest ranked projects within the terrestrial/freshwater ones, provided that the applications attain all thresholds
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In support of the implementation of the Green Deal and the Biodiversity Strategy, successful proposals will contribute to all the following expected outcomes notably to better understand biodiversity decline, its main direct drivers and their interrelations:

- Next generation fit for purpose and user friendly, validated and integrated coastal, marine and terrestrial biodiversity observation, mapping and monitoring tools (from remote sensing to eDNA, AI, robotics and citizen science framework) that provide data to feed models of prediction of biodiversity (for global and regional scales to define and update ecosystem-based management approaches).
- Fulfil the objectives of the Global Biodiversity Observation Network (The Group on Earth Observations Biodiversity Observation Network – GEOBON, MBON, GOOS)
- Empowering ocean observations (e.g., citizen science framework, robotics, artificial intelligence, big data analytics) and robust science-based thinking at national and international levels will promote science diplomacy and wider societal actions to support responsible and sustainability thereby enhancing ocean governance
- Coastal, marine and terrestrial biological processes and biodiversity are integrated into national, regional (including EU and AC sea basins), and global observation

systems. Reliable and affordable methods for monitoring water quality in line with the MSFD and WFD, which would generate information that is geo referenced and available more in real time.

- In line with the targets of the EU Biodiversity Strategy for 2030, contribute to establish a network of effectively and equitably managed, ecologically representative, protected areas and/or other area-based effective conservation measures.
- “Blue Carbon” balance model in the different marine ecosystems for possible use for carbon offsetting and for Nationally Determined Contribution (NDC)
- Contribute to the free and open access to biodiversity data of the Global Biodiversity Information Facility

Scope: Better biodiversity observations are needed to assess the health of ecosystems and the impact of measures derived from EU policies, and to feed data into models for the predictions of effects and the development of management measures for the implementation of EU policies.

Observation and mapping of coastal and marine biodiversity are key tools to manage and share the “ocean commons” in a fair and responsible way under the present global challenges and rapid environmental changes. They will also help ensure that the benefits derived from the exploitation of ocean resources can be sustainably managed and equitably shared. The distribution of these “ocean commons” is changing. The melting polar ice caps, stagnation in wild seafood provisioning opportunities, emergence of harmful pathogens and parasites, and previously inaccessible ocean spaces (e.g. the deep sea) now increasingly within human reach, are challenges that need to be addressed by responsible ocean governance to reduce the potential for conflicts at all levels and ensure human well-being. Current knowledge on how to relate and govern marine natural resources and associated societal changes is fragmented, and observations of resource distribution, use, state and dynamics are scant and insufficiently accessible. We need to advance observations to support modelling of the complex links between marine ecosystems and societal developments to forecast, manage and mitigate these changes.

Adequate scientific knowledge is also fundamental to protect and restore favourable conservation status of habitats and species under EU nature legislation, notably the Birds and Habitats Directive and good ecological status under the Water Framework Directive. Reliable data and knowledge are necessary inter alia to define protected areas in line with the EU Biodiversity Strategy and its underlying legislation, to develop conservation objectives, conservation and restoration measures, to define the conservation status and to undertake environmental impact assessments.

- In order to do so, projects are expected to encompass all of the following aspects: Use of satellite and drone images (earth observation) to assess pressures on freshwater, coastal and marine ecosystems (fragmentation, hydromorphological changes, etc.);

- Develop eDNA protocols complementing established biological indicators to monitor ecological status, in the context of the Water Framework Directive.
- New platforms and integration of variety of sensors in situ, autonomous unmanned vehicles, acoustic monitoring, satellite applications, holistic approaches (e.g., systems biology, meta-omics, and ecosystem approaches) and novel theoretical frameworks linking evolutionary theory and oceanography as well as marine social sciences and humanities can provide an integrated framework to inform decision making, particularly in inherently dynamic coastal ecosystems.
- Where relevant, creating links, contributing to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS), European Space Agency Earth Observation Programme and in particular the Flagship Actions on Biodiversity and Ocean Health of the EC-ESA Joint Earth system science initiative, is expected.
- Contribute to improving the knowledge on marine and terrestrial habitats and species protected under the Birds and Habitats Directive.
- Implement the Essential Ocean Variables for sustained observations of marine biodiversity and ecosystem changes identified by the Global Ocean Observing System (GOOS).
- The projects will benefit from the large datasets recovered from the long-term environmental monitoring conducted through the national and European dedicated Research Infrastructures (e.g. eLTER).
- Technical, theoretical and practical development and validation for the use of environmental DNA (eDNA), combined with other ocean data (both biotic and abiotic). These approaches promise leaps in our ability to sample ecosystem-wide data at increasingly low costs.
- Investigate all key processes (ecological and anthropogenic) controlling the fate of carbon and its sequestration in marine and coastal ecosystems. Evaluate the “Blue Carbon” balance in the different marine ecosystems through high-resolution mapping and modelling of marine ecosystems of the European EEZ, characterised by habitats, species, processes and functions, from deep sea, offshore to coastal.
- The tools, models and geo-referenced information systems that will be designed should be focused on user needs and designed with user experience.
- Standardised minimum set of Essential Ocean and Biodiversity Variables (EOVs / EBVs)

- Contribution to enhancing the overall societal and public understanding of link between biodiversity and ecosystem functioning through education and training (school & adult education, citizen science platforms)
- All the marine observations connected through these actions should be incorporated into EMODnet.
- Cooperation with the Knowledge Centre for Biodiversity.
- Opportunities for cooperation with relevant projects, such as EUROPABON awarded under the call “SC5-33-2020: Monitoring ecosystems through research, innovation and technology” or the projects resulting from topics of HORIZON-CL6-DEC and from Destination 5 (Carbon cycle and natural processes) and Destination 7 (environmental observation) should be identified. Furthermore, cooperation is expected with the European co-funded Partnership on Biodiversity¹⁰⁶ and other relevant Horizon Europe Missions and partnerships. Proposals should set out a clear plan on how they will collaborate with other projects selected under any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.
- In order to achieve the expected outcomes, international cooperation is advised.

HORIZON-CL6-2022-BIODIV-01-02: Building taxonomic research capacity near biodiversity hotspots and for protected areas by networking natural history museums and other taxonomic facilities

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Innovation Actions

Expected Outcome: In support of the implementation of the Green Deal, the EU Biodiversity Strategy 2030 and the Birds and Habitats Directives, successful proposals will contribute to increase and transfer local taxonomic knowledge, innovation and expertise across Europe, especially on endangered species and other species groups of particular interest, to better understand and address biodiversity decline, its main direct drivers and their interrelations.

¹⁰⁶ <https://www.biodiversa.org/1759>

Successful proposals must address all of the following outcomes:

- Increased local taxonomic knowledge and expertise across Europe, especially on endangered species and other species groups of particular interest, through a network of expert trainers.
- National reference collections for pollinators (bee, butterfly, moth and hoverfly specimens).
- Better taxonomic research capacity and reinforced digital networking, in particular near biodiversity hotspots and for protected areas, and access to materials, resources, advice, and professional expertise and infrastructures from museums and other taxonomic facilities, such as botanical gardens, herbaria, natural history collections, and biodiversity research centres.
- New taxonomy methods and technologies are put in use and tested in situ, in particular, generation of reference datasets linking DNA data and voucher specimens, and identification methodologies and digital applications, including 2D and 3D specimen digitalization. Knowledge and tools are generated and shared among central and local taxonomy nodes in the network, as well as with citizen scientists and end-users worldwide.
- Strategic opportunities to promote integrative taxonomy in professional careers and academic curricula are identified. Pilot actions to address the current shortage of taxonomists are initiated.

Scope: Professional taxonomists are highly specialised and skilled experts, traditionally working in academia or curating collections in natural history museums, herbaria, botanical garden or biobanks. European collections hold and document 80% of the worlds' described biodiversity. Today, this expertise is increasingly required by decision-makers at local and regional levels to plan and implement conservation efforts, establish protected areas, combat invasive species, sustainably manage forests, fields and seas, and many other aspects of ecological, economic and societal importance. There are millions of species still undescribed and there are far too few taxonomists to do the job: global biodiversity is being lost at an unprecedented rate as a result of human activities, and, paradoxically, many species are disappearing concomitantly to the decline of the number of experts who are able to document that disappearance.

EU member states and associated countries, often lack permanent taxonomic capacity in the field, especially near biodiversity hotspots and protected areas, , and could greatly benefit from professional expertise, networking and infrastructures from natural history museums and other taxonomic facilities, such as botanical gardens or biobanks, and centres integrating new genome- and image-based technologies to advance taxonomy, contributing at the same time with adequate in situ conservation monitoring, data and samples.

Building on expert findings and recommendations, such taxonomic network should develop a plan for strengthening the taxonomic expertise in Europe, promote taxonomy in official curricula, and set plans for international collaboration. Expert taxonomy trainers across Europe¹⁰⁷ should train a network of “followers”, by creating simple-to-use identification guides and methodologies, training programmes, online tools and activities adapted to local needs and resources (by area and by taxa of particular importance, such as endemic, locally-threatened species, those in the Red List, or intra-specific diversity). Strategy of promoting integrative taxonomy should also account for publication gap in taxonomic journals, discouraging specialists in academic competitions. For example, strategies should encourage engagement of taxonomists in wide ecological research projects, and identify relevant opportunities in the private sector, securing their career development. The project should also lead with guidance, resources and expertise to the establishment or enhancement of national reference collections for pollinators in all European countries (bee, butterfly, moth, and hoverfly and beetle specimens), as well as for soil fauna (mites, springtails, woodlice, millipedes and earthworms) and freshwater taxa including invasive alien species in all European countries, in collaboration with projects resulting from topic HORIZON-CL6-2021-BIODIV-01-02: “Data and technologies for the inventory, fast identification and monitoring of endangered wildlife and other species groups”.

The network should also support, guide and supervise the establishment of adequate facilities in a pilot number of local nodes (such as wet labs, connected computer data nodes and remote communications). For this purpose, proposals may involve financial support to third parties (e.g. in the form of cascading grants). A maximum of € 60 000 per third party might be granted. Conditions for third parties support are set out in Part K of the General Annexes. Consortia need to define the selection process of organisations, for which financial support will be granted. Maximum 20% of the EU funding can be allocated to this purpose. The respective options of Article 15.1 and Article 15.3 of the Model Grant Agreement will be applied.

Successful proposals should also promote the effective development of European infrastructures, such as LifeWatch ERIC, the future DiSSCo’s digitalised collections, or eLTER, and application of advanced taxonomic technologies (such as eDNA, genomics, AI).

The action should also seek to involve amateur taxonomists, reach for citizen scientists with tools and networks, produce/update a strategic mapping and agenda for taxonomic expertise in Europe, and identify gaps and needs for future actions. Gender aspects should be addressed both in amateur and professional taxonomy communities and the biogeographical approach needs to be taken into account.

Valuing and restoring biodiversity and ecosystem services

Proposals are invited against the following topic(s):

¹⁰⁷ Such as the members of the Consortium of European Taxonomic Facilities (CETAF): <https://cetaf.org/>

HORIZON-CL6-2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: This topic aims to support the development of policies, business models and market conditions to scale up and speed up the implementation of nature-based solutions (NBS)¹⁰⁸. It will contribute to the wider deployment of NBS and to fully reaping their economic, social and environmental benefits in order to build a competitive sustainability in Europe and to tackle climate change. NBS contribute to the EU Biodiversity Strategy for 2030 and other Green Deal priorities, by supporting biodiversity and vital ecosystem services: climate change mitigation and enhancement of carbon sinks, biomass provision, access to fresh water, clean soil, healthy diets and lifestyles and sustainable food systems. NBS deployment will also create green jobs and build resilience to climate change and natural disasters.

Successful proposals will contribute to all following expected outcomes:

- Broad and effective EU/AC community of innovators, practitioners and developers of NBS – including but not limited to Horizon 2020/Horizon Europe projects – engaged across communities of science, business, policy and practice, and from local to global scales;
- Enhanced engagement, with public authorities, private sector and society at large for implementing and investing in NBS;
- Established European NBS “quality brand” with an underlying, comprehensive and agreed vision and agenda, to position and promote EU excellence in NBS innovation;
- Improved cooperation and synergies with key strategic international partners and collaboration with CEN/CENELEC to help development of European and international standards and foster the emergence of a global market for NBS;

¹⁰⁸ As defined by the European Commission: Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services. In <https://ec.europa.eu/research/environment/index.cfm?pg=nbs>.

- Consolidation of NBS knowledge across sectors and disciplines through regional and Europe-wide transdisciplinary collaboration, advisory services, awareness raising, knowledge transfer and skills development.

Scope: Nature-based solutions (NBS) deliver multiple ecosystem services to address diverse societal challenges with a systemic and innovative approach. An effective multi-stakeholder platform is necessary to support and consolidate the understanding of NBS and promote their use and speed up market up-take and wider implementation.

Such a platform enables: a) dialogue, interactions, knowledge and information sharing; b) integration of EU project results and platforms; and c) collaboration and think-and-do-tanks among relevant stakeholders (science, public administration, professional organisations, businesses and investors, civil society).

The development of such a platform is currently undertaken by NetworkNature¹⁰⁹, a CSA funded under Horizon 2020's Societal Challenge 5 (WP 2019) that is due to end in 2022. The Oppla¹¹⁰ portal is developing the underlying EU NBS knowledge repository, supporting access, sharing and wider dissemination of NBS knowledge, including from EU-funded NBS projects, to already engaged and new target audiences, such as the finance and investment sector and the wider public.

This topic aims to maintain and build upon the achievements of NetworkNature and Oppla. The successful proposal should further develop and consolidate an engaged, broad and effective European community of innovators, practitioners and developers to promote the design, deployment, out- and up-scaling of NBS at the European and global scale, whilst recognizing regional and national specificities, contexts and needs.

The successful proposal should undertake continuous and strategically driven stakeholder dialogue and facilitate exchange of practices, experiences and expertise related to all NBS-relevant aspects, across multiple scales and sectors. Actions should cover social, economic, financial, environmental, educational, institutional, regulatory and cultural aspects; in particular:

- Enhanced engagement, strengthened ties and new partnerships with public authorities, the private and financing sector and society at large for implementing and investing in NBS, based on a high level of awareness about the advantages of NBS for wider uptake of these solutions;
- Maintain and further develop an online open source stakeholder platform that facilitates the interactions within and between NBS knowledge holders and implementers;
- Identify, evaluate, standardise and gather tools, mechanisms and advisory services that support different actors in NBS in a one-stop-shop, with a critical view to needs and matching offers;

¹⁰⁹ <https://cordis.europa.eu/project/id/887396/>.

¹¹⁰ <https://oppla.eu/>.

- Build on and expand NetworkNature's business plan and implement it, where applicable, to make such a platform financially self-sustainable at the end of the project, with an emphasis on payback models and payable advisory services;
- Maintain and support already established NBS hubs and establish new ones; support and advise on communication and outreach campaigns and regular events in all Member States, involving, as appropriate, international networks and environmental communicators and targeting all relevant stakeholders involved in the overall NBS value chain, including the scientific community;
- Develop communication toolboxes in all EU official languages easy for use for regional and local authorities to better communicate about NBS and their benefits, namely in terms of economic growth and job creation;
- Facilitate the clustering of current and upcoming EU-funded NBS relevant research and innovation projects and promote the uptake of their results in further EU or national initiatives (e.g. in projects resulting from the LIFE programme or cohesion policy);
- Assist the European Commission in organising science-policy workshops and assessing the contribution of NBS to global and EU policies, notably related to the EU Green Deal. These include biodiversity, pollution, climate adaptation and mitigation, water, agriculture and forestry, as well as urban and regional development, health, transformative change and just transitions;
- Facilitate the development of guidelines for practitioners with state-of-the-art NBS design practices and protocols; collaborate with CEN/CENELEC to help the development of European standards, making sure these guidelines are accessible for all potential users;
- Facilitate the development and mainstreaming of NBS-related professional training and the inclusion of NBS in primary and higher-education curricula¹¹¹;
- Develop mechanisms for capacity building and knowledge transfer in a transdisciplinary way, through the involvement of EU and MS/AC-wide professional organisations; include partner organizations from a variety of EU member states to facilitate both local and Europe-wide dissemination of NBS knowledge;
- Promote international cooperation with key strategic international partners and international dialogue and best practice sharing, in particular with – but not limited to – the CELAC region, the USA and Africa;
- Support a dialogue between cities implementing NBS (e.g. through twinning, peer exchanges, etc.) as catalysers for NBS knowledge sharing, experience exchange and

¹¹¹ Synergies should be considered with HORIZON-CL6-2021-COMMUNITIES-01-06: Inside and outside: educational innovation with nature-based solutions.

access to best practices in the Member States; establish the relevant links and consider synergies with other networking initiatives such as ICLEI, or the Covenant of Mayors;

- Identify specific domains and priorities where further research and innovation is needed for wider implementation, exploitation of NBS benefits and co-benefits and market acceptance of NBS.

Proposals should address all of the above points. Proposals must envision congruence with the Biodiversity Partnership goals and activities and ensure that all evidence and information will be accessible through the Oppla portal (the EU repository for NBS)¹¹².

Proposals should set out a clear plan on how they will collaborate with other projects selected under any other relevant topic/call¹¹³, by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals should adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles¹¹⁴. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

Collaboration with the Biodiversity Partnership (HORIZON-CF-PARTNERSHIP-BIODIVERSITY-2021-01) is expected in the context of reinforcing the knowledge base for assessing, developing and deploying Nature-based solutions.

HORIZON-CL6-2022-BIODIV-01-04: Natural capital accounting: Measuring the biodiversity footprint of products and organizations

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions

¹¹² <https://oppla.eu/>.

¹¹³ Notably the Horizon 2020 NBS project portfolio and its relevant task forces; HORIZON-CL6-2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding; HORIZON-CL6-2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector; HORIZON-CL6-2022-FARM2FORK-01-16: EU-China international cooperation on nature-based solutions for nutrient management; HORIZON-CL6-2022-COMMUNITIES-01-07: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities; HORIZON-CL6-2022-COMMUNITIES-01-06: Developing nature-based therapy for health and well-being; HORIZON-CL6-2021-COMMUNITIES-01-06: Inside and outside: educational innovation with nature-based solutions.

¹¹⁴ https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_0.pdf.

Expected Outcome: In keeping with the EU Biodiversity strategy for 2030 the successful proposal will contribute to measuring and integrating the value of nature into public and business decision making at all levels for the protection and restoration of ecosystems and their services.

Successful proposals will contribute all of the following expected outcomes:

In keeping with the EU Biodiversity strategy for 2030 the successful proposal will contribute to measuring and integrating the value of nature business decision making at all levels for the protection and restoration of ecosystems and their services.

Successful proposals will contribute to all of the following expected outcomes:

- Change the way in which EU and Associated countries organizations and companies allocate capital or influence their activities in order to promote a sustainable management by mainstreaming the use of corporate natural capital accounting.
- Integration of biodiversity and ecosystem considerations into business decision-making at different levels by measuring the biodiversity footprint of products and organisations through improving, developing and implementing standardized methods, criteria and standards that focus on essential features of biodiversity, ecosystems services, values, and sustainable use.
- Enhanced corporate biodiversity disclosure through innovative approaches to foster principles of biodiversity data transparency in order to accurately report on by biodiversity, ecosystems and services.
- Demonstrate solutions for valuing business impacts and dependencies in biodiversity and ecosystem and how this ends up in risks and opportunities for businesses private decision-making.
- Explore solutions to decrease the biodiversity footprint of retailers in global value chains.

Scope: The EU Biodiversity Strategy for 2030 recognises that biodiversity considerations need to be better integrated into public and business decision-making at all levels. This should include measuring the environmental footprint of products and organisations on the environment, through life-cycle approaches complemented and eventually integrated by natural capital accounting. In this context, the Commission will support the establishment of an international natural capital accounting initiative.

Natural Capital Accounting has potential in providing a concrete basis for business performance reporting by explicitly mapping out impacts and/or dependencies on natural resources and placing a monetary value on them. Specific examples include business accounting and reporting and the disclosure of non-financial reporting and accounting Directives.

The proposal will develop, uptake or demonstrate in real settings standardized natural capital accounting practices to support companies to measure, value and synthesize biodiversity and ecosystem risks assessment, notably in a way that is suitable for routine consideration in business and economy decision-making (including at executive level). It will also mainstream environmental footprints methods for instance through quantifying the environmental impacts of products, or supply and value chains, business models or organisations based the Commission Organisation Environmental Footprint (OEF) and Product Environmental Footprint (PEF).

The proposal should contribute to the alignment of natural capital accounting between the public and private sectors and to explore how the links between the public and private sectors in the collection and use of statistics and data for natural capital accounting. Additionally, it will address the obstacles businesses are facing, in particular with regard to data collection and improving the access and utility of European environmental data sets at different levels (i.e: national statistical offices, environmental agencies, corporate reports) allowing better corporate and national data integration for economic and financial decision making.

The proposal should work on methodologies for companies to set science-based biodiversity targets; address the concrete decision making needs of corporates and financial service provider in order to allow a concrete and meaningful linkage with the macro-economic perspective and the ecological concept of planetary boundaries at the scale of decision to be taken ta corporate level enabling to assess and understand to corporate safe operating space.

The proposal should develop and test a concrete natural capital accounting and reporting frameworks for business performance with respect to biodiversity and ecosystem services reporting. This should include explicit mapping of the impacts and/or dependencies on natural resources and placing a monetary value on them. Specific examples should include business accounting, reporting, and the disclosure of non-financial reporting.

The proposal should will explore to which extent the SEEA EEA framework in its current form is useful for natural capital assessment and natural capital accounting by businesses, both in terms of methodological approach and data collection o the opportunities for adapting the SEEA EEA framework to make it more tailored to the business needs or the extent to which national statistical offices (NSOs) can benefit from data collection by businesses.

The proposal should develop and test concrete natural capital accounting basis for business performance on biodiversity and ecosystem services reporting by explicitly mapping out impacts and/or dependencies on natural resources and placing a monetary value on them. Specific examples should include business accounting, reporting, and the disclosure of non-financial reporting.

The proposal should support the European contribution to a globally consistent approach to account for ecosystems and their value.. The proposal should ensure that the EU continues to play a lead role in international environmental affairs through its support for effective measures, international standards and accounting relating to natural capital.

The proposal should improve the access and utility of European environmental data sets at different levels (i.e: national statistical offices, environmental agencies, corporate reports) allowing better corporate and national data integration for economic and financial decision making.

Support developing and testing natural capital and biodiversity based business models: these shall invest in nature for the benefit of biodiversity, ecosystems functioning and ecosystem services and address the challenge to turn the value of ecosystem into a revenue stream – Support to make natural capital and biodiversity based business models bankable - thereby enabling private investments in nature conservation (“how to facilitate making money with nature by enhancing ecosystem conditions but not by exploiting it to the detriment of nature”)

The proposal should therefore take stock and establish links with the work undertaken by ongoing initiatives, European and national platforms on business and biodiversity, the Natural Capital Protocol, Value balancing alliance, the KIP INCA and other Horizon 2020 related projects¹¹⁵

The proposal will support the practical implementation of corporate reporting obligations such as under the EU Non-Financial Reporting Directive (2014/95/EU)¹¹⁶ or of the EU Taxonomy on Sustainable Finance¹¹⁷.

Proposals should dedicate appropriate resources to develop joint deliverables (e.g. activities, workshops, as well as common communication and dissemination) with relevant projects¹¹⁸, funded under this call. Furthermore, cooperation is expected with the Biodiversity Partnership and the Science Service¹¹⁹. The proposal should set practical policy recommendations for the EU Biodiversity Strategy for 2030 targets, commitments. Proposals must ensure that all evidence, data and information will be accessible in the Knowledge Centre for Biodiversity. The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

Managing biodiversity in primary production

Proposals are invited against the following topic(s):

¹¹⁵ [MAIA](#) and [We Value Nature](#)

¹¹⁶ The Commission is currently working on a review of the EU Non-Financial Reporting Directive (2014/95/EU) – current guidelines: https://ec.europa.eu/info/publications/non-financial-reporting-guidelines_en

¹¹⁷ In cooperation with topic HORIZON-CL6-TRA-2021-00-00: Policy mixes, governance (including financing) and decision-making tools for transformative action for biodiversity

¹¹⁸ Cooperation is requested with projects HORIZON-CL6-DIV-2021-00-00: Impact and dependence of business on biodiversity

¹¹⁹ “HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)

HORIZON-CL6-2022-BIODIV-01-05: Intercropping – understanding and using the benefits of complexity in farming and value chains

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 16.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the objectives of the Farm to Fork and Biodiversity strategies, successful proposals will promote diversification in agriculture as a means to increase the resilience of the sector vis-a-vis variable environmental, climatic and economic conditions, promote biodiversity and meet consumer demands for more diverse and sustainable production in agriculture.

Project results are expected to contribute to all following outcomes:

- Integration of knowledge from diverse disciplines (e.g. ecology, agronomy, genetics, physiology as well as social sciences) to better understand, assess and use ecological processes underpinning the multiple benefits arising from intercropping while at the same time understanding the barriers for its adoption by farmers;
- Optimised, field-tested and ready-to-use agronomic practices for intercropping applicable to various conditions across Europe;
- More wide-spread practical expertise of intercropping amongst advisors, farmers;
- Increased evidence and appreciation of the beneficial effects of intercropping on crop quality and product quality along with wider benefits for biodiversity, soil health, water quality and reduced GHG emissions;
- Demonstration of economic avenues and benefits of diversified production for the farming sector and related value chains.

In the the long(er) term:

- More sustainable, biodiverse and resilient farming ensuring the continued delivery of diversified food and non-food products along with multiple ecosystems services;
- Strengthened links between the various operators in value chains and increased economic avenues for the farming sector;

- Increased appreciation by the wider public of the benefits of intercropping and diversification in general.

Scope: Farmers face increasing pressure to shift production towards lower input systems, while continuing to ensure sufficient supplies of food and non-food products. The Green Deal in particular has set ambitious targets to reduce by 2030 the overall use of chemical pesticides and fertilisers, reduce nutrient losses and increase organic farming¹²⁰.

Species rich production systems such as intercropping¹²¹ have shown significant potential to increase resource efficiency and resilience against biotic and abiotic stresses, thereby allowing to deliver yield gains without increased inputs, or stabilise yields with decreased inputs. Diversified farming systems making use of strategic intercrops can also improve soil health and deliver multiple ecosystem services.

The benefits of intercropping are the result of highly dynamic interactions between plants and their environment and lead to an optimisation of the use of resources such as nutrients, water or solar radiation. Despite these benefits, intercropping is not widely applied in European agriculture, due e.g. to increased complexity of operations and labour intensity at farm level and market pulls for more standardized products and processing and simplified modes of marketing,

Activities will

- study the (context specific) mechanisms underpinning the benefits associated with intercropping such as enhanced resource efficiency, disease and pest avoidance and product quality;
- elucidate the links between above- and below-ground species interactions and how these could be optimised through management;
- provide evidence on the effects of intercropping on crop quality and product quality down the value chain;
- Identify, test and demonstrate agronomic practices that promote benefits from intercropping by optimising the interactions between plants, environment and management (G x G x E x M) , including the use of inputs and adapted machinery such as precision tools;
- explore the motivation of farmers to adopt intercropping practices and propose solutions to overcome potential barriers;

¹²⁰ Green Deal Farm to Fork and Biodiversity Strategies with 2030 targets: Reduce by 50% the overall use and risk of chemical pesticides and reduce use by 50% of more hazardous pesticides; reduce nutrient losses by at least 50% while ensuring no deterioration in soil fertility; this will reduce use of fertilisers by at least 20 %; achieve at least 25% of the EU's agricultural land under organic farming

¹²¹ tck is understood as a farming practice growing two or more crop species together at the same time in the same place

- promote the uptake of intercropping through the development of guidelines and wide-spread practical demonstrations taking into account a range of farming systems, pedo-climatic conditions and value chains;
- identify and test avenues for marketing and processing of more diverse farming outputs.

Result of activities should benefit both conventional and organic agriculture. Activities should follow a multi-actor approach¹²², thus ensure adequate involvement of advisors, farmers, other players in the value chain and consumers. Communication and outreach to a wide range of stakeholders is essential.

International co-operation is encouraged in particular with countries where intercropping is more widely applied, yet would benefit from further optimisation.

Proposals will specify how they plan to collaborate with other proposals selected under this and other relevant topics, e.g. by undertaking joint activities, workshops or common communication and dissemination activities. Proposals should plan the necessary resources to cover these activities without the prerequisite to define concrete common actions at this stage. Details of coordination activities will be defined during the grant preparation phase with the Commission.

HORIZON-CL6-2022-BIODIV-01-06: Monitoring and effective measures for agrobiodiversity

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the objectives of the 2030 Biodiversity Strategy and other policies such as the Common Agricultural Policy, successful proposals will contribute to the take up of practices in agriculture that promote biodiversity and to effective monitoring of farmland biodiversity to maintain and re-establish biotopes and habitats.

Projects should address all following outcomes:

- Methods and tools for a systematic monitoring of in situ biodiversity of agricultural areas, considering above ground and soil biodiversity;

¹²² See definition of the multi-actor approach in the introduction to this Work Programme part.

- Enhanced methods and indicators to evaluate the impact of agricultural practices and in particular CAP agri-environment measures on above and below ground biodiversity;
- Increased access to information on carbon- and nature-rich areas;
- More effective farm advisory systems in relation to biodiversity issues and providing special advice for farmers including those operating in Natura 2000 sites

In the longer term:

- More effective agri-environment measures, improving both above- and below ground biodiversity in agriculture areas along with an increased uptake of agroforestry support measures under rural development

Scope: The EU Biodiversity Strategy 2030 underlines the role of farmers in preserving biodiversity while at the same time indicating that certain agricultural practices are a key driver of biodiversity decline.

According to the latest State of Nature Report (EEA, 2020), many terrestrial habitats are severely impacted by agriculture, especially grasslands and freshwater habitats, heath and scrub, and bogs, mires and fens playing important role in soil carbon sequestration. This is also the case for most of the species groups, including reptiles, molluscs, amphibians, arthropods, vascular plants and breeding birds.

Grasslands as one of the most species-rich habitats in Europe, are among the habitats with the highest share of assessments showing a bad conservation status (49 %), accompanied by deteriorating soil properties.

Farmland birds and insects, particularly pollinators, and soil microbiota are key indicators of the health of agroecosystems and are vital for agricultural production and food security. The Biodiversity Strategy aims to bring back at least 10% of agricultural area under high-diversity landscape features. These include, inter alia, buffer strips, rotational or non-rotational fallow land, hedges, non-productive trees, terrace walls, and ponds. Such measures help enhance carbon sequestration, prevent soil erosion and depletion, filter air and water, and support climate adaptation.

The EU Birds and Habitats Directive aims at reaching favourable conservation status of wild birds as well as of those species and habitats covered in the annexes of the Habitats Directive. However, there are many data gaps to identify species' requirements and to monitor population trends over time for those species dependent on agricultural habitats. This hampers the design of appropriate agro-ecological conservation measures and the proper implementation of the Directives. Consequently, monitoring the diversity and area of habitats for farmland-dependent species, in space and time, in order to maintain and re-establish biotopes and habitats is necessary.

Projects will:

- Map carbon and nature rich areas and analyse the effects of agricultural practices on biodiversity
- Monitoring the diversity and area of habitats for farmland-dependent species, in space and time
- Develop and test effective agri-environment measures as well as indicators and monitoring tools to determine the effectiveness of conservation measures for species and their habitats in the agricultural context
- Develop and demonstrate practical examples of agro-forestry systems and how these can be promoted through rural development programmes.

Activities should be carried across a range of climatic/biogeographical regions in the EU.

The project needs to take account of already existing EU species action plans, such as the Turtle Dove Action Plan and the EU Wet Grassland Wader Action Plan. Furthermore, cooperation is expected with the Biodiversity partnership and other relevant Horizon Europe Missions and partnerships.

Enabling transformative change on biodiversity

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-BIODIV-01-07: Assessing the nexus of extraction, production, consumption, trade and behaviour patterns and of climate change action on biodiversity in the context of transformative change

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the EU Biodiversity Strategy, a successful proposal will develop knowledge and tools to understand the role of transformative change for biodiversity policy making, address the indirect drivers of biodiversity loss, and initiate, accelerate and upscale biodiversity-relevant transformative changes in our society.

Projects should address all following outcomes:

- Economically viable and sustainable pathways are designed to minimise biodiversity loss or to enhance biodiversity, related to mutually influencing extraction, production, consumption, trade patterns in the medium- and long-term (beyond 2030)
- Improved understanding of the human dimensions impacting biodiversity i.e. ethics, social context, institutions, organisation, behaviour will provide policy makers, industrial stakeholders and civil society the tools needed to reframe their actions, by highlighting the synergies of mainstreaming biodiversity with climate transitions, including on how to avoid or minimise trade-offs.
- Social norms and behaviours, linked to socio-economic values (e.g. ethics, social context of citizens, consumers, institutions, organisations, industry) impacting biodiversity, are better understood.
- The meaning of transformational change in practice, is laid out, based on case studies
- The understanding of the biodiversity inter-dependencies of the SDGs has improved; IPBES and IPCC are strengthened by the contribution of European research and innovation. Approaches, tools and knowledge influence policies at the adequate level on transformative change for biodiversity – the key elements for this change are delivered by the portfolio of cooperating projects (of which these projects are part of).

With focus on assessing the nexus of extraction, production (including processing), consumption, trade and behaviour patterns, including transformative changes for climate change on biodiversity for the EU and Associated Countries, international cooperation in particular with African countries, Brazil, CELAC or the Mediterranean region is encouraged.

Scope: Proposals should address all the following points:

- Assess how extraction, production, processing, consumption, trade, behaviour patterns, especially linked to primary production (e.g. livestock with/or energy crops, etc. including through tele-coupling from consumption and all along supply chains), food systems, and transformative changes towards climate neutrality, affect biodiversity and ecosystem services.
- Develop pathways together with key industries and key stakeholders to minimise loss of, and enhance biodiversity, whilst increasing the delivery of a wide range of ecosystem services. These industries cover food, feed, fibre, energy production and the wider food chain (related to bio-economy, renewable energies, infrastructure, technologies)¹²³, and the deployment of climate mitigation and adaptation measures potentially harmful for biodiversity (e.g. concrete walls in coastal areas, replacement of biodiversity rich ecosystems for energy crops, etc.).

¹²³ Based on the development of sustainable pathways as issued by projects such as CD-LINKS and EUCalc.

- Identify and address leverage points for transformational change in trade, triggering changes in established and new production and consumption patterns for new business models, and a multi-actor approach, taking into account direct impacts of climate mitigation and adaptation measures to biodiversity.
- Highlight the potential (1) of public procurement for delivering biodiversity benefits and (2) of nature-based solutions for enabling and accelerating the relevant aspects of transformative change.
- Quantify investments into infrastructure and the provision of labour which could be shifted from impacting biodiversity negatively towards benefits for biodiversity, including the anticipation, mitigation and management of social, institutional and economic conflicts this may trigger (or decrease), in order to achieve a just transition process.
- Understand and engage communities and other social actors, including through citizens science, and initiate behavioural changes leading to production and consumption patterns halting biodiversity loss.
- Cooperate with ongoing activities to include biodiversity into integrated assessment models¹²⁴ and analyse the usability of existing and emerging concepts such as ‘Planetary Boundaries’, ‘Doughnut Economy’, ‘Environmental Footprints’.
- Explain the relevance of transition pathways for biodiversity for competitive sustainability, towards a just transition in the full range of SDGs and climate neutrality.

Unsustainable production and consumption, including the role of trade for linking both, are pushing many of the direct drivers of biodiversity loss: land use change, overexploitation, climate change and pollution. Proposals should, based on a clear understanding of these relationships¹²⁵ address how leverage points and levers can be identified and used for generating benefits for biodiversity, e.g. through revision of regulation, standards, funding practices or governance processes.

They should highlight how the primary production sectors (in particular in agriculture, forestry, fisheries, raw material extraction, and also the construction sector) and the related infrastructure and energy provision and use impacts biodiversity directly. They should show effects on the direction of economic development, which leads to lock-in effects, inequalities, lack of capacities of institutions at every level to shift towards sustainable use, the protection and restoration of biodiversity and ecosystem services. On patterns of consumption, proposals should show how their impacts such as uneven use and exploitation of resources, generation of waste and pollution, value setting, power setting in societies, institutions and financial

¹²⁴ Such as activities stemming from CL5-D1-CSR-07-2021/2, CL5-D1-CSR-09-2021/2 and CL5-D1-CSR-15-2021/2

¹²⁵ As provided in IPBES (2018, 2019), IPCC (2019), EKLIPSE and EC (2020), GBO-5 (2020), FP7 and H2020 projects on climate and urban transitions. See also <http://www.biodiversitybarometer.org/>

streams could be addressed in business, institutional and consumer agendas to achieve positive outcomes for biodiversity.

Proposals should assess the cultural diversity that influences these compromises and people's engagement, and lead the way to further mainstream biodiversity in socio-economic and environmental agendas, from the transformative aspect of changing extraction, production and processing, consumption, trade and behaviour patterns, including on actions for addressing climate change on biodiversity. They should also analyse and test the use of nature-based solutions as tool in this regard. Optimal and cost-effective use of behavioural games, networks of sensors, GIS-mapping, big data and observational programmes such as the European Earth observation programme Copernicus, through the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) as well as citizens' observatories, should be used as appropriate to enable the integration and visualisation of data.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

Proposals should build their analysis upon the synergies of various sustainable development goals, to deliver directly and indirectly biodiversity benefits, and of the role of biodiversity in reaching the set of sustainable development goals, when related to extraction, production, consumption, trade and behaviour patterns.

Proposals should deliver case studies and collect good and failed examples which could inform these transformations and inform and motivate transformative change through learning, co-creation and dialogue.

Proposals should foresee appropriate resources to develop joint deliverables (e.g. activities, workshops, as well as common communication and dissemination) with all projects on transformative change related to biodiversity. This concerns projects funded under this Destination, or under calls included in Destination 2 related to transformational change (Fair, healthy and environmentally-friendly food systems from primary production to consumption) that will aim to deliver various co-benefits, including on the reduction of biodiversity loss. Projects should use existing platforms and information sharing mechanisms relevant for transformational change and on biodiversity knowledge¹²⁶. Cooperation and possibly synergies with relevant topics in Cluster 5 should be explored and established as relevant. Furthermore, cooperation is expected with the European Partnership on Biodiversity¹²⁷ and with the Science Service¹²⁸. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details

¹²⁶ BISE, Knowledge Centre for Biodiversity, BiodivERsA, Oppla, NetworkNature and their joint work streams

¹²⁷ <https://www.biodiversa.org/1759>

¹²⁸

“HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)

of these coordination activities will be defined during the grant preparation phase with the Commission.

The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles. Proposals should show how their results might provide timely information for major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), as well as the Convention on Biological Diversity on project outcomes¹²⁹.

HORIZON-CL6-2022-BIODIV-01-08: Understanding the role of behaviour, gender specifics, lifestyle, religious and cultural values, and addressing the role of enabling players (civil society, policy makers, financing and business leaders, retailers) in decision making

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 3.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the EU Biodiversity Strategy, a successful proposal will develop knowledge and tools to understand the role of transformative change for biodiversity policy making, finance and business leaders, address the indirect drivers of biodiversity loss, and initiate, accelerate and upscale biodiversity-relevant transformative changes in our society.

Projects should address all following outcomes:

- Informed approaches tackling biodiversity loss and implementing nature-based solutions consider how behaviour, lifestyles, religious, societal and cultural values shape the choices of producers and consumers, institutions and their policy decisions.
- The motives behind broad societal changes and transitions are taken up in the design of relevant policies, communication and engagement campaigns and other actions.
- Leverage points in those sectors with the greatest impact on biodiversity are addressed, as the role of decisive actors (civil society, education institutions, policy makers, financing and business leaders, retailers) and their inter-sectorial consultation is known.

¹²⁹ Cooperation is requested with projects “HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC” and “HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity”

This includes human rights and due diligence across economic value chains, as well as the role of employment patterns for a just transition.

- The understanding of the biodiversity inter-dependencies of the SDGs has improved; IPBES and IPCC are strengthened by the contribution of European research and innovation. Approaches, tools and knowledge influence policies at the adequate level on transformative change for biodiversity – the key elements for this change are delivered by the portfolio of cooperating projects (of which these projects are part of).

Scope: Proposals should engage with civil society organisations – in particular those working on gender, diversity, equity and inclusion –, social partners, policy makers, financing, industry and business leaders, and retailers and value-led (such as religious and cultural) institutions when addressing the role of enabling players for transformative changes in biodiversity actions, exemplified at relevant levels from local to global. They should identify and test measures to overcome barriers for behaviour changes in biodiversity action, considering ethical questions in behavioural economics, e.g. linked to future generations. This must acknowledge the interdependence of the climate and biodiversity crisis.

Proposal should explore intersectionality approaches and give consideration to interlocking systems of power between gender and other social categories and identities such as religion, ethnicity and race (including migrants and refugees), social class and wealth, gender identity and sexual orientation and disability to better address access to and ownership of nature-based solutions.

Proposals should analyse and address the impact of intrinsic vs economic/utilitarian values. Proposal should include an estimation of the importance of engineered vs haphazard policy making factors at relevant levels, and specify and address effects of processes impacting adherence to democracy, voting campaigns, science denialism¹³⁰.

Proposals should build their analysis upon the synergies of various sustainable development goals, to deliver directly and indirectly biodiversity benefits, and of the role of biodiversity in reaching the set of sustainable development goals, considering the importance of behaviour, lifestyle, religious and cultural values.

Proposals should deliver case studies and collect good and failed examples which could inform these transformations¹³¹ and inform and motivate transformative change through learning, co-creation and dialogue.

Proposals should foresee appropriate resources to develop joint deliverables (e.g. activities, workshops, as well as common communication and dissemination) with all projects with all projects on transformative change related to biodiversity funded under this Destination, , and

¹³⁰ Cooperation with Horizon 2020 Green Deal Call topic 10.2 is encouraged

¹³¹

Using results from previous projects and initiatives at EU and global level (see also project POLICYMIX and studies such as <http://www.biodiversitybarometer.org/> or <https://portfolio.earth/>) and referring to, and critically assessing, the understanding of transformative change in IPBES and GBO-5, EEA

should use existing platforms and information sharing mechanisms relevant for transformational change and on biodiversity knowledge¹³². Furthermore, cooperation is expected with the European Partnership on Biodiversity¹³³ and the Science Service¹³⁴. Proposals should show how their results might provide timely information for major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), as well as the Convention on Biological Diversity on project outcomes¹³⁵. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

The projects will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

HORIZON-CL6-2022-BIODIV-01-09: Understanding the impacts of and the opportunities offered by digital transformation, new emerging technologies and social innovation with respect to biodiversity

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the EU Biodiversity Strategy, a successful proposal will develop knowledge and tools to understand the role of transformative change for biodiversity, address the indirect drivers of biodiversity loss, and initiate, accelerate and upscale biodiversity-relevant transformative changes in our society.

Digital technologies are transforming all sectors of society, from food production to mobility, energy, climate mitigation and adaptation measures, construction, infrastructure, technology use, human behaviour and societal organisation, with different impacts on and perceptions of biodiversity, due to speed, scale and connectivity of these transformations. Projects should help finding a safe operating space, in which digitalisation and new emerging technologies are

¹³² BISE, Knowledge Centre for Biodiversity, BiodivERSa, Oppla, NetworkNature and their joint work streams

¹³³ <https://www.biodiversa.org/1759>

¹³⁴

“HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)”

¹³⁵ Cooperation is requested with projects “HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC” and “HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity”

not generating unsustainable rebound effects, but instead constitute a vehicle to accelerate and amplify the transition to a safe and just world for humankind whilst protecting, restoring and sustainably using biodiversity and ecosystem services.

Project should address all following outcomes:

- Impacts, risks and opportunities of digital transformation (through e.g. smart technologies, artificial intelligence, automation, miniaturised sensors, citizen science applications, crowdsourcing), new materials, (e.g. for biomimicry), and new and emerging technologies on biodiversity are better understood, today and through future scenarios.
- The way how system-level change affecting biodiversity through social innovation happens, has been identified and assessed. This relates to the introduction of new technologies, new processes of production, consumer products, regulations, incentives, or participatory processes, and changes how socio-technical and socio-ecological systems operate.
- Proposals for safeguards are available to ensure that diverse values held by citizens (i.e. indigenous communities, youth, women, vulnerable groups in society, socially or economically marginalized groups), are understood in societies to enable democracy and just transitions when related to biodiversity action. These safeguards are promoted to be incorporated in any transformative processes linked to the digital sector and technologies, which can have positive or negative impacts on biodiversity and the wide range of services ecosystems are able to provide.
- The potential of social innovation is demonstrated for tackling biodiversity loss, as well as using biodiversity and the ecosystem services it provides, with nature-based solutions as case studies. Nature-based solutions, through social innovation, are addressing poverty, low resilience and social inequality to achieve a just transition.
- Active intervention by R&I policy and sector policies (niche creation, reformulation of governance, ‘exnovation’), also through empowerment of communities and their endowment is tested.
- Approaches, tools and knowledge influence policies at the adequate level on transformative change for biodiversity – the key elements for this change are delivered by the portfolio of cooperating projects (of which these projects are part of).

Outcomes should be formulated in such a way which allows their potential users (policy makers, institutions, businesses, engineers, civil society) to understand and concretely apply them, including for monitoring, accounting and reporting. They should furthermore be translated to options for ratcheting up the targets and enabling mechanisms of the EU Biodiversity Strategy for 2030, the global post-2020 biodiversity framework, and to inform the processes on the Paris Agreement and the Sustainable Development Goals as well as IPBES. With the focus on the impacts and opportunities of digital transformation, new

emerging technologies and social innovation on biodiversity for the EU and Associated Countries, international cooperation in particular with African countries, Brazil, CELAC or the Mediterranean region is encouraged, in order to understand differences between the EU/AC and other world regions.

Scope:

- Proposals should generate, collect and distribute knowledge on how indirect drivers of biodiversity loss linked to technological and social innovation, which includes digitalisation, can be addressed. In this respect, the impacts of digital divide between urban, peri-urban and rural areas on biodiversity should also be assessed. Proposals should explain how changes in our societies are fostered by technological and social innovation impacting biodiversity – for example through the introduction of new and emerging technologies, new processes of production, consumer products, regulations, incentives, or participatory processes, which change how socio-technical and socio-ecological systems operate.
- It is expected that proposals contribute to informing stakeholders and users on social and technological impacts of new and emerging technologies, which are not covered by existing procedures for risk assessments related to biodiversity¹³⁶. This includes the wider positive and negative impacts on societal values, behaviour, institutional, financial and business frameworks, which in turn are impacting biodiversity and the capacity of ecosystems to provide a wide range of services.
- Proposals should look which tools to use to further mainstream biodiversity into policy making, and governance (including financing, the promotion of innovation, and the introduction of new and emerging technologies) for achieving transformative actions beneficial for biodiversity, for avoiding, mitigating or managing conflicts linked to these transformational changes¹³⁷, and to engage with civil society, policy makers, financing and business leaders, when creating the toolbox for transformative changes in biodiversity actions.
- Proposals should build their analysis upon the synergies of various sustainable development goals to deliver directly and indirectly biodiversity benefits, staying within planetary boundaries, and of the role of biodiversity in reaching the set of sustainable development goals, considering impacts and opportunities of digital transformation, new emerging technologies and social innovation on biodiversity. This explicitly includes the interdependence of biodiversity loss and climate change, and the impacts of digital, technological or social approaches to address mitigation of and adaptation to climate change, on biodiversity – and vice versa.
- Proposals should develop pathways for digital developments towards a successful twin digital and biodiversity transition. Methodologies for assessing their impacts (including

¹³⁶ Such as in the frame of the Convention on Biological Diversity and the Cartagena Protocol

¹³⁷ Referring to, and critically assessing, the understanding of transformative change in IPBES and GBO-5, EEA

through energy/electricity infrastructure impacts, or democracy and trust in science) on environmental, social and economic systems should be developed. Such assessments should focus on the direct and indirect effects of digital developments on biodiversity, intertwined with climate change and health.

- Proposals should deliver case studies and collect good and failed examples, including existing relevant business models, the role of citizen science, and scenarios that could inform these transformations and inform and motivate transformative change through learning, co-creation and dialogue.
- Proposals should foresee appropriate resources to develop joint deliverables (e.g. activities, workshops, as well as common communication and dissemination) with all projects on transformative change related to biodiversity funded under this Destination,, and should use existing platforms and information sharing mechanisms relevant for transformational change and on biodiversity knowledge¹³⁸. Furthermore, cooperation is expected with the Biodiversity Partnership and the Science Service¹³⁹.. Proposals should show how their results might provide timely information for major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), as well as the Convention on Biological Diversity on project outcomes¹⁴⁰. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.
- The project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles. Where relevant, creating links to and using information, data and impact-related knowledge of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) is expected.
-

Interconnecting biodiversity research and supporting policies

Proposals are invited against the following topic(s):

¹³⁸ BISE, Knowledge Centre for Biodiversity, BiodivERSA, Oppla, NetworkNature and their joint work streams

¹³⁹

“HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)

¹⁴⁰

Cooperation is requested with projects “HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC” and “HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity”

HORIZON-CL6-2022-BIODIV-01-10: Cooperation with the Convention on Biological Diversity

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In line with the Commission priority 'A stronger Europe in the world', to implement the EU Green Deal and demonstrated leadership as stipulated in the EU Biodiversity Strategy for 2030, a successful proposal will increase the European support to the Convention on Biological Diversity.

Projects results are expected to contribute to all of the following expected outcomes:

- A dedicated mechanism for scientific and technical cooperation of the EU with the Convention on Biological Diversity (CBD) delivers support for its working groups and task forces, and for the respective subsidiary bodies (incl. the Informal Advisory Group on Technical and Scientific Cooperation).
- Improved coherence in how the EU and Associated Countries gives input into both, CBD (e.g. SBSTTA/SBI) and IPBES processes¹⁴¹.

Scope:

- Research on biodiversity and nature-based solutions has made good progress in the last years, but must be stepped up to achieve targeted impacts on biodiversity-relevant policies. Global initiatives, in turn, should provide structured policy input into the research cycle. This is also key to guiding biodiversity governance, and to implement the EU Green Deal and international conventions. In line with the Commission priority 'A stronger Europe in the world', the European Union must take and demonstrate leadership in this field, notably by increasing its support to the Convention on Biological Diversity.
- Proposals should cover all the following points:
 - o Deliver a dedicated mechanism for scientific and technical cooperation of the EU with the Convention on Biological Diversity (CBD) for its Informal Advisory Group on Technical and Scientific Cooperation

¹⁴¹ In cooperation with HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC

- o In cooperation with the Knowledge Centre for Biodiversity, deliver on the European technical and knowledge contribution to a global biodiversity platform for biodiversity, and supporting the implementation of the CBD monitoring framework (including in collaboration with EU and national monitoring initiatives and the Biodiversity Indicators Partnership),
- o Improving policy relevant biodiversity knowledge, including through using information for understanding gaps in global biodiversity action and identifying the needs for ratcheting up biodiversity commitments and action.
- o Engage and support European researchers participating in CBD working groups and task forces, and the CBD's subsidiary bodies, and provide this expertise to UNFCCC processes where relevant.
- o Technically and scientifically support negotiators from the EU and Associated Countries in preparing and at SBSTTA/SBI meetings and CBD COPs.
- o Exchange internationally on topics, which are relevant for the European ambition to lead and to cooperate with worldwide research, which includes targeted capacity building for CEE and Associated Countries.

Proposals should indicate which concrete tasks they will initially deliver at the end of year one. This should be relevant and timely for the policy agenda of the Global Biodiversity Agenda, and for the international dimension of the EU Biodiversity Strategy.

Proposals should then deliver regular (e.g. half-yearly) input according to the agenda of SBSTTA and SBI to the EC services, and continuous support for the Working/Advisory Groups under CBD, in cooperation with the Science Service¹⁴², the Biodiversity Partnership, and further relevant instruments, tools and mechanisms¹⁴³. Its results, where relevant, should be accessible through the Knowledge Centre for Biodiversity. Proposals should foresee adequate resources for such cooperation.

Call - Biodiversity and Ecosystem Services

HORIZON-CL6-2022-BIODIV-02-two-stage

¹⁴²

“HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (“Science Service”)”

¹⁴³

Such as BISE, Oppla, EKLIPSE, NetworkNature

Conditions for the Call

Indicative budget(s)¹⁴⁴

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ¹⁴⁵	Number of projects expected to be funded
		2022		
Opening: 28 Oct 2021 Deadline(s): 15 Feb 2022 (First Stage), 01 Sep 2022 (Second Stage)				
HORIZON-CL6-2022-BIODIV-02-01-two-stage	IA	20.00	6.00 to 10.00	3
HORIZON-CL6-2022-BIODIV-02-02-two-stage	IA	14.00	Around 7.00	2
HORIZON-CL6-2022-BIODIV-02-03-two-stage	RIA	12.00	Around 6.00	2
Overall indicative budget		46.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant</i>	The rules are described in General Annex G.

¹⁴⁴ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

¹⁴⁵ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

<i>Agreements</i>	
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Managing biodiversity in primary production

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-BIODIV-02-01-two-stage: Maintaining and restoring pollinators and pollination services in European agricultural landscapes

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 6.00 and 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 20.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Procedure</i>	The procedure is described in General Annex F. The following exceptions apply: Grants will be awarded to proposals according to the ranking list. However, in order to ensure a balanced portfolio of supported actions, at least the two highest-ranked proposals covering action primordially in the European Union and Associated Countries will be funded provided that they attain all thresholds.
<i>Technology Readiness Level</i>	Main activities are expected to achieve TRL 6-8 by the end of the project. Restoration measures must be in place, but their full results not yet achieved, by the end of the projects – see General Annex B.

Expected Outcome: Responding to the EU Green Deal, the EU Biodiversity Strategy for 2030 and the Farm to Fork Strategy, a successful proposal will restore pollinator-habitats, support the development of pollinator-friendly policies, business models and market conditions, by helping to establish sustainable, productive, climate-neutral and resilient farming systems by minimising pressure on ecosystems, delivering a wide range of ecosystem services, improving public health and generating fair economic returns for farmers. Projects should address all of the following outcomes:

- Agricultural landscapes that are dominated by intensively managed crops and grasslands, are restored¹⁴⁶ through co-designed (with farmers and other land managers, local communities, agricultural advisory services, landscape planners, the nature conservation sector etc.) large-scale, experimental pollinator-friendly practices and services and through social innovation processes, such as new innovative approaches to enhance community participatory planning and innovative business models.
- Management, restoration, conservation and connectivity of wild pollinator habitats follow scientific and policy recommendations, which have been tested in the projects on their applicability. The range of recommendations in question is set in the Assessment Report on Pollinators, Pollination and Food Production of IPBES¹⁴⁷ and the updated Plan of Action of the international initiative on the conservation and sustainable use of pollinators¹⁴⁸.
- Systemic approaches provide an effective enabling environment for stakeholder actions. They demonstrate that coherent and comprehensive policies for the conservation and sustainable use of pollinators at various governance levels can be demonstrated at least at landscape scale, and contributing to foster sustainable agricultural practices while ensuring farming viability and profitability, for different agricultural sectors.
- Improved coordination in governance, as well as enhanced data accessibility, financing and maintenance agreements for actions beneficial for pollinators are achieved
- Adaptive management of measures for the conservation and sustainable use of pollinators is informed by continuous monitoring and assessing of the outcomes, including through the use of results-based payment schemes.

Scope: This topic aims at maintaining and restoring species-rich pollinator communities and their services in agricultural landscapes dominated by intensive land use, and facilitating the uptake of pollinator-friendly practices at wider scale.

The direct and indirect drivers of pollinator decline are of a cross-cutting nature. This calls for the need to ensure policy coherence and to integrate pollinator and pollination considerations not only in policy measures that support the transition towards more sustainable agricultural practices, but also across sectors (for example forestry, consumption and health) and at different spatial scales (farm, landscape, ecosystem).

Despite efforts, many of the main direct drivers of pollinator loss have remained largely unchanged over the years: habitat fragmentation and land use change, the widespread use of synthetic chemicals in agriculture and in other sectors, invasive alien species, and pathogens

¹⁴⁶ “Restoration” is based on CBD guidance on ecosystem restoration, and in line with the EU 2030 Biodiversity Strategy whose Restoration Plan aims to help bring diverse and resilient nature back to all landscapes and ecosystems. On experience of the LIFE programme, i.a. https://ec.europa.eu/easme/sites/easme-site/files/restoration_of_intensified_farmland_life_platform_-_final.pdf

¹⁴⁷ IPBES (2018) <https://ipbes.net/assessment-reports/pollinators>

¹⁴⁸ As adopted in CBD/COP/DEC/14/6..

(in case of managed pollinators). In particular, great attention has been focused on drivers linked to intensive agricultural practices, such as monoculture, and the use of conventional synthetic fertilisers and pesticides having both lethal and sublethal effects on pollinators. In addition, the increasing negative impact on pollinator habitats of other direct drivers, such as climate change, have exacerbated the problem.

This topic aims at restoring and maintaining species-rich pollinator communities and their services in agricultural landscapes characterised by intensive farming practices, and facilitating the uptake of pollinator-friendly practices in the agricultural sector at a wide scale, in different pedo-climatic conditions across Europe. The proposed projects should put emphasis towards mainstreaming pollination concerns into policies, developing and implementing measures on the ground to support the conservation and sustainable use of pollinators, addressing risks, building capacity, involving all relevant stakeholders along the agri-food chain and sharing knowledge on multiple levels to integrate pollination considerations into farming, land use and other management decisions, focusing collaborative research on emerging issues and prevailing needs.

The proposed projects must build on existing experience¹⁴⁹ in particular on lessons learned and best practices gained through EU-funded projects and initiatives such as those supported by Horizon 2020, Results-Based Payment Scheme projects¹⁵⁰, and the LIFE programme, and prepare the uptake of approaches developed and tested in this topic into future EU-funded activities (such as LIFE, the Common Agriculture Policy, Horizon Europe). Projects should apply a multi-actor approach¹⁵¹ where appropriate and ensure a value chain approach with adequate involvement of the farming sector, and support local initiatives with the tools and knowledge developed. Proposals must show how their results will contribute to the EU Pollinators Initiative¹⁵², feed into relevant IPBES functions, and ensure cooperation with the CBD¹⁵³.

Project consortia must give evidence that they have the rights to undertake actions on the areas to be restored. No land purchase or lease can be funded under this topic. Projects are expected to mobilise additional funding or in-kind contributions when implementing restoration actions.

Proposals should foresee appropriate resources to develop joint deliverables with all projects funded under this topic for aspects of horizontal nature and for cooperation with other

¹⁴⁹ Based on and/or informing the EU Pollinators Initiative, the Knowledge Centre for Biodiversity, BISE, and further projects and initiatives of EU importance and globally such as SC5-32-2020: Addressing wild pollinators decline and its effects on biodiversity and ecosystem services, or EcoStack, POSHBEE, B-GOOD and IPMWORKS, EIP-AGRI, the Focus Group on Bee Health and Sustainable Bee Keeping <https://ec.europa.eu/eip/agriculture/en/focus-groups/bee-health-and-sustainable-beekeeping>, and with the Biodiversity Partnership

¹⁵⁰ <https://ec.europa.eu/environment/nature/rbaps>

¹⁵¹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

¹⁵² https://ec.europa.eu/environment/nature/conservation/species/pollinators/index_en.htm

¹⁵³ Convention on Biological Diversity. Coordination with two topics must be envisaged: HORIZON-CL6-DIV-2022-00-00: Cooperation with the Convention on Biological Diversity and HORIZON-CL6-DIV-2021-00-00: Support to processes triggered by IPBES and IPCC

projects¹⁵⁴. Actions should use existing platforms and information sharing mechanisms relevant for pollinators and the restoration of their habitats, giving open access to generated data and results, whereby research outcomes and data will be freely shared following FAIR data principles. Furthermore, cooperation is expected with the European Partnership on Biodiversity¹⁵⁵ and with the Science Service¹⁵⁶, and where relevant with other large-scale initiatives under Horizon Europe, such as the candidate partnership on agroecology living labs, research infrastructures and the proposed mission ‘‘Caring for soils is caring for life’’. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

Proposals should address all the following points:

- Demonstrate measures to diversify large-scale farming systems and the resulting feeding resources and habitats of pollinators in agricultural lands, grasslands and semi-natural areas, through agro-ecological practices, including organic farming and agroforestry, as well as through home gardens, and forestry systems where relevant to the restored landscapes, with a view to ensure heterogeneous habitats formed by native species that offer diversified floral and nesting resources for pollinators;
- Create set-asides for nature, such as uncultivated patches of vegetation, with the objective to enhance floral diversity, and to ensure native, diverse, abundant and continuous floral resources for pollinator across time and space;

The two above points combined should cover at least 50% of the proposed budget.

- Analyse and evaluate different options to protect and conserve threatened pollinator species as well as their natural environment, and elaborate the requirements to promote recognition of pollinator-friendly practices and consequences on pollination functions and services in existing certification schemes; and develop methods for the inclusion of pollinator conservation into ecosystem restoration frameworks (in particular on grassland and other agro-ecosystems).
- Develop prototypes of potential extension services, farmer-to-farmer sharing approaches and farmer field schools to strengthen synergies between scientific evidence, traditional knowledge, conservation and farmer-researcher community practices, to exchange knowledge and provide hands-on education and empowerment of local farming communities on pollinators. This could include for instance fostering networks for exchanges of native seeds

¹⁵⁴ BiodivERsA, Oppla, the Knowledge Centre for Biodiversity, relevant H2020 and Horizon Europe projects such as SHOWCASE and HORIZON-CL6-CLI-2021-00-00: Agroforestry to meet climate, biodiversity and farming sustainability goals

¹⁵⁵ <https://www.biodiversa.org/1759>

¹⁵⁶ HORIZON-CL6-DIV-2021-00-00: A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy (‘‘Science Service’’)

- Elaborate, based on the large-scale approach, how the promotion of coherent policies across sectors and issues (e.g. biodiversity, agriculture and food security, chemicals and pollution, reduction of inequality, climate change and disaster risk reduction) could look like for pollinators. This scalability plan should be elaborated with the involvement of the concerned communities, and should include the dissemination of innovative solutions and practices, and a process for commitments in adopting large-scale restoration of pollinator communities within governance and financing systems, in order to allow replication and upscaling across the EU/AC and internationally. It should seek guarantees for the non-reversibility and/or continuity of restoration activities and/or further replication and/or expansion, implementation of sustainable management practices and monitoring after the end of the projects.
- Assess and propose options for the development and implementation of innovative incentives, consistent and in harmony with international obligations, for farmers and other actors along the agri-food chain, to encourage the adoption of pollinator-friendly practices (e.g. carbon sequestration measures that increase pollinator habitats; conservation of uncultivated areas for pollinator forage; communication to consumers and other actors on the benefits of pollinator-friendly practices, etc), assessing impacts on farmers' income, on overall business performance of farms, as well as on social aspects in farming communities.
- Building on existing knowledge, developed inter alia by EU-funded research projects, to assess options to remove or reduce incentives that are harmful to pollinators and their habitats (e.g. pesticides subsidies; incentives for pesticide use as credit requirements from banks), and to promote alternative approaches to pesticide use (e.g. Integrated Pest Management), taking into consideration the needs of farmers, gardeners, land managers, indigenous people, local communities and other stakeholders¹⁵⁷;
- Design and test a system to monitor the effectiveness of the large-scale interventions, taking into consideration the scale-dependent aspects of protecting pollinators and managing pollination functions and services, using standard methods in line with the proposal for an EU Pollinator Monitoring Scheme¹⁵⁸, and contribute to their improvement.

Proposals should develop scientifically robust and transparent methodologies, building on achievements from previous research activities. To ensure trustworthiness, swift and wide adoption by user communities, and to support EU and national policy-makers, actions should adopt high standards of transparency and openness, going beyond ex-post documentation of results and extending to aspects such as assumptions, models and data quality during the life of projects.

¹⁵⁷ In cooperation with e.g. Horizon 2020 and Horizon Europe calls on Integrated Pest Management
¹⁵⁸ <https://wikis.ec.europa.eu/display/EUPKH/EU+Pollinator+Monitoring+Scheme>

HORIZON-CL6-2022-BIODIV-02-02-two-stage: Boosting breeding for a sustainable, resilient and competitive European legume sector

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 14.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5-7 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will support the objective of the Farm to Fork Strategy to transition to a fair, healthy and resilient European agriculture, notably its objective to foster EU-grown plant proteins, in line with the ‘Report on the development of plant proteins in the EU’¹⁵⁹. They will do so by increasing the availability of crops and breeds that cater for the specific needs of the legume sector, thus supporting increased (agro-) biodiversity and the transition to sustainable, productive, climate-neutral and resilient farming systems that minimise pressure on ecosystems while ensuring fair economic returns for farmers and food consumption that is sustainable in terms of both health and the environment.

Project results are expected to contribute to all the following expected outcomes:

- Improved legume varieties for different attributes/traits (e.g., resilience to abiotic and biotic stresses, nutrient composition, food and feed processing, flavour, etc)
- Improved availability of and open access to data on breeding methods and legume breeding research outcomes
- Increased competitiveness of the legume breeding sector through cost-effective legume breeding methods, novel governance models, testing, training and networking
- Improved diversification of farming systems and agri-food value chains and increased farmers’ competitiveness through the implementation of crop rotation systems based on the cultivation of legumes
- Improved delivery of environmental services from agriculture, including the reduction of GHG emissions

Scope: Legume crops are a source of food, feed and environmental services. For instance, legumes have the unique capacity to fix nitrogen in the soil and hence improve soil fertility,

¹⁵⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0757>

while at the same time reducing the need to use conventional inorganic fertilisers. Legumes have an important role to play in the transition towards more sustainable farming systems that provide economic, environmental and social benefits and address relevant objectives of the EU Farm to Fork Strategy. In view of the global increase in protein demand, a sustainable diversification of protein sources in Europe needs to be explored and developed. Legume crops have a significant role to play in this regard. However, for a variety of reasons, European legume production is not sufficiently developed. Amongst others, a lack of breeding efforts and insufficient use of genetic resources are responsible for the low percentage of arable land currently used for legumes in Europe, despite their agronomic and environmental benefits. Closing gaps in breeding (traditional and new varieties) including facilitating the sharing of knowledge and best practices in legume breeding, can be a key driver for improving the competitiveness of European-grown legume crops.

Proposals will build on the results of relevant EU-funded research projects. Proposals should fall under the concept of the 'multi-actor approach'¹⁶⁰ and ensure adequate involvement of farmers, the breeding sector and other relevant actors of the value chain. This topic is open for the breeding needs of the legume sector in conventional, agroecological and organic farming, and addresses all climate/biogeographical regions in Europe. In order to achieve the expected outcomes, international cooperation is advised. Proposals should include a clear plan to collaborate with other projects selected under this topic.

Projects will develop a catalogue of legume species and varieties and desired characteristics driven by demands in the EU and Associated Countries food and feed chains. Projects will develop a range of measures to improve legume varieties for different attributes, such as higher and more stable yields, enhanced tolerance to abiotic and biotic stresses, resource efficiency, increased nitrogen-fixing capacity (eg. enhanced use of plant root-microbiome interactions within rhizosphere layer), and enhanced nutritional quality, food and feed processing, etc, through pre-breeding and breeding activities and tapping into local and traditional varieties where relevant. Projects will improve screening techniques for a better understanding of genetic relationships, origin and susceptibility to specific attributes. Proposals will build an open repository of breeding methods and breeding research outcomes for different attributes. Projects will analyse the cost-effectiveness of legume breeding methods and identify the best varieties suited for given uses (e.g. crop rotation, extensive agricultural livestock systems, etc). Case studies of innovative engagement of value chain partners in legume breeding initiatives in different contexts will be analysed and key factors of success will be identified. Governance and financial models will be developed to support legume breeding initiatives that are inclusive for all actors in the value chain and that build linkages among those actors, with a view to strengthening legume demand. Projects will design training packages tailored to the specific needs of different actors in the legume breeding and seed business to strengthen their capacities to achieve breeding gains. Building on existing tools or mechanisms, where relevant, projects will set up a transdisciplinary Europe-wide platform to facilitate trans-national and trans-regional sharing of knowledge and best practices in legume breeding, including facilitating cross-regional testing of varieties.

¹⁶⁰ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

Projects will foster demonstration and testing of legume breeding in different regions, with emphasis in regions where the legume breeding sector is less developed.

HORIZON-CL6-2022-BIODIV-02-03-two-stage: Resilient beekeeping

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Procedure</i>	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering biotic and abiotic factors, grants will be awarded to applications not only in order of ranking but at least also to one project within the biotic stressors (i.e. diseases) that is the highest ranked, and one project highest ranked within the abiotic stressors, provided that the applications attain all thresholds .

Expected Outcome: A successful proposal will support the objective of the Farm to Fork strategy to transition to fair, healthy and resilient European agriculture, and contribute to preserve biodiversity and strengthen the resilience and sustainability of specific farming sectors. It will contribute to the impacts related to a better knowledge of the biodiversity decline and of the interrelations between biodiversity, health and climate, as well as to the practices in agriculture supporting biodiversity and other ecosystem services.

The proposed projects are expected to contribute to a better understanding of agroecosystems practices that can sustain honeybees, to enhanced preservation of honeybee genetic resources and their use in breeding, and to mitigation of impacts of beekeeping activities on wild pollinators.

- Improved resilience of beekeeping against stresses like climate change, nutritional stresses, pathogens and chemicals
- Support to stakeholders associated with beekeeping, trade, services, monitoring and control through increased knowledge on honeybee immunity and nutrition
- Improved capacity to deal with relevant honeybee pathogens
- Robust evidence-based understanding of the importance of diversity within honeybee populations.

- Improved understanding of the impacts of beekeeping activities on wild pollinators and strengthened capacity to address them.

Scope: Resilience of beekeeping is important both for pollination services and for the honeybee production sector. Bees are subject to numerous biotic and abiotic stressors (e.g. loss of feed resources, exposure to various chemicals, invasive species and/or pathogens) and the impact of climate change on honeybees requires further attention. The biology of honeybees, including immunity and nutrition is still poorly understood, as is the role of genetic diversity within honeybee populations and interactions between honeybees and their environment.

Proposals will address relevant areas of research as appropriate:

- Develop technologies and strategies for beekeepers to adapt to climate change and possibly contribute to mitigate climate change, including the design of novel beehives equipment, technologies and management protocols.
- Perform baseline studies on immunity, health, nutrition, and genetic diversity and resistance of honeybees in line with their biological performance.
- Develop tools for assessing potential impacts of beekeeping on wild pollinators at landscape scale, strategies for mitigating those impacts, and tools tailored to public authorities for planning and decision-making with regard to optimal deployment of bee hives at local or regional level, taking into account among others nutrition requirements and landscape factors.
- Address at least Varroa destructor and possibly other honeybee mites, as well as Aethina tumida
- Review the key biological mechanisms of Varroa destructor, which determine its multiplication in a hive, including its potential connection with other pathogens, and identify possible novel areas to target with potential new control methods, including bee genetic resistance, especially in light of the experience and limitations of the attempts to fight it in Europe in the last decades.
- Assess the vulnerability and preparedness of the EU honeybee-keeping sector in relation to Aethina tumida and Tropilaelaps spp. which are exotic or largely exotic to the EU (A.tumida is present in southern Italy), scrutinise strategies and practices in other countries (outside of EU) where these appeared recently, identify successful practices and suggest mitigation strategies for and by the beekeepers to live with these pathogens, in case of their eventual spread in the EU.

Proposals should include, if appropriate, a genetic component, looking at both the diversity of honeybee populations and the possibility of breeding and conservation approaches to address the identified challenge.

Proposals should fall under the concept of the 'multi-actor approach'¹⁶¹ and ensure adequate involvement of beekeepers, farmers, agricultural advisory services, manufacturers, the veterinary profession, ecology and nature conservation experts, and other relevant actors.

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¹⁶¹ See definition of the multi-actor approach in the introduction to this Work Programme part.

Destination 2 – Fair, healthy and environmentally-friendly food systems from primary production to consumption

The national, EU and global food systems from farm to fork are facing sustainability challenges that could jeopardize food and nutrition security. The Farm to Fork Strategy, which is key for the Green Deal and the United Nations Sustainable Development Goals (SDGs), aims to address these challenges and deliver co-benefits for environment, health, society and economy, ensuring that actions leading to the recovery from the COVID-19 crisis put us onto a sustainable path. R&I are key drivers steering and accelerating the transition to sustainable, safe, healthy and inclusive food systems from primary production to consumption, thereby ensuring food and nutrition security for all within planetary boundaries.

Sustainable farming systems provides a number of economic, environmental, social and health benefits and are the most important prerequisite for food and nutrition security. For farmers, who are the backbone of food systems and immediate managers of natural resources, the European Green Deal sets ambitious targets to achieve with respect to improving the sustainability and safety of feed and food production. These targets are included in the main European Green Deal policy initiatives, in particular in the Farm to Fork Strategy, Biodiversity Strategy, Zero Pollution and Climate Action. R&I will be key enablers to achieve these challenging targets. R&I will speed up the transition to sustainable and competitive agriculture by unlocking the potential of agroecology¹⁶², including enhancing organic farming in the agroecological transitions, increasing EU-grown plant proteins and advancing digital and data technologies as enablers. R&I, notably taking advantage of the Horizon Europe mission in the area of “soil health and food”, will support farmers in managing land, soil, water and nutrients in sustainable ways. New knowledge and innovative solutions will improve plant and animal health and welfare, prevent inter-species disease transmission through food production and trade system, as well as reduce the dependency of farmers on the use of pesticides, antimicrobials and other external inputs. Thanks to R&I, farming systems will maximise the use of the wide range of ecosystem services from the EU agroecosystems and landscapes managed in a more sustainable way and contribute to reversing the loss of biodiversity and soil fertility while creating a resilient primary production (Destination 1). Farmers will be better equipped to significantly contribute to climate neutrality and their resilience to climate change will be enhanced (Destination 5). Besides, R&I will support development of policy, in particular Common Agricultural Policy (CAP), business models and market conditions enabling transition to sustainable food and farming systems. Effective Agricultural Knowledge and Innovation Systems (AKIS) will speed up innovation and the uptake of the R&I results from farm to fork (Destination 7). As a result, farmers will be able to transform their production methods and move to climate- and environmentally-friendly and resilient farming systems, thereby contribute to sustainable food value chains that generate fair economic returns for farmers and provide consumers with affordable, safe, healthy and sustainable food (Destinations 1 and 5).

¹⁶² <http://www.fao.org/3/i9037en/i9037en.pdf>

Sustainable fisheries and aquaculture contribute directly to an environmentally friendly, inclusive, safe and healthy food production through the provision of high nutritional value proteins, lipids and micronutrients for a healthy diet. Sustainably produced food from marine and fresh-water bodies can and should account for a much bigger proportion of the overall food consumed. The Farm to Fork Strategy aims at fishers and aquaculture producers that deliver better climate and environmental results and also at strengthening their position in the supply chain. R&I will directly support the Common Fisheries Policy and deliver inclusive and diversified approaches to allow for the adaptation of fisheries management to the different realities including in the international context. Sustainable and resilient aquaculture systems, including the use of low trophic species (e.g. algae and herbivores), high animal welfare and alternative sources of protein for food and feed, will increase seafood production and reduce the environmental impact while adding economic value to the chain. Seafood security will benefit from the drastic reduction in the currently massive pre- and post-harvest losses in seafood biomass. Producers and consumers awareness, trust and behaviour with respect to responsible production, consumption and disposal of seafood, will contribute directly to increased competitiveness and sustainability of the sector. An overarching partnership “A climate neutral, sustainable and productive Blue Economy” will contribute to increased food security, create added value, blue growth and jobs in Europe through a jointly supported research and innovation programme in the European seas, coastal and inland waters.

Transforming food systems for health, sustainability and inclusion requires robust, system-wide changes at all governance levels (from local to global and vice versa) as food systems are intertwined with all of the other sectors and are one of the key drivers of climate change and environmental degradation. Food systems are to be understood here as all the sectors, actors, stakeholders, organisations and disciplines relevant to and connecting primary production (from land and sea), food processing, food distribution and retailing, food services (canteens, restaurants and the gastronomic sector), food consumption, food safety, nutrition and public health, and food waste streams. The European Green Deal and, in particular, the Farm to Fork Strategy support a shift towards more resilient and environmentally, socially and economically sustainable food systems, sourced from land and sea, that is necessary to deliver safe, healthy, accessible and affordable food and diets for all, while respecting planetary boundaries. This implies a better understanding of the multiple interactions between the different components of the current food systems, to foster solutions that maximise co-benefits with respect to the four Food 2030 priorities: nutrition and health including food safety; climate and environmental sustainability; circularity and resource efficiency; and innovation and empowerment of communities. R&I will accelerate the transition to sustainable, healthy and inclusive food systems by delivering on different thematic areas: dietary shifts towards sustainable and healthy nutrition; supply of alternative and plant-based proteins; prevention and reduction of food losses and waste; microbiome applications; improving food safety and traceability; fighting food fraud; behavioural change; personalised nutrition, urban food systems (Destination 6), food systems governance and systems science, as well as digital and data-driven innovation (Destination 7). Furthermore, R&I activities supporting the partnership “Safe and Sustainable Food Systems for People Planet and

Climate” will contribute to identifying and delivering innovative solutions providing co-benefits for nutrition, quality of food, climate, circularity and communities.

The EU also aims to promote a **global transition to sustainable food systems**. Targeted R&I activities in particular under the EU-Africa Partnership on Food and Nutrition Security and Sustainable Agriculture (FNSSA) or global initiatives through international research consortia initiative will contribute to this ambition.

Expected impacts:

Proposals for topics under this Destination should set out credible pathways contributing to **fair, healthy, safe, climate and environmentally-friendly and resilient food systems from primary production to consumption, ensuring food and nutrition security for all within planetary boundaries in the EU and globally**.

More specifically, proposals will contribute to one or more of the following impacts:

- Sustainable, productive and climate-neutral and resilient farming systems providing consumers with affordable, safe, traceable healthy and sustainable food, while minimising pressure on ecosystems, restoring and enhancing biodiversity, improving public health and generating fair economic returns for farmers;
- Sustainable fisheries and aquaculture increasing aquatic biomass production, diversification and consumption of seafood products for a fair, healthy, climate resilient and environmentally friendly food systems with low impact on aquatic ecosystems and high animal welfare;
- Sustainable, healthy and inclusive food systems delivering co-benefits for climate mitigation and adaptation, environmental sustainability and circularity, sustainable healthy nutrition and safe food consumption, food poverty reduction, inclusion of marginalised people and empowerment of communities, and flourishing businesses.

To unlock the full potential of R&I and maximise impacts, participatory approaches, e.g., multi-actor approach, involving input industry and technology providers, primary producers, food businesses (e.g., food and drink industry, HoReCa, etc.) consumers, citizens, local authorities and other actors, will be promoted with a view to co-creating innovative systemic solutions in support of food systems sustainability goals.

In encouraging multi-actors approaches, the proposals may foster synergies with relevant initiatives funded at EU level, including the Knowledge and Innovation Communities (KICs) of the European Institute of Innovation and Technology (EIT). The innovation ecosystems created and nurtured by the EIT KICs can contribute to building communities or platforms for coordination and support actions, sharing knowledge or disseminating and fostering the exploitation of the project results. Where relevant, and without prejudice to the direct participation of the EIT KICs in the R&I activities, the proposals under this destination are also encouraged to explore other forms and means of service provisions distinct to the EIT

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

KICs, in particular EIT Food and EIT Climate-KIC, that can be complementary to the considered proposals and their activities.

Topics under this destination will have impacts in the following impact areas of the Horizon Europe Strategic Plan for 2021-2024: Climate change mitigation and adaptation; Enhancing ecosystems and biodiversity on land and in waters; Good health and high-quality accessible healthcare; Clean and healthy air, water and soil; A resilient EU prepared for emerging threats; Inclusive growth and new job opportunities.

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2021	2022	
HORIZON-CL6-2021-FARM2FORK-01	175.00		01 Sep 2021
HORIZON-CL6-2022-FARM2FORK-01		167.00	15 Feb 2022
HORIZON-CL6-2022-FARM2FORK-02-two-stage		62.00	15 Feb 2022 (First Stage) 06 Sep 2022 (Second Stage)
Overall indicative budget	175.00	229.00	

Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption

HORIZON-CL6-2021-FARM2FORK-01

Conditions for the Call

Indicative budget(s)¹⁶³

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ¹⁶⁴	Number of projects expected to be funded
		2021		
Opening: 15 Apr 2021 Deadline(s): 01 Sep 2021				
HORIZON-CL6-2021-FARM2FORK-01-01	RIA	4.00	Around 4.00	1
HORIZON-CL6-2021-FARM2FORK-01-02	IA	9.00	Around 9.00	1
HORIZON-CL6-2021-FARM2FORK-01-03	CSA	2.00	Around 2.00	1
HORIZON-CL6-2021-FARM2FORK-01-04	RIA	14.00	Around 7.00	2
HORIZON-CL6-2021-FARM2FORK-01-05	RIA	8.00	Around 8.00	1
HORIZON-CL6-2021-FARM2FORK-01-06	IA	12.00	Around 6.00	2
HORIZON-CL6-2021-FARM2FORK-01-07	CSA	3.00	Around 3.00	1
HORIZON-CL6-2021-FARM2FORK-01-08	RIA	12.00	Around 4.00	3
HORIZON-CL6-2021-FARM2FORK-01-09	IA	10.00	Around 5.00	2
HORIZON-CL6-2021-FARM2FORK-01-10	RIA	10.00	Around 5.00	2
HORIZON-CL6-2021-FARM2FORK-01-11	RIA	11.00	Around 11.00	1

¹⁶³ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

All deadlines are at 17.00.00 Brussels local time.

The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

¹⁶⁴ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

HORIZON-CL6-2021-FARM2FORK-01-12	RIA	12.00	6.00 to 7.00	2
HORIZON-CL6-2021-FARM2FORK-01-13	RIA	11.00	Around 11.00	1
HORIZON-CL6-2021-FARM2FORK-01-14	RIA	11.00	Around 11.00	1
HORIZON-CL6-2021-FARM2FORK-01-15	RIA	11.00	Around 11.00	1
HORIZON-CL6-2021-FARM2FORK-01-16	IA	11.00	Around 11.00	1
HORIZON-CL6-2021-FARM2FORK-01-17	RIA	18.00	Around 6.00	3
HORIZON-CL6-2021-FARM2FORK-01-18	RIA	6.00	Around 6.00	1
Overall indicative budget		175.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Enabling sustainable farming

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-FARM2FORK-01-01: Reaching the Farm to Fork target: R&I scenarios for boosting organic farming and organic aquaculture in Europe

Specific conditions

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will support the objective of the Farm to Fork strategy to transition to fair, healthy, climate-resilient and environmentally-friendly food systems from primary production to consumption, notably the target of at least 25% of the EU’s agricultural land under organic farming by 2030 and a significant increase in organic aquaculture. They will do so by evaluating the conditions and proposing scenarios related to knowledge and innovation for reaching this target.

Project results are expected to contribute to all of the following expected outcomes:

- Support to the implementation of the Common Agricultural Policy, the EU organic farming regulation and the action plan for the development of the organic sector in the EU
- Robust evidence on the socio-economic scenarios and market analysis of organic farming (crops and livestock) and aquaculture and food systems across Europe for reaching the target of at least 25% of the EU’s agricultural land under organic farming by 2030 and a significant increase in organic aquaculture
- Increased and coordinated R&I investments in the organic sector
- Improved knowledge exchange and best practices on organic farming (crops and livestock) and aquaculture production, as well as increased availability of advisory services and capacity building, leading to an European innovation ecosystem that is fit to support the achievement of the Farm to Fork target on organics

Scope: The EU is taking a leading role in promoting organic farming and aquaculture and organic food production systems, ensuring high quality standards and developing new value chains. One of the goals of the Farm to Fork strategy is to reach at least 25% of the EU’s agricultural land under organic farming by 2030 and a significant increase in organic aquaculture. This significant increase needs to be accompanied by a likewise increase in the organic market. However, the distribution of organic farming and aquaculture in Europe is uneven, and there is a need to better understand the obstacles that prevent their development. A number of factors need to be in place for this increase to happen. Among those, research to identify the possible socio-economic impacts on organic producers and on other operators of the value chain, as well as empowering the organic farming (crops and livestock), aquaculture

and food sectors, are essential. Networking and coordination of research and innovation activities among all relevant actors in the organic farming and aquaculture sectors can ensure the strategic thinking, mobilisation of resources and sharing of knowledge and best practices necessary to strengthen the European organic R&I ecosystem, in order to support achieving these objectives.

Projects will evaluate the constraints and lock-ins for reaching the Farm to Fork Strategy target and the necessary facilitating environment. Projects will analyse the uptake of organic farming (crops and livestock) and aquaculture across Europe and the reasons for their varied uptake.

As part of a foresight exercise, projects will build scenarios outlining where the expected increase can be achieved, analysing the socio-economic impacts for existing and new organic producers, as well as on other market players.

Projects will assess the knowledge needs of different actors for enhancing innovation towards greater adoption of organic farming and aquaculture, allowing reaching the target of the Farm to Fork strategy. Projects will promote capacity building and ensure the necessary sharing of knowledge and best practices among organic farmers (crops and livestock), aquaculture producers, advisors, scientists and other operators of the value chain, building on existing tools where relevant and available.

In undertaking these activities, projects will promote close cooperation among relevant research and innovation actors across Europe, ultimately leading to a more efficient R&I ecosystem on organic production. As such, projects will help to preserve and continue existing communities of research providers and research funders, and widen them to include other public or private actors.

Proposals will fall under the concept of 'multi-actor approach'¹⁶⁵ and ensure a value chain approach, with adequate involvement of the organic farming and aquaculture sector.

Collaboration with other relevant EU-funded research projects and initiatives under Horizon 2020 and Horizon Europe will be ensured, including the relevant Horizon Europe Partnerships and networking initiatives.

HORIZON-CL6-2021-FARM2FORK-01-02: Developing sustainable and competitive land-based protein crop systems and value chains

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

¹⁶⁵ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

<i>Indicative budget</i>	The total indicative budget for the topic is EUR 9.00 million.
<i>Type of Action</i>	Innovation Actions

Expected Outcome: A successful proposal will support the objective of the Farm to Fork Strategy to transition to a fair, healthy and resilient European agriculture, notably its objective to foster EU-grown plant proteins, in line with the ‘‘Report on the development of plant proteins in the EU’’¹⁶⁶. Activities will support the transition to sustainable, productive, climate-neutral and resilient farming systems that minimise pressure on ecosystems, while ensuring fair economic returns for farmers and food consumption that is sustainable in terms of both health and environmental aspects.

Project results are expected to contribute to all of the following expected outcomes:

- Identification of the most suitable regional and local transition paths for stimulating sustainable, resilient and economically viable land-based protein crop production for food and feed in Europe, resulting in increased uptake of commercial production of land-based protein crops and enhanced food security in the context of Europe’s protein requirements
- Improved and robust evidence of the social, economic, environmental, climate and health benefits and costs of increasing land-based protein crops
- Improved capacities of farmers to cultivate land-based protein crops through innovative advisory tools, improved and wider knowledge/best practice exchange, and collaboration with other actors of the value chain
- Strengthened innovation ecosystem for land-based protein crop development in Europe through multi-stakeholder and transdisciplinary intra-regional, trans-regional and trans-national collaboration and networking

Scope: Land-based protein crops¹⁶⁷ are a source of food, feed and environmental services and have an increasingly important role to play in the transition towards more sustainable farming systems that provide economic, environmental and social benefits. In view of the increase in protein demand, a sustainable diversification of protein sources in Europe needs to be explored and developed. Land-based protein crops have a significant role to play in this regard. However, due to a variety of factors, European land-based protein crop production is not sufficient to cover the growing demand for plant-based proteins. Developing and ensuring more sustainable and resilient supply chains, as well as promoting higher consumer acceptability and attractive market opportunities become necessary. Specific measures are needed in order to realise the potential of land-based protein crops in Europe. Projects will build on and expand existing knowledge in order to identify the most suitable transition paths

¹⁶⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0757>

¹⁶⁷ This topic focuses on protein rich plants with a crude protein content of more than 15 % (oilseeds: rapeseed, sunflower seeds and soya beans; pulses: beans, peas, lentils, lupins etc.; and fodder legumes: mainly alfalfa and clover), accounting for about 1/4 of the total crude plant protein supply in the EU.

for sustainable land-based protein crop production in different pedo-climatic regions, and to develop strategies for sustainable and competitive regional protein-based crop systems and agri-food and feed chains. Proposals will cover the diversity of available and novel land-based protein crop species with a crude protein content of more than 15 %, and will consider conventional, agroecological and organic farming systems in all European climate/biogeographical regions. Projects will fall under the concept of the 'multi-actor approach'¹⁶⁸ and will ensure adequate involvement of farmers and all relevant actors of the land-based protein crops value chain. Projects will build on the results of relevant projects and thematic networks funded under Horizon 2020 and will include a task to collaborate with the project(s) selected under *HORIZON-CL6-2021-FARM2FORK-01-11: Filling knowledge gaps on nutritional, safety, allergenicity and environmental assessment of alternative proteins and dietary shift* in this Work Programme. Projects should have a clear plan on how they will collaborate with other projects selected under this topic (if funding more than one project is possible).

Projects will identify the most suitable transition paths for the development of sustainable new and existing land-based protein crop farming systems and agri-food and feed chains across Europe. Projects will explore the potential for value chain development, taking into consideration opportunities, constraints and impact on different value chain actors, of different tools, instruments and policies, based on case studies of existing farms, networks of farms and producer organisations. Projects will develop and test strategies for sustainable and competitive local and regional land-based protein crop systems that result in improved production techniques, cropping systems design towards crop diversification, feed efficiency, value chain development, reduced environmental impact and improved farmers' organisation, taking into account complementarity among regions and addressing regional imbalances. Projects will elaborate the specific support needs of farmers (advice, knowledge and best practice sharing, etc) to cultivate protein crops in different regions, assessing the availability of specific tools, and developing new, innovative ones. Building on existing tools or mechanisms where available and relevant, projects will set up a transdisciplinary and multi-stakeholder Europe-wide network to facilitate trans-national and trans-regional sharing of knowledge and best practice in land-based protein supply chain management and agronomic practices, including facilitating cross-regional testing of varieties. Building on existing tools or mechanisms where available and relevant, projects will set up regional multi-stakeholder networks for advisory services, awareness raising, knowledge and best practice sharing, experimentation and demonstration on land-based protein crops species that are best adapted to regional conditions. Projects will analyse the impact of climate change on land-based protein crops in various farming systems, as well as their contribution towards climate resilient farming and wider environmental benefits in relation to aspects such as biodiversity, input reduction, closing nutrient cycles, increased soil organic matter and improved soil health. Projects will develop innovative measures for improving the impact of land-based protein crop production on increased (agro-)biodiversity. Projects will develop methods and indicators to compare the climate, environmental, social and health benefits and costs of increasing land-based protein crop production and their industrialisation, considering the

¹⁶⁸ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

impact of policy measures on land-use changes and implications for farmers, in different farming systems and regions. Projects will develop indicators to take into account and compare further industrialisation feasibility and costs among the considered varieties. A method for the systematic collection of data on land-based protein crops for economic and environmental assessment will be developed.

HORIZON-CL6-2021-FARM2FORK-01-03: Digitalisation as an enabler of agroecological farming systems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 2.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: A successful proposal will support the objective of the Farm to Fork Strategy to transition to a fair, healthy and resilient European agriculture, and notably the objective to promote agroecology. They will do so by increasing understanding of the potential of digitalisation as an enabler of agroecology, a transformative, sustainable, healthy, resilient and inclusive approach to farming that can minimise farming pressure on ecosystems while generating fair economic returns for farmers.

Project results are expected to contribute to all of the following expected outcomes:

- Robust evidence of existing innovative digital tools and technologies that specifically support the transition towards agroecology for different crops, farming systems and pedo-climatic conditions
- Improved understanding of the barriers, drivers, risks and usability aspects of digital tools that support the implementation of agroecological farming approaches for different crops and farming systems in different pedo-climatic regions
- Improved awareness of different actors of the cost-effectiveness and of the economic, environmental and social performance of digital tools that support the implementation of agroecology, as well as the barriers and incentives for their uptake and deployment
- Pathway to address the R&I needs on digital tools that specifically support the transition towards agroecology in Europe

Scope: Agroecology¹⁶⁹ is a holistic approach that relies on and maximizes the use of ecological processes to support agricultural production. By working more with nature and

¹⁶⁹ <http://www.fao.org/3/i9037en/i9037en.pdf>

ecosystem services, agroecology has the potential to increase the circularity, diversification and autonomy of farms, and drive a full transformation of farming systems and value chains, from input substitution and beyond. Agroecological farming systems therefore have great potential to enhance the sustainability performance of agriculture and agricultural value chains contribute to the objectives of the EU Farm to Fork Strategy. When compared to industrialised and most conventional agricultural production approaches, agroecology brings a higher level of complexity to farming systems. Digital technologies and agricultural equipment can play a key role in improving the performance of agroecological farming approaches at farm and territorial level and boosting its uptake by farmers, including by supporting their decision-making with regard to farming practices. These technologies, such as artificial intelligence, geo-spatial technology, advanced image analysis procedures, IoT, robotics and sensors, are available and can be applied to most farming approaches. However, agroecological farming systems are more likely to benefit from tailored digital technologies and technology portfolios that allow, for instance, to continuously monitor the transition of farming practices and their performance through databases of in-situ data, or to support farmers' decision-making through the integration of the different elements of an agroecological farming system in a holistic, system-thinking approach. The cost-effectiveness and performance of these solutions need to be evaluated in order to ensure they contribute to the effectiveness and sustainability of agroecological systems and to farm and/or landscape management. Activities will contribute to the road-mapping for improving productivity and sustainability performance of agroecological farming systems by assessing the availability of digital and data-based solutions tailored to agroecological farming as well the potential to adapt "standard" digital technologies used in agriculture to the specific requirements of agroecological approaches for farm and landscape management. Due attention will be given to aspects related to security in the use of data, interoperability as well as to the acceptance and usability of these solutions by farmers and other actors of the food chain.

Proposals will ensure that any data produced during the project will comply with the FAIR principles. Proposals will build on the results of relevant projects funded under Horizon 2020 and will ensure collaboration with projects funded under calls *HORIZON-CL6-2021-CLIMATE-01-05: Agroecological approaches for climate change mitigation, resilient agricultural production and enhanced biodiversity* and *HORIZON-CL6-2022-FARM2FORK-02-01-two-stage: Agroecological approaches for sustainable weed management* in this Work Programme.

Projects will evaluate the need for and implementation capacity of such tools for different crops and farming systems, in different pedo-climatic zones. Projects should fall under the concept of the 'multi-actor approach' and should ensure adequate involvement of the farming sector. Projects will elaborate the specific needs in digital technologies of agroecological farming approaches including farm, territorial and regional/national level. Building on existing data bases of digital technologies for agricultural production, projects will assess the availability of tools tailored to agroecological approaches and identify gaps and needs for the adaptation of existing technologies or the development of new, innovative solutions to serve the needs of agroecological farming systems. Projects will evaluate the cost-effectiveness of

the proposed solutions, and assess their potential performance in agroecological farming systems for different crops, farming systems and pedo-climatic conditions. Projects will analyse barriers to and incentives for the uptake and effective deployment of these tools, including analysis of cost effectiveness, risks, usability and affordability for farmers, as well as social and cultural obstacles. Based on this information, projects will build an open repository of available digital tools to address the specific needs of agroecological farming systems under different pedo-climatic conditions. In collaboration with a wide range of stakeholders, including farmers, the private and public sector as well as consumer representatives, projects will develop a roadmap for R&I on digital technologies targeted to support agroecology in Europe.

HORIZON-CL6-2021-FARM2FORK-01-04: Tackling outbreaks of plant pests

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 14.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy, for a transition to fair, healthy and resilient European agriculture and forestry, including an ambitious target of reduced use of plant protection products¹⁷⁰, proposals will support R&I to help the agricultural/forestry sector to remain productive and contribute to sustainable agriculture and/or forest health.

Project results are expected to contribute to all of the following expected outcomes:

- Find adequate responses to EU quarantine plant pests
- Enhance capacities to prevent, model, monitor and (bio)control important plant pests
- Support to relevant EU and Associated Countries' plant health policies

Scope: Proposals will target one or more plant pest(s)¹⁷¹ that are either Union quarantine plant pests¹⁷² present in the EU or Union quarantine pests which are priority pests¹⁷³ in the EU,

¹⁷⁰ The Farm to Fork strategy sets the target to reduce by 50% the overall use and risk of chemical pesticides and reduce use by 50% of more hazardous pesticides

¹⁷¹ A pest is defined here as any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (EU legislation, Regulation 2016/2031)

¹⁷² See part B of Annex II to Commission Implementing Regulation 2019/2072 for pests known to occur in the Union territory

which are of concern for agriculture and/or forestry. They will improve methods and strategies for surveillance and control as well as enlarge the range of tools for integrated and effective pest management.

Proposals will:

- Contribute to understanding the drivers of plant pest spread and establishment including the influence of climate change and globalisation
- Develop efficient methods and strategies for surveillance and (bio)control of the pest(s)
- Enlarge the range of tools and technologies available to aid in the development of economic and environmentally sound solutions for effective pest management in farming and forestry in line with the principles of integrated pest management
- Analyse the social and economic implications for farmers affected by the plant pest(s) and developing approaches on how to best cope with the situation when affected

International cooperation with countries affected or threatened by the same pest(s) is encouraged. Proposals should fall under the concept of the “multi-actor approach”¹⁷⁴ including a range of actors to ensure that knowledge and needs from various sectors such as research, plant health services and farmers/foresters are brought together. Proposals will consider both the conventional and the organic sector. The Joint Research Centre (JRC) may participate as a member of the consortium but is not eligible for funding.

HORIZON-CL6-2021-FARM2FORK-01-05: Animal welfare 2.0

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the Farm to Fork Strategy, for a transition to fair, healthy and resilient livestock production systems, including the improvement of animal welfare and reduction of anti-microbial usage, a successful proposal will support R&I to help policy makers and other actors (e.g. business operators) in the monitoring and improvement of animal welfare in intensive and extensive systems, thus contributing to sustainable agriculture.

¹⁷³ See Annex to Commission Delegated Regulation (EU) 2019/1702 for priority pests.

¹⁷⁴ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

The project results are expected to contribute to all of the following expected outcomes:

- Improved capacity to evaluate and monitor the state of animal welfare in a region/country or related to a group of business operators.
- Enhanced capacity to further improve animal welfare by business operators or decision makers, through provision of best practices and innovative tools.
- Enhanced capacity to integrate the environmental and socio-economic impact of proposed practices and innovations.

Scope: Farming and food production are subject to collection of data at different stages of the production process of terrestrial livestock, which are mostly used for different purposes such as economic efficiency, disease control, food safety and quality. Few data collected at farm or during later processing (i.e. slaughterhouses or dairy factories) are used to monitor the welfare state of the animals and the different levels of welfare. The combination of diverse sources of data already collected and greater intensity of collection through automatic systems, or routine sampling, can be used to facilitate animal welfare monitoring. At present, even when data are used for animal welfare purposes, they are often exploited solely at individual farm level or for just a few business operators. The integration of the different data collected and the development of algorithms to interpret the data could increase their value in relation to animal welfare. This would be both beneficial at individual farm level as well as in a broader context, like a population of business operators, a region or a country, or at European level.

Proposals should address the following areas of research in terrestrial livestock:

- Identification of the data and appropriate indicators allowing the assessment of the welfare of animals in farms, during transport and at the time of slaughtering or killing;
- Development of innovative ways of automatically collecting data pertaining to welfare and related sustainable farming techniques.
- Standardisation of the collection of data for a population of business operators along the supply chain.
- Development of algorithms integrating various heterogeneous data from a population of operators in order to evaluate the level of animal welfare within the population concerned.
- Development of best practices associated with an improved level of welfare of animals that are statistically meaningful (i.e. associated with improved indicators at population level).
- Evaluation of the environmental and socio-economic impacts of the best practices, for animal welfare, including marketability.

- Development of monitoring tools and smart models to improve the scope of the data collection both quantitatively (population size) and qualitatively (quality of data collected and impacts measured).
- Development of innovative ways to estimate the impact of past detrimental conditions on welfare.

The choice of the population of business operators concerned should take into account their economic and social relevance for the EU policies and regulatory framework as well as potential animal welfare issues addressed both quantitatively and qualitatively. The choice of data studied should take into account their complementarity, their frequency and ease of collection (automation or routine sampling). The choice of the data should also take into account that animal welfare includes various dimensions (feed and water, comfort, health, behaviour, etc.). Proposals should fall under the concept of the 'multi-actor approach'¹⁷⁵ and ensure adequate involvement of the farming sector, the veterinary profession, agricultural advisory services and other relevant actors along the food chain.

HORIZON-CL6-2021-FARM2FORK-01-06: Vaccines and diagnostics for priority animal diseases

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL6-7 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy, for a transition to fair, healthy and resilient livestock production systems, including the reduction of anti-microbial usage, a successful proposal will support R&I to help policy makers and business operators in decreasing the burden of infectious animal diseases, thus contributing to sustainable livestock industry and to public health (food safety, zoonoses, anti-microbial resistance).

The project results are expected to contribute to all of the following expected outcomes:

- Enhanced capacity to prevent or control relevant priority diseases, through the provision of innovative tools and products to policymakers, the veterinary profession and business operators.

¹⁷⁵ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

- Increased knowledge of virulence factors, mechanisms of infection and protection and identify protective antigens necessary for effective vaccine development.

Scope: Vaccines and diagnostics are essential components of the toolbox for preventing and controlling infectious animal diseases and limiting their impact, including the potential reduction of anti-microbial usage. Development or improvement of vaccines for regulated diseases may not be attractive for the pharmaceutical industry and needs public support because of market failure. Early, fast and reliable diagnostics is also important in the toolbox for control of diseases and may go hand in hand with vaccination (e.g. DIVA tests). New developments in science and technology (e.g. genomics, artificial intelligence) enable a renewed approach to vaccine and diagnostic development.

Proposals should address, in terrestrial livestock and relevant wildlife, improvement in vaccine technologies (e.g. adjuvants, stability, and administration), products (e.g. new/improved vaccines, vaccines addressing multiple pathogens), underpinning knowledge (virulence factors, mechanisms of infection and protection and identity of protective antigens necessary for effective vaccine development) and related diagnostics, and look into the feasibility of vaccine production based on vaccine platforms (whether existing or novel). Use of artificial intelligence to decipher target antigens is encouraged.

Diagnostics for infectious diseases of terrestrial livestock and related domains is recommended, for instance to set animal-specific clinical breakpoints for susceptibility of key veterinary pathogens for which disease-specific breakpoints are not available and generic breakpoints based on antimicrobial concentrations in serum are not relevant. Point-of-care and multi-pathogen diagnostic tools are particularly relevant to help strengthen surveillance and capacity to respond to threats.

The choice of the infectious agent / diseases should take into account their importance for the EU policy and regulatory framework, such as by being responsible for epizootic diseases such as African swine fever or African horse sickness, or priority zoonotic diseases, or contributing to the development of anti-microbial resistance, or more generally as having serious socio-economic impact. Proposals may use priorities identified under OIE¹⁷⁶, the EU Animal Health Law, the SCAR Collaborative Working Group on Animal Health and Welfare¹⁷⁷, Discontools¹⁷⁸, or STAR-IDAZ International Research Consortium¹⁷⁹.

Participation of industry is highly recommended.

International research cooperation with institutions outside the EU is welcome insofar as it brings clear added knowledge, value and expertise to the project and will maximise the impact.

176

https://www.oie.int/fileadmin/SST/adhocreports/Diseases%20for%20which%20Vaccines%20could%20reduce%20Antimicrobial%20Use/AN/AHG_AMUR_Vaccines_Apr2015.pdf and https://www.oie.int/fileadmin/Home/eng/International_Standard_Setting/docs/pdf/SCAD/A_SCAD_Sept2018.pdf (annex8 p:46)

177

https://www.scar-cwg-ahw.org/wp-content/uploads/2018/04/Final-Report-CWG-AHW-CASA_updated-EU-AH-SRA.pdf

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www.discontools.eu

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www.star-idaz.net

Proposed research should take into account other EU funded projects, including those funded under ICRAD ERA-NET¹⁸⁰.

HORIZON-CL6-2021-FARM2FORK-01-07: Research & innovation roadmap for blockchain technologies in the agri-food sector

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 3.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In line with the Farm to Fork Strategy and the headline ambitions of a Digital Age and Economy that works for all, the successful proposals will support increased traceability and transparency in food supply chains and support the implementation of sustainability schemes. They will therefore contribute to the ambition of developing sustainable, productive and climate-neutral and resilient farming systems providing consumers with affordable, safe, healthy and sustainable food, minimising pressure on ecosystems, improving public health and generating fair economic returns for farmers through the exploration and development potential of the use of blockchain in the agri-food sector.

Project results are expected to contribute to all of the following expected outcomes:

- Enhanced transparency and traceability in agri-food supply chains, including “green supply chains” through blockchain technologies;
- Contributing to increasing competitiveness and market power of producers, including through smart contracts;
- Reduce transaction costs and administrative burdens in the field of agri-food management for public and private actors through blockchain technologies and dedicated tools;
- Capacity building in Research & Innovation (Infrastructure), in the agri-food sector and public administration for the development, assessment and application of blockchain technologies in the field of agri-food;
- Excellence in research and innovation in blockchain technologies in the agri-food sector in Europe through networking of actors and initiatives.

180 <https://www.icrad.eu/>

Scope: The potential of blockchain technologies across sectors and fields of application has been widely acknowledged and is driven in private and public domains. Also in the area of agri-food, blockchain technologies has raised interest, but is not yet applied in mainstream mode. On the one hand, the area of agri-food induces special challenges to the application of blockchain technologies, such as the nature of products; on the other hand, the sector is predestined for tracking technologies. As pointed out in the European Commission's Green Deal, and the Farm to Fork Strategy in particular, transparency and sustainability efforts in the food supply chain are to be increased and power between actors to be balanced. Blockchain technologies can not only support traceability ambitions, but also support the implementation of organic or other (sustainability-related) labelling schemes as well as sustainable finance and climate mitigation schemes and smart contracts, track information for consumers, and reduce administrative burdens for the public administration

A new level of ambition is needed to tackle Research and Innovation (R&I) in the field of blockchain technologies in the agri-food sector, thereby generating the necessary knowledge and solutions to enhance the development and application of blockchain technologies in the agri-food sector in the private and public domain and develop the relevant capacities to foster this R&I objective in the short-, medium-, and long-term. Experiences from the application of blockchain technologies in others sectors and areas are to be capitalised.

Activities will create an effective framework for action, which will allow pooling resources, coordinating efforts and developing a coherent portfolio of R&I activities in the wider area of blockchain technologies in the field of agri-food following an integrative and de-fragmented systemic approach. This will include:

- Mapping and assessing existing blockchain technologies related European and international R&I activities and promoting their coordination in the field of agri-food; where relevant, initiatives and approaches developed in/ for other sectors/ fields of application with the potential of being transferred to the agri-food sector might be mapped as well;
- Assessing the extent of application of blockchain technologies in the agri-food sector in the EU and globally including the extent to which blockchain technologies meet EU and international regulatory requirements, and draw lessons learnt, benefits and shortcomings/ disadvantages;
- Analysing the needs for R&I on blockchain technologies in agri-food as expressed through stakeholder consultation and on-going research projects;
- Identifying gaps, priority areas and types of action for intervention;
- Proposing methodologies to monitor and review a portfolio of blockchain technologies related R&I activities in the field of agri-food.

Funded activities will increase European capacities (technical, organisational) for implementing a major R&I programme on blockchain technologies in the agri-food sector. This will result in:

- A roadmap for R&I on blockchain technologies in the agri-food sector in Europe developed following the concept of "co-creation" with a wide range of stakeholders, including the private and public sector as well as consumer representatives;
- Improved coordination with existing activities in Europe and globally, thereby raising visibility and effectiveness of R&I funding going beyond EU-funded initiatives and including e.g. also nationally or regionally or privately supported actions;
- Identification of potential "flagships" for testing and demonstrating solutions on key actions from a producer, processor, consumer, investor and public administration perspective under consideration of experiences gained/ approaches developed in other sectors;
- Informed development of policies supporting the development of relevant policies facilitate harmonisation and coordination between decision-making levels.

Proposals should cover all of the following aspects:

- Development of innovative, cost-effective and resource-efficient blockchain-based approaches (including systemic approaches) to increase the traceability of agricultural products taking local, regional, national, European and global supply chains as reference point considering private and open blockchain networks.
- Development of innovative approaches reflecting on the environmental, socio-economic and practicability implications of the application of different blockchain approaches considering the situation in the EU and developing countries.
- Giving special attention to the capacities of (small) farmers and processors and actors in third countries in the deployment of blockchain technologies, as well as to private and public (sustainability-related) labelling schemes, organic production, sustainable finance, food safety, food safety emergencies, detection of non-authorized substances, border controls and consumer benefits, and fraud prevention.
- Identification of possible new application areas for blockchain technologies in the area of agri-food; possible spill-over effects to related application fields, such as bio-based value chains.
- Development of innovative resource efficient approaches to reduce transaction costs and administrative burden for producers and the administration (for organic products).
- Development of suitable R&I programmes to deliver the knowledge, technologies and practices needed to achieve the aforementioned expected outcomes.

- Establishment of links to relevant actors and organisations, including to Digital Innovation Hubs, the European Blockchain Partnership and the EU Blockchain Observatory.

Proposals are expected to demonstrate how to liaison with Cluster 4 activities as regards the development of cross-sectoral technological developments of blockchain solutions and reflect on their potential for the agri-food sector, e.g. in the fields of blockchain-based Internet of Things network management, authentication and access controls methods and novel decentralised analytics.

HORIZON-CL6-2021-FARM2FORK-01-08: Uncovering lock-ins and levers to encourage farmers to move to and stay in climate-neutral and sustainable food production systems: from experiments to systemic mechanisms

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the Biodiversity and Farm to Fork Strategies and the Common Agricultural Policy (CAP), the successful proposals will support development and implementation of policies, business models and market conditions enabling sustainable, productive and climate-neutral and resilient farming systems providing consumers with affordable, safe, healthy and sustainable food, minimising pressure on ecosystems, enhancing biodiversity, improving public health and generating fair economic returns for farmers.

Projects results are expected to contribute to all of the following expected outcomes:

- Improved understanding of farmer’s individual (in particular behavioural) and systemic ‘lock-ins’ and ‘levers’ for moving to and staying in climate neutral and sustainable farming systems
- Improved understanding of challenges and opportunities for the development of climate neutral and sustainable farming systems at the farm and landscape levels
- Improved understanding of consumer’s decision-making and market segmentation with regard to buying food from climate-friendly and sustainable farming systems
- Better design and implementation of relevant policies, in particular CAP and Farm to Fork and Biodiversity Strategies, that effectively incentivise large-scale and long-term

behavioural shifts among farmers to climate neutral, biodiversity friendly and sustainable farming systems

- Improved business strategies and relationships building collective interests between relevant food systems' actors across sectors supporting farmers to produce in a more sustainable manner, contributing to climate neutrality and reversing biodiversity decline
- Improved capacities of researchers in experimental research, behavioural economics and systems thinking

Scope: Although the EU has made strides in improving the sustainability of agriculture, further substantial efforts are needed to achieve the ambitious targets of the European Green Deal, in particular Farm to Fork Strategy, and the objectives of the future CAP. There are many approaches emerging, such as agroecology¹⁸¹, including organic farming, etc., that have the potential to make the farming systems more sustainable in climate, environmental, economic and social dimensions. There are, however, multiple lock-ins that are preventing farmers from full and scaled-up transition to more sustainable production systems. Policy and business shifts are needed to help farmers escape from the lock-ins and accelerate and scale up the pace of change required. An in-depth understanding of the 'lock-ins' and 'levers' is key to spur large-scale behavioural shifts. Behavioural and experimental research that unpacks the decision-making related to the adoption of sustainable practices holds significant potential to identify the lock-ins and levers, thereby improving the effectiveness of the CAP and contributing to the successful implementation of the Farm to Fork Strategy. Besides, farmer's behaviour is driven by beliefs, attitudes, interests, culture, structures etc., and many other mechanisms within broader food systems. Therefore, in addition to unpacking the different pieces of the decision-making puzzle, it is important also to achieve a more comprehensive picture of the food systems, in which farmers operate, and of the governance, mechanisms and dynamics that lock them in unsustainable practices or incentivise them to get and stay on a sustainable path.

Projects should investigate farmer's decision-making and the food systems / broader environment (context) within which they have to operate (and create collective action) to uncover what locks them in unsustainable practices and incentivises them for moving to and staying in sustainable production systems. Attention should be paid to the multiple factors, structures, mechanisms and dynamics (related to, e.g., behavioural, economic/regulatory, knowledge, biophysical, gender, cultural aspects, etc.). Projects should take a comprehensive behavioural approach and investigate proximal as well as distal factors to better understand farmer's decision-making with the objective to inform the design and implementation of policies, in particular the CAP, as well as the European Green Deal initiatives, notably Farm to Fork and Biodiversity Strategies. An extensive experimental research is required, for instance (but not limited to) as it pertains to "nudges", voluntary schemes or regulation that makes adoption mandatory, to fill policy-oriented research gaps and support effective evidence-based policy design and implementation.

¹⁸¹ <http://www.fao.org/3/i9037en/i9037en.pdf>

It is important to analyse also the role of other food systems' actors in hindering or incentivising farmers to adopt and continue applying sustainable practices in the long-term. To this end, projects should thoroughly analyse consumers' decision-making and shopping behaviour, in particular by looking at market segmentation as well as willingness to pay versus buying acts. The knowledge on consumers behaviour, buying acts/market segmentation should be shared with farmers, so that they can "better respond to changes in consumer demand", which is strategic CAP objective. Besides, projects should explore the decision-making of operators across the value chains (e.g., input industry, food companies, retailers, HoReCa, etc.) that lock farmers in unsustainable practices or enable them to adopt sustainable practices as well as stimulate or hinder consumer demand for more sustainable foods. Based on these insights, projects should explore and propose ways to engage consumers and other food systems' actors through, for instance, improved farmers' organisation, social innovation or new business models, in enabling farmers move to and stay in sustainable farming systems.

With an interdisciplinary lens, projects should consider also the "whole-system" in which farmers operate and analyse the systemic mechanisms and dynamics that lock farmers (and landowners) in unsustainable states and ways to break away, build collective interest for and keep them in a sustainable state.

Concurrent research should be conducted using identical (or similar) methods in a variety of settings (i.e., a wide range of farm typologies, diverse farming systems, including various agroecological approaches and organic farming, sectors, commodities and value chains, communities, collective actions and countries) representative of the diversity of EU agri-food sector, to derive meaningful conclusions on the external validity of behavioural factors across countries and contexts.

Based on the research results, projects should formulate and widely disseminate to relevant actors: (1) policy recommendations and innovative policy options, in particular for the CAP, environmental policy, and other relevant Green Deal initiatives, etc.; (2) business strategies (including the identification of end markets for sustainable products on a cross-sectoral basis) for encouraging farmers to adopt more sustainable practices on a long-term basis.

Projects should build on and expand the achievement of past and current projects, e.g., funded under the topic SFS-29-2017¹⁸² as well as collaborate with future projects to be selected under the topics *HORIZON-CL6-2022-FARM2FORK-01-04: Towards an EU approach to assess and internalise positive and negative externalities of agri-food products for incentivising sustainable choices*. The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.

This topic requires the effective contribution of SSH disciplines the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

¹⁸² Reference to the H2020 topic SFS-29-2017

Enabling sustainable fisheries and aquaculture

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-FARM2FORK-01-09: Sea to Fork transparency and consumer engagement

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives, the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, the successful proposal will support consumer engagement to a more sustainable, environmentally friendly, inclusive, safe and healthy seafood consumption through innovative information strategies and tools.

Project results are expected to contribute to all of the following expected outcomes:

- Sustainably fished or farmed nutritious seafood with a low ecological and carbon footprint is well-communicated, well-accepted and preferred by consumers.
- Identification of key bottlenecks to achieve a fully transparent seafood value chain in Europe, including the assessment of criteria for consumers' non-acceptance.
- A lasting cooperation on data and information sharing between fishers, aquaculture producers, industry, retail sector, public authorities, scientific or knowledge centres, digitalisation companies and consumers, implementing innovative tools, including labelling. Full life cycle analyses that include environmental impact with an extended variety of monitored and communicated indicators on the environmental and climate footprint of seafood products supported by digital transition.
- Growth, in the medium and long-term, of aquaculture in the EU and increased competitiveness of European seafood in global markets.
- Increase public awareness and education to reaching and engaging more citizens to achieve a carbon footprint reduction in the seafood supply chain.

- Social innovation for short-chain slow seafood solutions. Promotion of traditional or indigenous knowledge and skills or cultural culinary heritage and short-food chains with potential integration in ecotourism.

Scope: Transparency in the seafood chain is fundamental to create trust and improve acceptance by the consumers. A wealth of information is already available on seafood stocks to guide consumers and retailers in their purchasing choice. However, knowing when and where fish are caught in the vastness of the ocean is challenging and requires innovative and cost-efficient approaches. Additionally, farmed fish and shellfish grow in relatively controlled conditions, but producers do not always find the way to demonstrate this benefit. A lot of seafood is consumed processed and this adds downstream steps before reaching consumers' table through logistics and retail. Often, consumers are faced with fish and shellfish of little-known origin with little information about fishing gear, feed, welfare issues, processing and transport details. This adds to an already existing important lack of trust in seafood, especially farmed seafood. Therefore, the level of awareness and demand among consumers and retailers is still far from sufficient to achieve a fully sustainable seafood sector and to efficiently promote consumption of the products with nutritional benefits and the lowest ecological and carbon footprint.

Research in this topic is expected to contribute to improving our understanding and developing new approaches and tools (e.g. new methods to trace origin, **interoperable data** technologies) to provide fully traceable records on how seafood is produced, processed and transported. The environmental performance of seafood production and consumption needs to be based on a complete set of criteria that can be efficiently ranked, monitored and integrated in transparent labelling of seafood. Issues of biology, feeding, disease, pathology, environmental sustainability (including issues related to organic aquaculture) among others should be addressed.

Innovations should lead to a change in the seafood consumption behaviour towards a preference for nutritious and sustainable seafood with a low ecological and carbon footprint.

Proposals should significantly increase the visibility of sustainably fished or farmed seafood and the engagement of consumers with these products through improved monitoring approaches, analytical methods and communication and marketing strategies, and the development and optimization of web-based and digital tools. Traceability must be ensured. Moreover, the tool can show information on the seafood species life cycle, nutritional values and the fishing or production and processing methods.

The use of social innovations for short-chain slow food solutions to reach and engage more citizens should be considered. Underused caught or produced species with very low ecological or carbon footprint can also be promoted. Traditional or indigenous knowledge and skills or cultural culinary heritage should be taken into account where relevant and appropriately assessed for environmental and food safety, and integrated in ecotourism developments. Special attention should be paid to the younger generation.

Proposals should fall under the concept of the 'multi-actor approach'^[1]. Cooperation activities with projects funded under other seafood-related topics, like HORIZON-CL6-SFI-2021-00-00 and HORIZON-CL6-SFO-2022-00-00, are encouraged. Engaging with managing authorities of European Structural and Investment Funds during the project would help increase implementation of the project outcomes.

Active co-creation with stakeholders and end-users, including from third countries that export seafood to the EU is also key for the achievement of traceability in all seafood consumed in the EU.

International co-operation with third country partners across the Atlantic Ocean, the Mediterranean Sea, the Baltic Sea and the Black Sea and across international freshwater bodies is encouraged as a win-win scenario, while contributing to the European competitiveness and resilience.

This topic links with potential activities under the Mission Ocean, seas and waters and the partnership on Blue Economy¹⁸³. It can also have potential links with activities funded by the European Maritime and Fisheries Fund.

Social innovation¹⁸⁴ is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2021-FARM2FORK-01-10: Digital transition supporting inspection and control for sustainable fisheries

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to range between TRL 3 and 6 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives, Common Fisheries Policy, the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, and the Blue Growth Strategy, the successful proposal will support better fisheries management through data and technological development.

¹⁸³ HORIZON-CL6-GOV-2022-00-00: European Partnership for a climate neutral, sustainable and productive Blue Economy

¹⁸⁴ https://ec.europa.eu/growth/industry/policy/innovation/social_en

Project results are expected to contribute to some or all of the following expected outcomes:

- Advancing the digital transition for fisheries inspection and control and deliver data for fisheries science, management and monitoring in a cost-efficient way to fully achieve the objectives of the Common Fisheries Policy (CFP).
- Delivering innovative technological solutions such as machine learning and artificial intelligence and advance sensing technologies to support biologically complex data analysis
- Devise new monitoring and control strategies to stop illegal, unreported and unregulated fishing (IUU) and promote sustainable fisheries in the EU and globally.
- Create a new generation of jobs in the EU requiring digital and high-tech know-how applied to fisheries.
- Improve the professional skills and competences of those working and being trained to work within the blue economy.

Scope: The CFP aims to ensure that fisheries are environmentally, economically and socially sustainable and provide a source of healthy food for EU citizens. The CFP adopts a cautious approach, which recognises the impact of human activity on all components of the ecosystem. It seeks to make fishing fleets more selective in what they catch, to phase out the practice of discarding unwanted fish and to fight IUU vigorously. These illegal practices deplete fish stocks, destroy marine habitats, distort competition, put honest fishers at an unjust disadvantage and weaken coastal communities, particularly in developing countries. The EU is working to close the loopholes that allow illegal operators to profit from their activities. To be successful, the EU needs to have in place a technologically advanced and effective fisheries control system. Fighting IUU requires global cooperation, namely through regional fisheries organisations, to foster synergies by adopting innovative control technologies and data standards by fishing, coastal, port and consumer states.

Despite the advances attained since its inception, important challenges remain to ensure that the CFP aims are fully met. The availability and quality of fisheries data must be improved and more needs to be done to ensure that these data are shared systematically between all relevant entities, including fisheries scientists. In the EU, current control measures are only partially effective at ensuring the enforcement of the landing obligation, and of fully documented fisheries more generally. Accurate recording and accountability of by-catches of sensitive species, such as birds and mammals, and of marine biological resources are essential for an ecosystem approach to fisheries and for a sound stock assessment, which are in turn the foundation of responsible and sustainable fisheries management. The control and monitoring of vessels operating outside EU waters (long-distance fleet) as well as the small-scale fleet and recreational fisheries need particular attention.

Moreover, in order to ensure that EU fish imports come from sustainable fisheries and to promote the eradication of IUU worldwide it is necessary to cooperate with third-countries

and international organisations to strengthen and promote the use of similar cost-efficient control technologies and data standards. The digital revolution has to contribute to ensure accurate catch registration data, including from weighing at landing, the verification of measures on fishing capacity applicable to vessels engine power, better traceability of fisheries products and improved catch certification schemes.

Digitisation and advanced tools applied to fisheries, such as Remote Electronic Monitoring Systems (REMs), artificial intelligence, machine learning tools, sensor data and high-resolution satellite imagery, have enormous potential to optimise fishing operations and enhance our ability to collect and analyse data, as well as improve monitoring and control capabilities and ultimately support a sustainable management of marine biological resources.

Research and innovation under this topic should review existing and develop new technological solutions to improve: (i) detection of illegal discards; (ii) checks on weighing, weighing systems and accurate catch registration; (iii) data management and reporting and third-party reporting based on remote electronic monitoring systems on vessels; (iv) risk management applied to fisheries; (v) monitoring and control of small-scale, recreational and long-distance fleet, (vi) electronic marking of fishing gear, (vii) identifying IUU activities as well as fisheries products stemming from those activities, (viii) promoting data standards and protection, remote access to data and automatic data exchange protocols, and (ix) innovative tools to assess compliance with technical requirements and measures applicable to fishing vessels, such as continuous engine power monitoring.

Research under this topic should be cross-disciplinary bringing together marine scientists, maritime (including fisheries) surveillance and control authorities, IT specialists and governance experts.

Where relevant, proposals under this topic will seek synergies and capitalise on the results of past and ongoing EU research projects (under Horizon 2020, European Maritime and Fisheries Fund and other funding streams).

Transforming food systems for health, sustainability and inclusion

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-FARM2FORK-01-11: Filling knowledge gaps on nutritional, safety, allergenicity and environmental assessment of alternative proteins and dietary shift

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050, the successful proposal will support R&I to promote both the production, provision and consumption of alternative sources of proteins as well as dietary shifts towards sustainable healthy nutrition, contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

The Farm to Fork Strategy clearly stated that: “A key area of research will relate to (...) increasing the availability and source of alternative proteins such as plant, microbial, marine and insect-based proteins and meat substitutes”.

While information already exists on the environmental and climate-related benefits of a dietary shift toward alternative proteins, more R&I activities are needed to get a comprehensive and up-to-date understanding of the environmental footprint and sustainability performance of alternative protein sources (e.g. plant-based, microbe-based, ocean-based (i.e., fish, algae, invertebrates), fungus-based, insect-based, cultured meat) compared to conventional sources of proteins (e.g., meat and dairy) and dietary shifts. There is also a need for further research on both the positive and negative impacts of alternative protein sources in a diet on human health (e.g. food allergies) and their bioavailability (which is part of their characteristics along with structure, colour, taste or flavour). It is presumed that a shift to alternative proteins should lead to healthier and more sustainable diets, but this depends on the nature of the shift (for example, shifting diets from processed meat to another nutrient poor highly processed protein source might not necessarily provide the wanted health benefits).

Projects results are expected to contribute to all of the following expected outcomes:

- Informing a systemic approach to integrated food policy development as well as informing individual policies, such as those for consumer protection, public health, agriculture, aquaculture and the environment, through additional information and knowledge on what we still do not know about all alternative sources of proteins and dietary shift, including latest developments.
- Providing solutions and assessing their appropriateness to fight climate change (through climate change adaptation and mitigation), halt biodiversity loss and improve the state of ecosystem services, promote the circularity of the food system and improve people's

health and wellbeing through more nutritious, healthier and more sustainable food systems and food choices.

Scope: Many studies highlighted the large impact of traditional livestock production and consumption on the environment (e.g. IPCC, EAT-Lancet), as well as the need for and benefits of a dietary shift towards alternative protein sources. Switching from meat and dairy to alternative sources of proteins can for example lead to savings in land (e.g. plant alternatives need less land per unit protein, aquatic animals have in general a high production per area) and land use, better animal welfare, and reducing deforestation for food production. Excessive consumption of livestock products can also lead to a decline in health. The WHO has classified processed meat as carcinogenic to humans and red meat as probably carcinogenic to humans. A meta-analysis of 10 studies has estimated that every 50 gram portion of processed meat eaten daily increases the risk of colorectal cancer by about 18% ([Bouvard, et al. 2015](#)). The Oxford University's model specifies that switching to diets made of alternative protein sources (e.g., algae, insects, plants, fungi) markedly reduces diet-related mortality by 5-7%, which is due to an increased consumption of dietary fibres ([World Economic Forum, 2018](#)). However, a concern to keep in mind regarding novel foods (especially those containing proteins) is their likelihood to cause food allergy.

Proposals are expected to address the following:

- Consider all alternative sources of proteins (e.g. plant-based, microbe-based, ocean-based (i.e., fish, algae, invertebrates), fungus-based, insect-based, cultured meat), including their processing, and avoid focusing on only one, so that a comparison is possible.
- Fill knowledge gaps and increase our understanding of the positive and negative impacts of each type of alternative protein and the overall dietary shift with respect to the environment, natural resources and climate (considering the global aspect, the pedo-climatic conditions, and trade issues).
- Fill knowledge gaps on the characteristics of each type of alternative protein, including the nutritional quality (e.g. bioavailability, protein quality itself as well as of combined protein sources), alone and within the context of their introduction within European diets (taking into account the cultural aspects related to diets and national dietary advice in the EU).
- Fill knowledge gaps on the impact of alternative proteins and overall dietary shift on health (e.g., allergy, compliance with nutrient based and food based dietary guidelines and recommended dietary patterns) and safety (e.g., not cytotoxic, no toxic aggregates or excessive amount of toxic substances).
- Conduct a comparative systemic analysis of conventional and alternative proteins. New Product Environmental Footprint (PEF) based categories should be created and health effects should be included in diet assessment frameworks. Non-linear effects should be studied, with regard to both consumption and production.

- Highlight the need for new ‘future-proof’ technologies and anticipate potential issues in relation to resource availability, pollution and societal acceptability.
- Create or contribute to a data space to gather knowledge, information and results of studies, and share them openly (open science practices) amongst research communities, interested parties and the public (dietary data hub). Seek interactions and complementarities with the data space for research and innovation, the European Open Science Cloud, and contribute to increasing the level of FAIRness (Findability, Accessibility, Interoperability and Re-usability) of dietary data.
- Clearly explain how they will contribute to achieve the Farm to Fork objectives and deliver co-benefits to each of the Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowering communities (e.g., meeting the needs, values and expectations of society in a responsible and ethical way).
- Implement the multi-actor approach¹⁸⁵ by involving a wide diversity of food system actors and conducting inter-disciplinary research. Proposals should also promote international cooperation. Where relevant, activities should build on and expand the results of past and ongoing research projects (especially the four projects funded under topic LC-SFS-17-2019 - Alternative proteins for food and feed). Projects should have a clear plan on how they will collaborate with other projects selected under this topic (if funding of more than one project is possible) and topic HORIZON-CL6-2021-FARM2FORK-01-03: Developing sustainable and competitive land-based protein crop systems and value chains. They should participate in joint activities, workshops, focus groups or social labs, as well as common communication and dissemination activities and show potential for upscaling. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. Proposals are encouraged to link with relevant EIT Knowledge and Innovation Communities and other relevant research infrastructures.

HORIZON-CL6-2021-FARM2FORK-01-12: Evidence-based decision-making to change social norms towards zero food waste

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 6.00 and 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions

¹⁸⁵ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

<i>Technology</i> <i>Readiness Level</i>	Activities are expected to achieve TRL 4-5 (according to the activity) by the end of the project – see General Annex B.
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Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050, the successful proposal will support R&I to prevent and reduce food loss and waste, contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Projects results are expected to contribute to all the following expected outcomes:

- More timely and responsive decision-making in relation to food waste prevention and reduction of any actor willing to implement a food waste prevention or reduction initiative, based on new, comprehensive and easily accessible evidence about the impact and cost-effectiveness of different measures and behaviours at different levels and across different sectors, including consumers;
- Food companies engage themselves more in food waste prevention and reduction activities.

Scope: Food loss and waste has negative impacts on the society, the environment and the economy: it contributes to food insecurity and hinders nutrition, it generates GHG emissions and create pressure on land and water, and it is responsible for great economic losses. Such negative impacts are exacerbated in times of crisis (e.g. Covid-19), where additional food losses and wastes are generated by food supply chains disruptions.

Reducing the levels of the food intended for human consumption, that is eventually lost or wasted, represents a complex challenge, as it requires change of established business practices and people's habits, while guaranteeing the safety of food. In medium- and high-income countries, food is wasted or lost mainly at the later stages of the supply chain (particularly at consumption level, both in households and food services). Here, the behaviour of consumers and the lack of awareness and coordination between actors in the supply chain, play a key role. An additional issue directly linked with loss and waste is the amount of packaging that is eventually discarded with – or without – the food.

Proposals responding to this topic are expected to address two complementary areas:

Area A:

Developing a comprehensive evidence-based analysis of food loss and waste prevention actions, with the overall aim of informing decision-making. In particular, this activity will perform an impact assessment and cost-benefit analysis of existing food waste prevention actions within the EU and its associated countries, as well as of their impacts on economic, environmental and social dimensions. This will include the development of a database of

possible actions and tools to prevent and reduce food waste and losses that will help inform future interventions by different stakeholders and promote replicability across countries. The activity will follow a life-cycle approach aligned with the Environmental Footprint methods developed by the European Commission.

The development of sector-specific guidance sharing the key success factors, barriers and data for an effective prevention and reduction of food losses and waste will also be recommended.

Area B:

Supporting research (i.e. the development of an evidence base) and innovation (with a special focus on open and social innovation) on the existing social norms responsible for food waste, so as to foster appropriate changes in consumer behaviour and business practices (e.g. marketing standards, retail and trade practices, restaurant portion sizes).

This shall include new evidence on the feasibility of adopting innovations that are tailored to specific contexts.

With regards to consumer behaviour, the investigation will include the analysis of current trends and correlations of:

- Food waste and convenience food (i.e. ready to eat);
- Food waste at household level and food services (i.e. eating out/take away);
- Food waste and obesity and malnutrition;
- Food waste and crisis response policies (e.g. case of COVID-19).

With regards to food businesses, this activity will support innovative and/or improved business practices in both large companies and small and medium sized enterprises (SMEs) that:

- Effectively demonstrate the value of food as a mean to reduce food waste;
- Redesign portion sizes to reduce food waste;
- Operationalize food waste reduction and prevention as part of internal corporate policies and business strategies with supply chain actors.

The expected behaviour change will also be supported by newly proposed or specifically adapted technologies in both of the following areas: date marking and sustainable and smart food packaging.

The activity shall build on the work done by the European Commission’s Joint Research Centre in support of the EU Platform on Food Losses and Food Waste and be aligned to the Environmental Footprint method developed by the European Commission^{186, 187}.

Proposals relevant to this topic will deliver on food waste reduction and prevention across the food system. They will explain how they will deliver co-benefits to the four Food 2030 priorities: Nutrition for sustainable healthy diets, Climate and environment, Circularity and resource efficiency, Innovation and empowerment of communities.

Proposals should implement the multi-actor approach by conducting inter and trans-disciplinary research and involving a wide diversity of food system actors, with a special attention to consumers and civil society organisations.

Proposals will develop compelling communication products, and potentially two-way communication activities, for each relevant food system actor and an innovative science education package for schools. They are encouraged to build on past or ongoing EU-funded research and collaborate with relevant initiatives, including the European Commission’s Platform for Food Losses and Waste. Proposals will set out a clear plan on how they will cluster with other proposals selected under this and any other relevant topic, e.g. by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals shall ensure that any data produced during the project will comply with the FAIR principles. In addition, they will adopt an open data approach whereby research data will be freely-shared.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2021-FARM2FORK-01-13: Microbes for healthy and sustainable food and diets

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 2-5 (according to the activity) by the end of the project – see General Annex B.

¹⁸⁶ [JRC - Assessment of food waste prevention actions. Development of an evaluation framework to assess the performance of food waste prevention actions](#)
¹⁸⁷ [Calculator for impacts of food waste prevention actions](#)

Expected Outcome: The successful proposal will be in line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050. It will support R&I to foster advances in research related to microorganisms for safer, healthier and more environmentally friendly food processing. This is along with contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Project results are expected to contribute to all of the following expected outcomes:

- A furthering of open access provision for the necessary standardisation, identification, and mapping techniques of existing and potential beneficial microorganisms, and microbial consortia for use in food processing, which providing an assessment of their benefits with respect to nutrition, health, food safety, circularity, and sustainability.
- Knowledge from the assessment of the economic, societal and environmental importance of fermented foods and of their role in transition from animal to vegetable proteins.
- Advanced knowledge on what can be considered a healthy human microbiota and the conditions (for example diet and treatments) under which this equilibrium is disrupted.
- Further knowledge on fermentation-based solutions for food products and processes, such as improved nutritional, structural, and functional properties, and enhanced food preservation.

Scope: There is evidence that beneficial bacteria and other microorganisms can lead to a healthy animal and human gut microbiome, that microbiomes can improve food quality and safety (incl. tailored food) as well as the nutritional value of aliments/food, contributing to more sustainable food systems. The rupture of the human microbiome symbiotic relationship could also be associated to more health disorders and the cause of chronic diseases, and that food is an essential lever to maintain symbiosis by promoting optimal intestinal microbial diversity and restoring healthy microbiome profiles and functionality. An expected outcome of this topic is the further scientific underpinning, verification and elucidation of these investigative pathways through evidence driven research and innovation.

In this context food based on microbial fermentation needs further investigation as it currently accounts for 5 to 40% of our diet (country depending) yet we still know little of its role in the human digestive system after ingestion. Further research will provide dietary strategies based on microbe-fermented foods aiming to improve human health, and help in determining any possible role in metabolic disease control. Food fermented by microorganisms and food ingredients produced by them also have huge innovation potential, in particular for SMEs, for local development, and as a way of minimizing food waste from non-optimal raw material, waste products from food manufacturing, or seasonal overproduction.

Activities should develop applicable solutions, in particular for the food processing industry, and in the utilisation of fermentation potential. New products may seek EU market regulatory approval, thus proposals will need to consider and address relevant regulatory requirements as well as EFSA guidance documents for specific safety testing and risk assessment protocols.

Proposals are expected to address the following:

- Understand the interaction mechanisms between fermented foods, different types of food microbiomes, and the human microbiomes in order to determine the role of fermented food in nutrition, health and diet diversification.
- Develop applicable solutions for the food processing industry utilizing microbial potential in the production of food ingredients, and nutrients including formulation into food products.
- Develop new tests to evaluate the condition of the symbiosis between humans and microbiotas used routinely in pro- and diagnostics.
- Using microbes to reduce food packaging, food processing inputs (e.g.: energy, water), chemicals used in food (production), while ensuring the increased lifespan and safety of the products and the benefits to human and animal health.
- Activate societal engagement with relevant stakeholders (e.g. farmers, civil society organisations, regulatory bodies, citizens and media outlets) in order to ensure product acceptability and labelling.

Proposals will explain how they will deliver co-benefits to the four Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities as well as those relevant to different socio-economic and cultural groups.

Proposals should implement the multi-actor approach by involving a wide diversity of food system actors and conducting inter- and trans-disciplinary research engaging consumers and civil society organisations and including local and indigenous knowledge of soils. Proposals are encouraged to build on past or ongoing EU-funded research, research infrastructures and collaborate with relevant initiatives, including the Horizon Europe Soil Health and Food Mission. International cooperation (such as the International Bioeconomy Forum) is highly recommended. Proposals will include a clear plan on how they will collaborate with other proposals selected under this and any other relevant topic, by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. Proposals shall ensure that any data produced during the project will comply with FAIR principles. In addition, they will adopt an open access and open data approach whereby research outcomes, tools and data will be freely shared. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete

common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

HORIZON-CL6-2021-FARM2FORK-01-14: Transition to healthy and sustainable dietary behaviour

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 3-5 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050, the successful proposal will support R&I to facilitate the transition towards healthy and sustainable dietary behaviour. It will contribute to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

The main objective of this topic is to better understand and measure factors influencing dietary behaviour. Furthermore, it seeks the development of innovative, effective tools and strategies to facilitate the transition towards healthy and sustainable dietary behaviour and self-management of the dietary habits.

Project results are expected to contribute to all of the following outcomes:

- Improved knowledge and understanding of the factors influencing dietary behaviour of different target groups, also looking specifically at vulnerable groups, across Europe, including barriers and constraints.
- Identification of effective means for each food system actor to foster behavioural change.
- The ability of citizens to make informed food choices.
- A scientific basis for dietary advice to support policy makers and Member States that will empower individuals to adopt healthy and sustainable dietary behaviours, choices and lifestyles, as a win-win for both their health and the environment, building on national, EU and international competent bodies' advice.

- A better scientific basis for policy makers to develop communication strategies that would increase the acceptability of food and health policy interventions by all actors and sectors that aim to support a shift towards healthy and sustainable diets for all, taking into account that education and dietary advice is a national competence.

Scope: Changes in food production, processing and consumption patterns have contributed to diet-related health problems worldwide. Non-communicable diseases (NCDs) such as cardiovascular diseases (CVDs), cancer, obesity, chronic respiratory diseases and diabetes account for 71% of all deaths. NCDs are largely preventable through effective interventions that tackle shared risk factors such as unhealthy diet, physical inactivity, tobacco use and abuse of alcohol. According to the EAT Lancet Commission, a shift from current diets to healthier diets is likely to substantially benefit human health, averting about 11 million deaths per year. Long-lasting, healthy and sustainable dietary behaviour needs to be given a high priority from an early age as good eating habits are usually formed in childhood.

The change of dietary behaviour is a complex challenge subject to manifold influences that should be better understood through individual and system levels, public engagement and inter- and transdisciplinary approaches. The development of new approaches/strategies/tools requires a systemic approach involving all the main actors at different levels who can ensure acceptance and a better adherence to healthy and sustainable dietary behaviour. These include governmental and public authorities, health care providers, educational systems from schools to universities, (local) producers, food industry, retailers, hospitality and food services, non-governmental consumer and patient organisations, citizens, policy makers and media.

Proposals should consider a range of geographic, socio-economic, behavioural and cultural factors and aim at innovative and effective strategies, tools and/or programmes promoting sustainable and healthy dietary behaviours and lifestyles to be used by policy makers, as well as monitoring approaches in order to allow for measuring the progress towards these goals if policy makers decide to implement such strategies, tools and/or programmes. The gender dimension exploring physical and behavioural differences between men and women should also be investigated. Data collected and integrated by the private and public sectors should be disaggregated by sex and will be made freely available, searchable and reusable in accordance with the FAIR data principles, and the projects will make use as much as possible of open source tools. Proposals are encouraged to link with relevant EIT Knowledge and Innovation Communities.

Where relevant, activities should build on and expand the results of past and ongoing research projects, as well as input by national, EU and international competent bodies. Selected projects under this topic (including also projects of the topic HORIZON-HLTH-STAYHLTH-2021-01-01: *“Prevention of obesity through the life course”*) are strongly encouraged to participate in joint activities as appropriate. These joint activities could take the form of clustering of projects, participation in workshops etc. The proposals will also be expected to demonstrate support to common coordination and dissemination activities. Applicants should plan the necessary budget to cover those activities without the prerequisite to define concrete

common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

Proposals are expected to address the following:

- Map and monitor dietary patterns at national/regional/rural/(sub)urban levels relevant to different genders, socio-economic and cultural groups, including the most vulnerable, to provide a snapshot of the situation across Europe.
- Identify, involve and analyse different population groups, in particular the most vulnerable, and the impact of their choices in relation to health and environment in order to potentially enable them to benefit from the outcome of the project.
- Understand and measure the impacts of the factors and incentives influencing individual and collective dietary choice and behaviour across Europe.
- Understand the barriers and enablers of food system actors to improve food environments and to produce, process, promote and propose healthier and environmentally, socially and economically sustainable food products/processes/services to respond to the needs/demands of citizens.
- For different targeted groups, develop innovative local (different countries, region, urban and rural areas) actions/approaches/interventions that could be considered by policy makers to facilitate the transition towards healthy and sustainable dietary behaviour and lifestyle, and evaluate the effective impact if those would be implemented.
- Develop innovative and effective tools to improve education, communication, engagement and training on sustainable healthy nutrition and diets, and on sustainable food systems, adapted to different population groups in respect of their cultures, needs and gender at different levels (e.g. public authorities, health care providers, education systems). These tools should be available to the responsible national authorities, to support their efforts for health promotion, disease prevention and care.
- Develop science-based tools for translating the scientific evidence base into easy-to-understand food-based dietary guidelines by national competent authorities that take local, seasonal, cultural, social, ethical, health and environmental aspects into account to help citizens to make an informed, responsible and easy choice.
- Fill the knowledge gaps and update the scientific basis to provide support for national authorities developing dietary guidelines for specific population groups, while building on the basis provided by national, EU and international competent bodies.
- Provide recommendations for policy makers underpinned by scientific evidence to facilitate the transition towards healthy personalized management and sustainable dietary behaviour and lifestyle.
- Provide an evidence based cost-benefit analyses of the measure proposed.

Proposals should implement the multi-actor approach¹⁸⁸ by involving a wide diversity of food system actors and conducting inter-disciplinary research and trans-disciplinary research. Proposals should bring together multiple types of scientific expertise in both health and natural sciences, as well as social sciences and humanities.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2021-FARM2FORK-01-15: Identification, assessment and management of existing and emerging food safety issues

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 3-5 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050, the successful proposal will support R&I on integrated approaches along the food system for detecting, assessing, and mitigating relevant food safety risks. It will contribute to the transformation of the food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Project results are expected to contribute to all of the following outcomes:

- Reduced risks from biological and chemical hazards throughout the food system.
- The ability of administration to anticipate and mitigate emerging food safety risks; capacity and expertise for risk assessment activities including holistic risk assessment (risks in combination with benefits) and best-fitting control measures for biological and chemical hazards across the food system.
- Improved holistic risk assessments supporting food systems regulatory science (integrated risk-benefit assessment, cost-benefit assessment); and develop and assess

¹⁸⁸ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

technologies, tools and methods to identify, evaluate, and reduce risks from chemical and microbiological hazards throughout the food system.

- Improved usage of big data collection and sharing to predict and prevent emerging food related threats.
- Long-term anticipation and prevention of emerging risks for food and feed safety, plant, soil and animal health and nutritional quality through better trend tracking and characterisation systems.

Scope: Food-borne diseases are an important cause of morbidity and mortality, and a significant impediment to socio-economic development worldwide, but the full extent and burden of unsafe food, and especially the burden arising from chemical and biological hazards, is still largely unknown (WHO, 2015).

Proposals responding to this topic are expected to address both areas (area A and area B):

Area A:

- Develop methods for early identification and monitoring of drivers of (re)emerging food safety risk and threats (e.g. global environmental changes, globalisation, technological innovations, policy changes, changes in values, perceptions and sensitivity, change in economic models, etc.).
- Develop methods and devices for the characterisation of emerging risks, with the aim of anticipating and possibly mitigating/preventing impacts (preparedness).
- Develop educational material/curricula to help strengthen existing food safety risk analysis teaching with an inter- and transdisciplinary systems dimension.
- Engage authorities and citizens throughout Europe in early warning and the identification of emerging risks through a coordinated citizen science approach, and food safety awareness-raising efforts.
- Develop guidance on how to integrate food safety considerations in the design phase of innovations like circular economy, by identifying possible emerging risks; this requires liaising with relevant initiatives that would benefit from these results.
- Develop methods to guarantee food safety in local food systems from farm to fork, in particular in small-scale businesses, and local cooperatives.
- Develop holistic risk-benefit assessment methods and tools and implement these for use in a regulatory setting.

Area B:

- Improve knowledge on the persistence of pathogens (including viruses) in food matrices and food processing environments for improved microbe control.

- Develop data, indicators and tools to address and tackle the risks associated with new and food-borne pathogens (including viruses).
- Develop and validate detection methods for new hazards and develop methods and devices for early identification of risks for food safety and threats.
- Develop more robust and responsive models for food safety crisis management, taking into account socio-economics and environmental factors.
- Analyse drivers of risks (globalisation, urbanisation, environmental degradation, climate change, etc.) for long-term anticipation and possible prevention of several emerging risks.
- Develop scientific evidence to support the assessment of the risk posed to susceptible human subpopulations (including gender in the research context) and ecosystems and the underlying risk drivers.

Proposals relevant to this topic will deliver on support for evidence-based policymaking and related risk assessment activities and implementation needs, in particular, support the development of effective regulatory control and enforcement aspects in the food safety area. Engagement with risk managers and risk assessors will be needed for priority-setting and to deliver impactful results.

Proposals will explain how they will deliver co-benefits to the four Food 2030 priorities.

Proposals should implement the multi-actor approach¹⁸⁹ by involving a wide diversity of food system actors and conducting inter-disciplinary research.. Proposals are encouraged to apply a One-Health approach, and to build on past or ongoing EU-funded research and cooperation with relevant initiatives (such as EJP One Health). They should have a clear plan on how they will collaborate with other projects selected under this topic (if funding of more than one project is possible). They should participate in joint activities, workshops, as well as common communication and dissemination activities. Proposals shall ensure that any data produced during the project will comply with the FAIR principles. In addition, projects will adopt and open data approach whereby research data will be freely shared. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage.

HORIZON-CL6-2021-FARM2FORK-01-16: Increasing the transparency of EU food systems to boost health, sustainability and safety of products, processes and diets

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting

¹⁸⁹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

	different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-7 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, the successful proposal will support R&I to increase transparency across food systems to boost health, sustainability and safety of products, processes and diets, contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Advances in research and innovation to upgrade transparency will provide multiple benefits relevant to improving food safety, fighting food fraud, and addressing growing concerns of EU citizens regarding the climate, biodiversity and environmental impacts of their food and diets in practice.

Projects results are expected to contribute to all following expected outcomes:

- accelerate the deployment of transparency innovations and solutions in EU food systems, especially among micro-enterprises and SMEs, to boost health, sustainability, and safety of products, processes and diets and drive climate action
- make sure that future transparency innovations and solutions are demand-driven, systemic, and cost-effective and support the objectives of the EU Farm-to-Fork Strategy and the EU Green Deal

Scope: Despite the advancement of technologies and the emergence of new approaches, solutions and methodologies, recent literature¹⁹⁰ highlights that there are continuing challenges to increase the uptake of transparency solutions among food system actors. These challenges include concerns about connectivity, interoperability, privacy, cost-efficiency and low consumer confidence in the technologies being deployed. In addition, many point to the fragmentation and complexity of food systems, to the high number of SMEs and micro-companies and to the crosscutting and systemic nature of transparency innovations as important reasons for the slow deployment of these solutions.

Transparency, defined in supply chains as access to non-distorted, factual, relevant, and timely information about supply chain products¹⁹¹, is a critical component of modern food systems. Transparency of food production from farm to fork is crucial to inform citizens, authorities and food system actors about items such as origin, production method, ingredients,

190 E.g. <https://doi.org/10.1016/j.tifs.2019.07.024>

191 <https://doi.org/10.1016/j.aei.2010.06.001>

and safety of products and about the sustainability and ethical aspects of products and processes. It is also a crucial contributor to ensuring food traceability and authenticity.

Proposals will accelerate the deployment of transparency solutions in EU food systems, especially among micro-enterprises and SMEs, to boost health, sustainability and safety of products, processes and diets towards 2030, and drive climate action. In particular, proposals will facilitate innovations that increase transparency in support of six objectives:

1. Improving the efficiency and effectiveness of traceability;
2. Making it easier for citizens to adopt healthy and sustainable diets with a lower environmental and climate impact, by advancing innovations that provide and process transparency data across the food chain to support the implementation of the future EU framework for sustainability labelling;
3. Making it easier for farmers and food businesses to increase the sustainability of their products and processes and make them more nutrition-sensitive;
4. Drastically improving the efficiency and effectiveness of food safety processes and procedures, within companies and beyond;
5. Increasing the authenticity of products, and reducing food fraud;
6. Increasing the capacity of authorities and policy makers that deal with food safety and sustainability, and with related to nutrition and health to monitor the performance of different parts and processes of the food system.

Proposals will build a **network of expertise** that can act as an EU hub for knowledge sharing, demonstration and piloting of systemic solutions related to transparency. This network will be governed by a wide range of experts and stakeholders, including practitioners (primary producers, processors, retailers, food service providers, consumers), public and private institutions (governmental institutions, civil society including NGOs, industry), investors, entrepreneurs and policy makers.

Proposals will create an inventory of validated technologies (such as IoT, Blockchain, Artificial Intelligence, 5G/edge, and Big Data), open data, approaches and methodologies based on past research and emerging best practice. Proposals will demonstrate the use of these technologies to address the six objectives listed above using existing or emerging data infrastructures across the food chain. Proposals will take care to valorise relevant past EU funded research.

Proposals will consolidate the state-of-play of approaches to effectively deal with cross-cutting challenges (e.g. connectivity, privacy, interoperability, consumer acceptance, cost-effectiveness, skills) and address the lack of such approaches where needed, and in line with the relevant legal frameworks.

Proposals will widely **disseminate and communicate** their expertise among primary producers, processors, retailers, food service providers, public and private institutions

(governmental institutions, NGOs, industry), investors, entrepreneurs and policy makers to build awareness, education and skills on a European scale and in a way that it supports solution development in practice in major food categories, by taking into account EU, national, regional and sectoral contexts and needs (health, food & nutritional policies, environmental, socioeconomic, cultural, gender-related, behavioural, dietary).

Proposals will develop methodologies, tools and approaches to enable the clients of the network of expertise to **actively engage** with end-users of transparency solutions (e.g. retailers, public authorities), with a broad range of food system actors, with technology and infrastructure providers and with policy makers to make sure that new transparency solutions are demand-driven, systemic, in line with the relevant legal frameworks, and cost-effective and support the objectives of the EU Farm-to-Fork Strategy, including the implementation of the future food sustainability labelling framework. Proposals are encouraged to assess the merits of existing and future relevant citizen science initiatives that can help build or uptake transparency solutions.

Proposals will support clients to apply system thinking to define the challenges that are linked to the six objectives that are mentioned above and to identify possible innovative systemic solutions. They will help them to understand and assess how transparency solutions will be used and how they will enable policy development (including the implementation of a future EU framework for sustainability labelling) and generate benefits and incentives for consumers and food businesses. They will stimulate mutual learning across parts of food systems, across scientific disciplines, geographies and languages.

Proposals will perform these tasks using a business-model that guarantees the functioning of the network and its services beyond the lifespan of the project.

In addition, proposals will develop and pilot crosscutting and systemic solutions that improve transparency with regards to one or several of the six objectives mentioned above, to complement and support the tasks mentioned above. These pilots should advance solutions that can benefit a wide range of micro-enterprises and SMEs. For the purpose of these pilots, proposals may involve financial support to third parties in the form of grants, typically in the order of EUR 100 000 to 300 000 per party. Up to 20% of the EU funding requested by the proposal may be allocated to the purpose of financial support to third parties.

Proposals should explain and map how the pilots will achieve co-benefits relevant to the four Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities.

Proposals should set out a clear plan on how they will collaborate with other projects selected under this and any other relevant topic, by participating in joint activities, as well as common communication and dissemination activities. Proposals are encouraged to link with relevant Smart Specialization Platforms and EIT Knowledge and Innovation Communities.

Proposals shall ensure that any data produced during the project will comply with the FAIR principles. In addition, proposals will adopt an open access and open data approach whereby research outcomes and data will be freely shared.

Targeted international cooperation

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-FARM2FORK-01-17: One health approach for Food Nutrition Security and Sustainable Agriculture (FNSSA)

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 18.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6 by the end of the project – see General Annex B.

Expected Outcome: The EU’s relationship with Africa is a key priority for the EU. The effects of the COVID-19 pandemic and the growing urgency of the climate crisis put pressure on both domestic/local food production and on ecosystems that generate higher health risks for plants, animals and humans with the emergence of new pest and diseases.

In line with the Farm to Fork Strategy, and the development of Green Alliances on sustainable food systems, successful proposals will provide a comprehensive and integrated response to current and future challenges benefiting people, nature and economic growth in Europe and in Africa.

Projects results are expected to contribute to all of following expected outcomes:

- EU – Africa jointly tackle climate change and environment-related challenges and meet the objectives of the Paris Agreement on climate change, and contribute to the Sustainable Development Goals
- Develop Natural-Based solutions to plant nutrition and animal health addressing human health, with innovative methods and technologies that optimize, and limit when necessary, the use of external inputs and helps farmers in the implementation of regulated deficit strategies.
- Strengthened transdisciplinary research and integrated scientific support for relevant EU policies and priorities (the EU strategy for Africa, European Green Deal objectives, etc.).

Scope: The “One Health” approach to plant and animal health is based on a systemic perspective linking the health of ecosystems, animals and humans. It requires interventions at different level (local, territorial, value chain) and coherent public policies. ‘One Health’ can be applied to establish a transformative approach to increasing sustainable practices in agriculture and improving the overall health and well-being of humans, animals, and natural ecosystems.

There is a need to fill knowledge gap regarding interactions with different components and especially between human and animal and plant health and strengthen monitoring and evaluation systems to prevent the emergence and spread of pest and diseases with nature-based solutions.

Proposals will build on existing and new knowledge, data, models (including in situ calibration measurement) and available tools to:

- Identify local farm animals and crops in the different agro-ecological zones in Africa to maintain/increase productivity and resilience taking into account the interactions between plants, animals, diseases, pests, zoonosis and ecosystems under conditions of limited external inputs and increased abiotic and biotic stresses.
- Develop innovative means including innovative methodologies for risk assessments and practices to tackle current and emerging plant diseases, pests and zoonosis (including transboundary infectious livestock diseases) taking into account the interactions between plants, livestock health and the natural ecosystems.
- Develop sustainable and systemic integrated approaches to plant and animal health from farm to international scales in line with a greener agriculture by optimising resource efficiency, minimising production losses and avoiding geographical spread of diseases/pathogens (i.e. control of locusts, development of vaccines) including animal breeding and being responsible/respectful of natural ecosystem integrity, goods and services.
- Establish a multidisciplinary team that works together to achieve these outcomes and bring together experts from academic, government, public, and private institutions to achieve meaningful change in public awareness, policies, and practices that support implementation of sustainable agricultural practices.

Proposals should fall under the concept of the 'multi-actor approach'¹⁹² and ensure adequate involvement of the farming sector and, as relevant, bio-based industry active in rural areas.

HORIZON-CL6-2021-FARM2FORK-01-18: EU-China international cooperation on integrated pest management in agriculture

Specific conditions

¹⁹² See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy, the successful proposals will contribute to promote a global transition to sustainable food systems. They will therefore contribute to ensure sustainability of agri-food systems, catering for the needs of a growing population and support the development and implementation of integrated pest management practices. They will strengthen international cooperation with actors from China in the areas of integrated pest management.

Project results are expected to contribute to all following expected outcomes:

- Reduce the use of pesticides for crops of importance to the EU, Associated Countries and China which dependency on chemical pest management is currently high.
- Increasing on-farm use and implementation of integrated pest management practices.
- Developing integrated pest management training for farmers/growers and extending the range of applications by developing incentives to increase the uptake of integrated pest management practices.
- Increase the awareness of integrated pest management practices and improve product quality and food safety by decreased residue concentrations of pesticides in crops and lower environmental impact.

Scope: A high percentage of food crops are lost to plant pests and diseases annually. At the same time, concerns are mounting over the effects of pesticides used in agriculture on the environment, non-target organisms and human health. Proposals should support the development and implementation of integrated pest management practices for crops where the dependency on conventional chemical pesticides is the highest, and where the exchange of information, best practices and technologies is a benefit for the EU, Associated Countries and China.

Proposal will:

- Enlarge the range of tools available for integrated pest management practices, such as crop diversification leading to more functional diversity, effective cropping techniques,

appropriate species and varieties resistant to pests, development of biological control agents, the preservation and enhancement of natural enemies of pests etc.

- Develop technologies enabling prevention, modelling and monitoring of pest emergence allowing timely and appropriate intervention in line with the principles of integrated pest management.
- Develop risk assessment methods for assessing the risks and environmental impacts of these technologies.
- Support capacity building, training and education of farmers/growers to adopt sustainable agricultural practices in pest management and the establishment of a reward/incentives system.

Proposals should fall under the concept of the 'multi-actor approach'¹⁹³ and ensure adequate involvement of the farming sector. Practical solutions for farmers/growers, close to the market, should be facilitated by the involvement of industry, including SMEs, aiming at integrated pest management related technology transfer.

Actions will contribute to implementing the EU-China Food, Agriculture and Biotechnology (FAB) flagship initiative, which aims to ensure sustainability of agri-food systems, catering for the needs of a growing population, the reduction of food and agricultural losses and waste, and the provision of safe and healthy foodstuffs.

Due to the scope of this topic, international cooperation is strongly encouraged, in particular with China.¹⁹⁴

Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption

HORIZON-CL6-2022-FARM2FORK-01

Conditions for the Call

Indicative budget(s)¹⁹⁵

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project	Number of projects

¹⁹³ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

¹⁹⁴ TBC co-funding (ONLY IF AGREEED WITH CHINA) *China based participants in projects selected under this topic are invited to apply for co-funding from the ministry of Science and Technology - MOST.*

¹⁹⁵ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

		2022	(EUR million) ¹⁹⁶	expected to be funded
Opening: 28 Oct 2021 Deadline(s): 15 Feb 2022				
HORIZON-CL6-2022-FARM2FORK-01-01	RIA	7.00	Around 7.00	1
HORIZON-CL6-2022-FARM2FORK-01-02	RIA	6.00	Around 6.00	1
HORIZON-CL6-2022-FARM2FORK-01-03	RIA	10.00	Around 5.00	2
HORIZON-CL6-2022-FARM2FORK-01-04	CSA	8.00	Around 4.00	8000000
HORIZON-CL6-2022-FARM2FORK-01-05	IA	7.00	Around 7.00	1
HORIZON-CL6-2022-FARM2FORK-01-06	RIA	10.00	Around 5.00	2
HORIZON-CL6-2022-FARM2FORK-01-07	RIA	12.00	Around 6.00	2
HORIZON-CL6-2022-FARM2FORK-01-08	IA	11.00	Around 11.00	1
HORIZON-CL6-2022-FARM2FORK-01-09	RIA	14.00	Around 7.00	2
HORIZON-CL6-2022-FARM2FORK-01-10	RIA	10.00	Around 10.00	1
HORIZON-CL6-2022-FARM2FORK-01-11	RIA	11.00	Around 11.00	1
HORIZON-CL6-2022-FARM2FORK-01-12	RIA	11.00	Around 11.00	1
HORIZON-CL6-2022-FARM2FORK-01-13	RIA	26.00	Around 7.00	4
HORIZON-CL6-2022-FARM2FORK-01-14	RIA	10.00	Around 10.00	1
HORIZON-CL6-2022-FARM2FORK-01-15	RIA	11.00	5.00 to 6.00	2
HORIZON-CL6-2022-FARM2FORK-01-16	CSA	3.00	Around 3.00	1
Overall indicative budget		167.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.

¹⁹⁶ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Enabling sustainable farming

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-FARM2FORK-01-01: Risk assessment of new low risk pesticides

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 7.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy, for a transition to fair, healthy and resilient European agriculture and forestry, including an ambitious target of reduced use of plant protection products, the successful proposal will support R&I to help agriculture/forestry sector to remain productive and contribute to sustainable agriculture and forest health.

Project results are expected to contribute to all of the following expected outcomes:

- Improve risk assessment of new so-called low-risk substances and plant protection products with the use of relevant methods

- Foster EU regulatory science and risk assessment of new low-risk pesticides for agriculture.
- Ensure the safety of new low-risk pesticides used in agriculture through robust and transparent risk assessment.
- Increase the availability of safe and environmentally friendly methods for plant protection and weed control to reduce the risks to the environment, non-target organisms and human health.

Scope: Concerns are mounting over the effects of pesticides on the environment, non-target organisms and human health. Member States and EU policies seek to reduce the reliance on chemical pesticides for crop protection through the design and implementation of approaches that are more integrated and include restrictions on the use of several active substances. To ensure the lowest risk to human health and the environment, the development of so-called low-risk substances¹⁹⁷ is encouraged by several regulatory incentives in the EU. However, the changing nature of low-risk plant protection products requires increased capacities in risk assessment. The plant protection products approval and authorization process has to keep pace with scientific and technological developments to advance assessment methods of new low-risk plant protection products.

New products may seek EU market regulatory approval, thus proposals will need to consider and address relevant EU regulatory requirements as well as relevant guidance documents are to be followed for specific hazard characterisation and exposure assessment to achieve an appropriate risk assessment.

Proposals will contribute to:

- Improve risk assessment of newly proposed or specifically adapted low-risk pesticides such as new species/strains of microorganisms, ds-RNA-based pesticides, pheromones, plant extracts, and/or microbiome solutions or a new mode of application with the use of relevant methods.
- Develop and advance the integration of different tools, technologies and methodologies to support comprehensive and consistent risk assessments of new low-risk pesticides in view of safety and sustainability.
- Contribute to the understanding of the biological effects of these new substances and/or products.
- Assess the impacts and risks of these new substances and/or products.
- Assess and improve the level of certainty in risk assessments of new low-risk pesticides.

¹⁹⁷ Low-risk active substances for plant protection are defined according to criteria outlined in Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC. They are subject to specific provisions for their approval and the authorisation of low-risk plant protection products containing them outlined in this Regulation and its implementing Regulations.

- Identify the relevant additional studies required for assessing these new low-risk pesticides in order to establish that they have a hazard profile compatible with the qualification as low-risk substances and plant protection products.
- Contribute to the standardization and validation of the developed tools, technologies and methods for risk assessments.

HORIZON-CL6-2022-FARM2FORK-01-02: Socio-economics of pesticide use in agriculture

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy, the successful proposal will support integrated pest management practices facilitating the progress towards the ambitious target of reduced use of plant protection products while supporting the agricultural / forestry sector to remain productive and contribute to sustainable and biodiversity friendly agriculture and/or forest health.

Project results are expected to contribute to all of the following expected outcomes:

- Identify opportunities and barriers to increase the uptake of integrated pest management and low-pesticide-input pest management across the diversity of EU and Associated Countries farming systems.
- Increase the capacity to understand the impact of current pesticide use practices and proposed alternatives on the agricultural sector.
- Thorough understanding of farmers’ decision-making, governance aspects and consumption patterns behind integrated pest management and low pesticide use practices.
- Support the design of relevant related policies to achieve the targets of the Farm to Fork and Biodiversity Strategies.

- Strengthened transdisciplinary research and integrated scientific support for relevant EU policies and priorities (Sustainable Use Directive¹⁹⁸, Common Agricultural Policy, Green Deal objectives, etc.).

Scope: Research has shown that well-designed integrated pest management programmes can control pests in an ecologically friendly manner; however, farming today relies on chemical treatments to ensure farm profits and yield. A better understanding of the social, economic and policy factors that can hinder or promote the uptake as well as evidence of the economic performance of integrated pest management/ low pesticide practices are needed to identify measures that can enhance its adoption and encourage the involvement of all relevant actors across the value chain. Project funded under this topic will ensure synergies and collaboration with other relevant ongoing Horizon 2020 projects.

Proposals will:

- Improve understanding of the reasons for the limited uptake of reduced pesticide use/integrated pest management practices and/or shift towards low-risk pesticides and bio-control agents and practices. This should include a deeper analysis of the evolution since the whole agricultural sector may be impacted by a reduction of pesticide use.
- Improve understanding of the impact (including direct and indirect effects) of current pesticide use practices and proposed alternatives at various scales, from fields to landscape and rural areas.
- Analyse the sociological and economic drivers and unintended consequences, such as the switching of crops/switching of pesticides when a plant protection product becomes unavailable.
- Analyse the consequences of the ongoing development of resistances on the use of pesticides (both in qualitative and quantitative terms), on productivity, on the economic performance of farms and the environment.
- Analyse the competitiveness of goods produced from a chemical pesticide-free/low-pesticide agriculture.

Proposals will cover a wide range of farm typologies, sectors and systems representative of the diversity of EU and Associated countries farming, including both conventional and organic. The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.

HORIZON-CL6-2022-FARM2FORK-01-03: Enhancing biosecurity in terrestrial livestock production

Specific conditions

198

Directive 2009/128/EC on the sustainable use of pesticides

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the Farm to Fork Strategy, for a transition to fair, healthy and resilient livestock production systems, including the reduction of anti-microbial usage, a successful proposal will support R&I to help policy makers and business operators in the prevention and control of infectious animal diseases, thus contributing to sustainable agriculture and to public health.

The project results are expected to contribute to all of the following expected outcomes:

- Improved capacity for policy makers, veterinary profession, business operators and other relevant actors to prioritise and implement biosecurity measures in different production systems on farms and other places where animals are handled;
- Better understanding of the costs and efficiency of certain biosecurity measures.

Scope: Biosecurity refers to a set of management and physical measures designed to reduce the risk of introduction, establishment and spread of diseases, infections or infestations to, from and within a population¹⁹⁹. Biosecurity can prevent or minimise the risk of transmission of infectious diseases not only to animals, but also people (zoonoses), and contributes to the fight against antimicrobial resistance. Where no vaccine is available nor authorised, like for African swine fever or other new and emerging diseases, the control of infectious diseases relies heavily on biosecurity and no disease prevention, eradication or control programme can work without it. Proposed projects must address biosecurity at primary production, at least on farms and where animals are handled, but may also address relevant sectors like the feed industry. Effective biosecurity requires constant attention by those implementing it. Biosecurity can more easily be performed in enclosed facilities, like for indoor livestock farming, than in outdoor production, which may facilitate direct or indirect contacts with wildlife and subsequent transmission of a pathogenic infectious agent to livestock, although risks from outdoor farming may not always be higher than indoor. General principles of external and internal biosecurity are known, not least at farm level, but may not be equally applicable to all farms, production systems, species and protect equally well against all relevant diseases. The costs and efficiency of different measures are not always known, and guidelines are not common yet.

The proposals should:

¹⁹⁹ <https://www.oie.int/en/standard-setting/terrestrial-code/access-online/?htmfile=glossaire.htm>

- Research biosecurity in different terrestrial animal species and production systems, different situations where livestock are handled.
- Address main diseases or groups of diseases against which biosecurity measures are effective, taking into account epidemiology of the diseases and related risks (e.g. wildlife).
- Collect and disseminate best practices; develop guidelines where appropriate
- Develop validated applicable methods or refine tools to assess biosecurity measures on farms or other places where livestock is handled.
- Select certain measures, evaluate their efficiency, where appropriate by testing, and estimate their cost.

Proposals should fall under the concept of the 'multi-actor approach'²⁰⁰ and ensure adequate involvement of the farming sector, the veterinary profession, advisory services and other relevant actors.

HORIZON-CL6-2022-FARM2FORK-01-04: Towards an EU approach to assess and internalise positive and negative externalities of agri-food products for incentivising sustainable choices

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In line with the Farm to Fork Strategy, the successful proposals will contribute to the transition to sustainable, biodiversity friendly, climate-neutral and resilient farming and food systems. They will do so by supporting development and implementation of policies, business models and market conditions that better internalise external costs and benefits of agri-food production, thereby make the most sustainable food the most affordable and available for consumers, while generating fair economic returns in the supply chain, in particular for farmers and SMEs.

Projects results are expected to contribute to all of the following expected outcomes:

- Better understanding of the challenges and opportunities in relation to internalisation of climate, environmental, social and health externalities of various agri-food production at

²⁰⁰ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

various levels (e.g., policy, product, organizational, farm, and investment) and in different contexts by policymakers, businesses and other actors in agri-food systems;

- Well-informed policy at local, regional, national and EU levels about the possibilities to steer farmers, businesses and consumers decision-making towards sustainable options through assessing and valuing externalities of the agri-food products (including using subsidies, taxes, incentives, etc.);
- Widespread use of improved and harmonised approaches to identify, measure and value the positive and negative climate, environmental, social and health impacts of agri-food products by policymakers, farmers and businesses;
- Better internalised positive and negative climate, biodiversity, environmental, social and health externalities of agri-food products making the most sustainable food the most affordable and available for consumers, while generating fair economic returns in the supply chain, in particular for farmers and SMEs.

Scope: In line with the Farm to Fork Strategy, the successful proposals will contribute to the transition to sustainable, biodiversity friendly, climate-neutral and resilient farming and food systems. They will do so by supporting development and implementation of policies, business models and market conditions that better internalise external costs and benefits of agri-food production, thereby make the most sustainable food the most affordable and available for consumers, while generating fair economic returns in the supply chain, in particular for farmers and SMEs.

Projects results are expected to contribute to all of the following expected outcomes:

- Better understanding of the challenges and opportunities in relation to internalisation of climate, environmental, social and health externalities of various agri-food production at various levels (e.g., policy, product, organizational, farm, and investment) and in different contexts by policymakers, businesses and other actors in agri-food systems;
- Well-informed policy at local, regional, national and EU levels about the possibilities to steer farmers, businesses and consumers decision-making towards sustainable options through assessing and valuing externalities of the agri-food products (including using subsidies, taxes, incentives, etc.);
- Widespread use of improved and harmonised approaches to identify, measure and value the positive and negative climate, environmental, social and health impacts of agri-food products by policymakers, farmers and businesses;
- Better internalised positive and negative climate, biodiversity, environmental, social and health externalities of agri-food products making the most sustainable food the most affordable and available for consumers, while generating fair economic returns in the supply chain, in particular for farmers and SMEs.

Scope: Better internalisation of the real costs in terms of both positive and negative climate, environmental, social and health externalities in the price of agri-food products has emerged in the policy debates as one of many solutions to improve the availability and affordability of sustainable food for consumers and generate fair economic returns to sustainable producers. Attribution, assessment and valuation of the externalities related to agri-food products are, however, complex and challenging tasks. Interest and research around internalisation of externalities in the price of agri-food has been growing in the last years. A number of initiatives and collaborations on internalisation of externalities of agri-food products are building at various levels from local to global. Accordingly, over the past years, diverse concepts, frameworks, methods and approaches to operationalise the concept have been developed and researched. However, the benefits of internalisation of externalities of agri-food products are widely debated. Besides, as a solution the concept remains more theoretical than practical, and requires development and adaptation over time.

Projects should fall under the concept of the ‘multi-actor approach’²⁰¹, and pilot a “community of practice” as well as convene policy dialogues involving researchers, policymakers, various agri-food systems’ actors (e.g., farmers, downstream and upstream businesses, retailers, HoReCa, consumers, etc.), engaged in work-on-the-ground on the identification, measurement and monetary valuation of positive and negative climate, environmental, social and health externalities generated by agri-food products. Balanced coverage of the EU contexts as well as inclusion of diversity of viewpoints (i.e., “believers” and “sceptics”) and relevant initiatives at different levels from local to global are essential.

Based on an in-depth review of the state-of-the-art (including scientific evidence and initiatives), projects should scrutinize various approaches to identify, assess and monetize positive and negative climate, environmental, social and health externalities of the agri-food products, as well as to measure the degrees of internalisation (i.e., which part of different costs and benefits is already internalised in the current context). Projects should explore possible ways to improve, harmonise and operationalise in practice these approaches. Projects should also map and analyse gaps in existing databases, as well as collect the necessary data for assessment of the externalities, in such a way that it can be used for several purposes (e.g., footprint analysis). Where possible, strategies to support open science and freely share research data following FAIR data principles should be encouraged. Based on a “hotspot” analysis, project may identify several case studies and using the approaches and databases demonstrate their usefulness in practice. Project should also identify possible strategies to elevate internalisation of externalities and embed it into farmer, consumer and business decision-making. Project should analyse these strategies to inform policymakers and businesses on various possibilities, e.g., to tax negative externalities and/or to reward positive externalities across food value chains, from production to consumption.

In all endeavours, various agri-food products sourced from different types of farming systems, (including agroecological and organic), supply chains, processes, contexts and levels (e.g. farm, product, policy, investment, organizational, etc.) should be considered. Attention should

201 See definition of the multi-actor approach in the introduction to this Work Programme part.

be given also to, *inter alia*, legal issues (especially related to fiscal policy) and distributional effects as well as the international component (e.g., how to deal with feed and food produced outside the EU) and the whole spectrum of impacts of supply chains (for instance in relation to deforestation, land-grabs and rights violations, leakage of GHG emissions, etc.), in line with the principles of due diligence and systems thinking.

Based on the insights generated, recommendations for policy and business will be widely communicated and disseminated. Projects should encourage networking, sharing of knowledge and good practices as well as building the necessary expertise and competency among policymakers and businesses. As a result, a consensus in the policy debate should be reached on the feasibility, implications and next steps to develop a harmonised EU approach for assessing and internalising externalities of agri-food products taking into account the various approaches and viewpoints. Project should also develop a roadmap for future R&I to operationalise in practice the assessment and internalisation of externalities of agri-food products.

HORIZON-CL6-2022-FARM2FORK-01-05: Innovative solutions to prevent adulteration of food bearing quality labels: focus on organic food and geographical indications

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 7.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: The Farm to Fork Strategy aims to accelerate transition to sustainable farming and food systems by *inter alia* promoting the growth of organic farming and achieving the target of at least 25% of the EU’s agricultural land under organic farming by 2030. Moreover, the strategy foresees strengthening of the geographical indications (GIs) and, where appropriate, by including specific sustainability criteria. One of the main priorities of the Farm to Fork Strategy is also to combat food fraud along the food supply chain. The successful proposals will contribute to preventing food fraud of quality labelled products, in particular organic and GIs. In this way, the successful proposals will facilitate progress towards the strategy’s challenging target for organic farming and strengthen the GIs scheme.

Projects results are expected to contribute to all of the following expected outcomes:

- A wider and accelerated use of new and improved indicators, tools and field-deployable methods for rapid and cost-effective verification of claims related to plant and animal food products with quality labels, in particular organic and GIs;
- Unlocked potential of new technologies and other innovative approaches (e.g., business models) fit for farmers and food businesses (especially small-scale farmers and SMEs) as well as policymakers that cost-effectively facilitate traceability and transparency along the supply chains of quality labelled food, in particular organic and GIs;
- Increased data availability, interoperability and use as well as advanced analytical capacity for enhanced traceability and transparency along the supply chains of quality labelled food, in particular organic and GIs;
- Well-informed decision-making of farmers, food businesses and policymakers for improved climate, environmental, economic, social sustainability along the supply chains of quality labelled food, in particular organic and GIs;
- Improved functioning and effectiveness of the control systems in the Member States and the legislative framework for organic and GI food products.

Scope: Quality labelled food products, such as organic and GIs, are generally more expensive than their counterparts. Therefore, foods with quality labels are particularly prone to fraud. Illegal practices can considerably harm the quality schemes, as they can undermine consumer confidence, thus damaging the farmers and food businesses who respect the rules.

The main challenge is that it is difficult for consumers and operators across supply chains to visually distinguish genuine organic or GI from false organic or GI products. Traditional methods of food quality determination are time consuming and usually require special laboratory analyses, which are often costly and may not be sufficient to guarantee product authentication. In addition, as organic and GI food supply chains become more complex, the need to ensure product traceability and transparency along the entire chain increases. Existing traceability and control systems help to track products throughout the food supply chain and improve transparency. However, the organic and GI sectors rapidly change due to, for example increasing use of e-commerce, and given the expected growth of these sectors, risk of fraud may increase. Therefore, there is the need to continuously innovate and upgrade the approaches to prevent fraudulent practices. Diverse new technologies and other innovative solutions (e.g., business models; participatory certification; local, short or mid-tier supply chains; etc.), are emerging to improve authentication and traceability of organic and GI food products as well as increase transparency of their supply chains, thereby contributing to combating fraud. These innovative solutions need to be developed/improved, tested and demonstrated.

Projects should investigate the state of play in relation to the current fraud practices affecting quality labelled food products, in particular organic and GI, and analyse the root causes of these practices and obstacles to eradicate them. Based on these insights and building on the state-of-the-art, projects should develop/improve, test, demonstrate and pilot promising

innovative low-cost methods, tools and approaches to authenticate and trace quality labelled food products, especially organic and GI, as well as to improve transparency of their supply chains from farm to fork. Proposals should explore the potential of various technological and non-technological innovative solutions (e.g., digital (photonics, AI, blockchain, IoT, Machine Learning, etc.), new business models (in particular involving and suitable for small-scale farmers and SMEs), suitable reference materials, rapid and field-deployable, non-destructive testing methods, technologies to enhance cybersecurity, etc.), and their combination. The heterogeneity of products and sectors, as well as the diversity of the supply chains should be taken into account. Proposals should also assess the barriers and incentives to deploy the innovative solutions as well as the positive and negative impacts on the different actors in the organic and GI food supply chains, with particular attention to the final part of the chain and the Member State control system as well as small-scale farmers and SMEs. Project should develop a system to promote harmonisation, increase data availability and storage, and explore ways to advance the analysis, use, interoperability and security of data to enhance fair transparency and support better decision-making for sustainability along organic and GI food supply chains. Where possible, strategies to support open science and freely share research data following FAIR data principles should be encouraged.

The innovative solutions should be widely disseminated and recommendations for relevant actors in public sector and business should be provided. Close involvement and consultation with project Advisory Board members supporting the activities is recommended. Projects should fall under the concept of the 'multi-actor approach' ensuring adequate involvement of the relevant actors²⁰², including SMEs. Proposals are encouraged to build on past or ongoing EU-funded research, and are strongly encouraged to cluster with upcoming projects under the topic *HORIZON-CL6-2022-FARM2FORK-01-12: Effective systems for authenticity and traceability in the food system*, research infrastructures and collaborate with relevant initiatives including specifically the European Commission's Joint Research Centre (JRC) Knowledge Centre for Food Fraud and Quality, which provides expertise in food science, authenticity and quality of food supplied in the EU. The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.

Enabling sustainable fisheries and aquaculture

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-FARM2FORK-01-06: Integrated and sustainable freshwater bioeconomy: Combining aquaculture, biodiversity preservation, biotechnology and other uses

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless,

²⁰² See definition of the multi-actor approach in the introduction to this Work Programme part.

<i>project</i>	this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to range between TRL 3 and 6 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives, the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, the EU Bioeconomy Strategy and Blue Growth Strategy, the successful proposal will support freshwater aquaculture products/processes and/or environmental services sustaining the health of freshwater ecosystems and their bioeconomy sectors.

Project results are expected to contribute to all of the following expected outcomes:

- Improvement of the environmental footprint and resource efficiency of freshwater aquaculture and stimulation of its diversification and growth in the framework of an integrated freshwater bioeconomy strategy.
- Preservation of freshwater biodiversity by reducing the freshwater aquaculture impacts (e.g. with appropriate spatial planning) and assessment of its potential for biotechnological applications
- Stimulation of sustainable economic growth and jobs creation in the freshwater bioeconomy sector for people living in lakeside and riverside areas in Europe.
- Improvement of the professional skills and competences of those working and being trained to work within the blue economy.

Scope: Freshwater systems host an immense biodiversity and support a multitude of activities providing livelihoods to inland populations. Lakes, ponds and rivers require a transition to more sustainable and environment-friendly productive ecosystems through optimal water management and planning, mutually benefiting the different ecosystem services by developing economic activities in rural areas, maintaining the biodiversity, and increasing resilience to climate change and water crises.

Aquaculture, in particular integrated multi-trophic or recirculating aquaculture systems, can be key for the development of lakeside and riverside areas as it can be combined with other bio-based activities, such as farming, livestock and the use of hitherto unused naturally produced biomass. Addressing environmental concerns, such as the requirements of the Water Framework Directive and the Habitats Directive, are essential for sustainable growth of freshwater aquaculture. Preserving biodiversity, including health and biosecurity issues, is also key for potential biotechnological applications that should also be explored under this topic.

The Strategic Working Group on Fisheries and Aquaculture (SCAR-Fish) of the Standing Committee on Agricultural Research (SCAR) highlighted in a recent study²⁰³ several issues that urgently need to be explored by research and addressed by innovation, such as climate change-related issues and issues of profitability. Research in this topic should consider the priorities of the SCAR-Fish study.

Strong and active involvement of stakeholders and end-users, including industry and NGOs, in a co-creation approach, is key for the success of the projects that will be selected.

International co-operation with third country partners across the Atlantic Ocean, the Mediterranean Sea, the Baltic Sea and the Black Sea and across international freshwater bodies is encouraged as a win-win scenario, while contributing to the European competitiveness and resilience.

This topic links with potential activities under the Mission Ocean, seas and waters, the mission on Soil, Health and Food, the partnership on Blue Economy²⁰⁴, the partnership on Biodiversity²⁰⁵ and the partnership Water4All²⁰⁶. It can also have potential links with activities funded by the European Maritime and Fisheries Fund.

HORIZON-CL6-2022-FARM2FORK-01-07: Biosecurity, hygiene, disease prevention and animal welfare in aquaculture

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to range between TRL 3 and 6 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives, the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, the EU Bioeconomy Strategy and the Blue Growth Strategy, the successful proposal will support R&I on animal health and welfare in aquaculture to contribute to an environmentally friendly, inclusive, safe and healthy seafood production, including from freshwaters.

Project results are expected to contribute to all of the following expected outcomes:

203 SCAR-Fish (2020) Evaluation of the freshwater aquaculture research needs in Europe. Edited by P. Lengyel. https://scar-europe.org/images/FISH/Documents/Freshwater_aquaculture_research_Europe_final_04022020.pdf

204 HORIZON-CL6-GOV-2022-00-00: European Partnership for a climate neutral, sustainable and productive Blue Economy

205 HORIZON-CF-PARTNERSHIP-BIODIVERSITY-2021-01 Rescuing Biodiversity to Safeguard Life on Earth

206 HORIZON-CL6-CLI-2021-00-00: European Partnership Water Security for the Planet (Water4All)

- Advancement of knowledge about how farmed fish react to farming conditions and their effects on their welfare and growth.
- Development of innovative and less invasive disease prevention, monitoring, control and treatment approaches for a more sustainable production.
- Healthier seafood production through improvement in farming practices and thus contribute to increase its competitiveness.
- Improve the professional skills and competences of those working and being trained to work within the blue economy.

Scope: Aquaculture is the food production sector with the fastest growth globally, but in the EU it is stagnant. Fish and mollusc disease remain an important constraint on productivity and its prevention and management are essential for the sustainability of the European aquaculture industry. Parasites, viruses and microbes often have devastating effects when they infect fish or shellfish farms. The great variety of species cultured and production systems used hinders the implementation of good husbandry practices tailored to each aquatic species. The aquaculture sector falls short of codes of good practice and technologies for the early detection, prevention and control of aquatic diseases. There is also a need for alternatives to pharmaceutical treatments: antimicrobials and antiparasitic drugs are limited and expensive, environmentally impacting and raise consumers concerns on the safety of seafood. The Strategic Working Group on Fisheries and Aquaculture (SCAR-Fish) and the Collaborative Working Group on Animal Health and Welfare (SCAR-AHW) in the frame of the Standing Committee on Agricultural Research (SCAR), highlighted in a recent study²⁰⁷ several fish pathology issues that need urgently to be explored by research and addressed by innovation, such as rapid tests for diagnosis and DNA vaccines at the level of hatchery, bloodstock, cage, pond, etc. Research in this topic should consider the priorities of the SCAR-Fish study.

A similar SCAR-Fish and SCAR-AHW study²⁰⁸ revealed major gaps related to fish welfare, such as a striking lack of welfare indicators, and a strong interest from the industry to improve fish welfare for more and better production. Main gaps presented by this study should be included in the research under this topic.

Codes of good practices are crucial for fish and shellfish sustainable production. Research under this topic should develop innovative aquaculture approaches to achieve the highest possible health standard in production, including breeding, nutrition, alternative disease control methods or increased biosecurity. A holistic approach should be applied, considering the interaction with the environment, the reservoirs, wild and farmed fish interaction or the importance of co-existing pathogens simultaneously infecting the same hosts. Modelling of aquaculture health economics should be covered in the study.

207 SCAR-Fish & SCAR AHW (2019). Disease Prevention In Farmed Fish New Developments and Research Needs. https://scar-europe.org/images/FISH/Documents/CASA_Fish_Disease_Final-Report.pdf

208 SCAR-Fish & SCAR AHW (2018). Strengthening fish welfare research through agap analysis study. https://scar-europe.org/images/FISH/Documents/Report_CWG-AHW_CASA_FISH-welfare.pdf

Strong and active involvement of stakeholders and end-users, including industry and NGOs, in a co-creation approach, is key for the success of the projects that will be selected.

International co-operation with third country partners across the Atlantic Ocean, the Mediterranean Sea, the Baltic Sea and the Black Sea and across international freshwater bodies is encouraged as a win-win scenario, while contributing to the European competitiveness and resilience.

This topic links with potential activities under the Mission Ocean, seas and waters, the partnership on Blue Economy²⁰⁹. Where relevant, proposals under this topic will seek synergies and capitalise on the results of past and ongoing EU research projects (under Horizon 2020, European Maritime and Fisheries Fund and other funding streams).

Transforming food systems for health, sustainability and inclusion

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-FARM2FORK-01-08: Building alternative protein-friendly sustainable and healthy food environments

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to be of TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050, the successful proposal will support R&I to promote both the production, provision and consumption of alternative sources of proteins as well as dietary shifts towards sustainable healthy nutrition, contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

The EU's Farm to Fork Strategy stated that: "European diets are not in line with national dietary recommendations, and the 'food environment' does not ensure that the healthy option is always the easiest one".

The food environment, which makes the link between food supply and diets, is one of the determinants of both consumers' choices and food production. As such, food environments are essential to enable a dietary shift towards less livestock-based and less highly processed food (e.g., more fresh and processed fruit and vegetables, plant-based and aquatic food to tackle the over-consumption of meat and dairy), and much more R&I is needed on food environments to ensure that it can help achieve environmental sustainability and health objectives.

Projects results are expected to contribute to all of the following expected outcomes:

- Improve the effectiveness and efficiency of food environments to ensure the provision of alternative proteins to people (e.g. plant-based, microbe-based, ocean-based (i.e., fish, algae, invertebrates), fungus-based, insect-based, cultured meat), including the most vulnerable groups, to foster a dietary shift (accessibility and availability).
- Ensure an overall improvement of the health outcome resulting from this shift and aiming for healthy, sustainable, and diversified dietary patterns in line with national dietary advice.
- Reduce environmental burden of the food system, including but not limited to food system-related greenhouse gas (GHG) emissions, improve circularity (e.g. food waste and by-products), provide new, sustainable and healthy products to consumers.

Scope: According to studies by [Milford et al. \(2019\)](#) and [Castellani et al. \(2017\)](#), consumer choices depend on the food environment that ensures the availability of and access to food. Behavioural sciences suggest that a choice architecture should be designed to promote healthy and sustainable food preferences to achieve a meaningful dietary shift.

Proposals are expected to address the following:

- Empower the “middle part” of the food system, including for example industry, processors, retailers, food services, cooks, caterers to shape the food environment toward sustainability through the provision of a diverse diet based on alternative sources of proteins (all alternative sources of proteins as specified above to be considered), including through training/skills-building of the different actors in order to produce and provide alternative protein food.
- Work on diversifying the offering particularly in terms of alternative protein sources and ensure an easier access to and affordability of sustainable and healthy (as defined in national dietary recommendations) foods and diets everywhere (urban, peri-urban and rural areas) for everybody (including the most vulnerable).
- Develop industry ready processes to sustainably produce food based on alternative proteins whose sensory characteristics (e.g. colour, taste, structure) and nutritional value will be accepted by consumers.

- Develop a typology of food environments across Europe and the enabling factors for positive transformative change to healthy sustainable diets.
- Assess tools and instruments (e.g., policy measures, incentives, existing and new promotion and marketing approaches, pricing policies) for the increased and varied provision of alternative protein foods leading to overall healthy and sustainable dietary patterns in line with national recommendations.
- Take into account several key elements for the provision of alternative protein sources such as shelf-life, food handling, affordability (including externalities in prices of unhealthy and unsustainable diets), trade-offs between various food provision routes, developing new varieties of proteins sources and rediscovering/valorising old varieties, traceability, as well as preserving taste and natural resources (this would therefore be linked to the outcome of projects funded under topic *HORIZON-CL6-2021-FARM2FORK-01-12: Filling knowledge gaps on nutritional, safety, allergenicity and environmental assessment of alternative proteins and dietary shift*). The gender aspects should also be considered.
- Explore how the food environment can become “crisis-proof” (whether something can be learnt from or has changed with the COVID-19 crisis): resilient local, regional or European food systems in providing food and nutrition security for European citizens in order to be able to tackle future disruptions in supply chains, for example through the diversification of diets and the provision of alternative sources of proteins.
- Clearly explain how the proposal will deliver co-benefits to each of the Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowering communities (e.g., meeting the needs, values and expectations of society in a responsible and ethical way).
- Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.
- Implement the multi-actor approach²¹⁰ by involving a wide diversity of food system actors and conducting trans-disciplinary research. Proposals should also promote international cooperation. Where relevant, activities should build on and expand the results of past and ongoing research projects (especially the four projects funded under topic LC-SFS-17-2019 - Alternative proteins for food and feed). Projects should have a clear plan on how they will collaborate with other projects selected under this topic (if funding of more than one project is possible). They should participate in joint activities, workshops, focus groups or social labs, as well as common communication and dissemination activities and show potential for upscaling. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. Proposals are encouraged to link with relevant EIT Knowledge and Innovation Communities.

²¹⁰ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

HORIZON-CL6-2022-FARM2FORK-01-09: Research and innovation for food loss and waste prevention and reduction through harmonised measurement and monitoring

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 14.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Procedure</i>	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio, grants will be awarded to applications not only in order of ranking but also to at least one project within the area A that is the highest ranked, and one project highest ranked within the area B, provided that the applications attain all thresholds.
<i>Technology Readiness Level</i>	Activities are expected to achieve up to TRL 5 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's climate ambition, the successful proposals will support prevention and reduction of food losses and waste, contributing to the sustainable, healthy and inclusive food systems delivering co-benefits for climate mitigation and adaptation, environmental sustainability and circularity, sustainable healthy nutrition and safe food consumption, food poverty reduction and empowerment of communities, and thriving businesses.

Projects results are expected to contribute to some of the following expected outcomes:

- Successful implementation of the harmonization of food waste measurement across Europe, supported by the development of new tools across the food system from farm to fork, producing reliable and comparable data on food and waste (area A);
- Robust measurement of the magnitude of food losses at the production stage at the levels of Member States as well as the EU of various commodities and at aggregated level contributing to prevention and reduction of these losses (area B);
- Better understanding of the drivers (root causes) of on-farm food losses and ways to prevent and reduce them by policymakers and farmers (area B)
- Well-informed and more effective policy and business strategies for preventing and reducing food losses and waste across the food system from farm to fork (area A and B).

Scope: Annually, a substantial amount of food is lost or wasted all along the agri-food value chain, from primary production to final consumption. Food losses and waste have negative impacts on the society, the environment and the economy. They contribute to food insecurity and hinder nutrition, generate GHG emissions and create pressure on land and water, and are responsible for great economic losses. Such negative impacts are exacerbated in times of crisis such as the current Covid-19 pandemic, when additional food losses and wastes are generated by food supply chains disruptions.

Preventing and reducing the levels of the food intended for human consumption that is eventually lost or wasted is a complex challenge. A robust and reliable measurement and monitoring of food losses and waste is key to track progress made over time and inform development and implementation of effective strategies and actions.

The recent adoption of the EU Commission Decision (EU) 2019/1597 established a common method and minimum quality requirements for the uniform measurement of levels of food waste at the national level. However, since thoroughly assessing on-farm food losses is difficult, time-consuming and costly, the common EU method excludes measurement of food losses at farm stage. In addition to this lack of information about the levels of on-farm food losses, there is an insufficient understanding about the drivers (root causes) behind these losses that are key for developing effect strategies for preventing and reducing them.

Proposals responding to this topic should address one of the two complementary areas:

- A. Develop cost-efficient food waste-relevant data collection, integration and analyses from a large number of dispersed sources (e.g. households, food services, other small business), as well as food discarded through wastewater, in order to improve the mapping of current food waste profiles at European and national level. To this end, proposals should speed up the innovation process and develop and test new technologies and tools along the food system – from farm to fork.
- B. Develop and validate tools and methods to measure and estimate food losses at the farm level, including storage of agricultural products. Where relevant, measurements from Earth observation platforms can be used. The method should be applied and on-farm food losses measured across a large enough sample of diverse farms (including organic), for a range of most important commodities produced in the EU, across several years and in all Member States, in order to generate robust measurement/estimation of on-farm food losses at Member States and EU levels of different commodities and at an aggregated level. To minimise data collection bias, a pool of trained researchers should be established in all Member States able to use the method and measure directly the on-farm losses. In addition to measurement, the direct and indirect drivers of food losses at farm level should be investigated. Particular attention should be paid to identification of the market driven on-farm food losses, to assess the potential for a reduction strategy based on marked demand shifts.

Proposals should provide recommendations for policymakers and best practice guidelines / business strategies for researchers and relevant operators across the food value chains.

Proposals should build on the work done by the European Commission’s Joint Research Centre in support of the EU Platform on Food Losses and Food Waste and be aligned to the environmental footprint method developed by the European Commission. The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.

Proposals resulting from this topic will deliver on food waste reduction and prevention targets relevant to the Farm to Fork Strategy, across the food system. They will explain how they will deliver co-benefits to the four Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities.

In area A, proposals should implement the multi-actor approach²¹¹ by conducting inter and trans-disciplinary research and involving a wide diversity of food system actors, with a special attention to consumers and civil society organisations.

This topic requires the effective contribution of SSH disciplines the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

Proposals are encouraged to build on past or ongoing EU-funded research and collaborate with relevant initiatives, including the European Commission Platform on Food Losses and Food Waste. Proposals will set out a clear plan on how they will collaborate with other proposals selected under this and any other relevant topics, e.g. by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals shall ensure that any data produced during the project will comply with the FAIR principles. In addition, they will adopt an open data approach whereby research data will be freely-shared.

HORIZON-CL6-2022-FARM2FORK-01-10: Microbiomes in food production systems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 2-5 (according to the activity) by the end of the project – see General Annex B.

²¹¹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

Expected Outcome: The successful proposal will be in line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050. It will support R&I to foster advances in microbiome-related research for more sustainable agricultural food production. This in turn will contribute to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Project results are expected to contribute to all of the following expected outcomes:

- More nutritious and diverse plant-based food produce and products, based upon diverse microbiomes.
- Knowledge that leads to microbiome based understanding as needed by the industry on the interaction of plants (e.g. secondary metabolites) and of plant microbiomes with animal and human microbiomes. This is within the context of animal/human health effects, and of plants hosting plant/human/animal pathogens or other microorganisms causing quality and safety problems.
- Enhanced "translational research", which generates and applies knowledge that can improve human health and environmental practices and contributes to yield stability and food and nutrition security.
- Strengthened relationships between all actors involved in our food systems (e.g. farmers, and consumers) by offering transparency of business strategies, including related integrated assessments and decision support tools.
-

Scope: Diversity is increasingly important and is fundamental to achieving the UN Sustainable Development Goals 2, 3, 12, 13 and 15. To introduce such diversity there is a need to implement research and innovation, education, communication, regulation and policy at (multi-)national and European level addressing existing food systems-related microbiome research gaps from laboratory to the field to food production ecosystems. This includes the interaction of food chain microbiome components from the soil to the plant/animal to the plate. We require a better understanding of the interaction of microbial biodiversity of plant/animal/human microbiomes and other biological processes in the larger food and animal/human health context. This is based upon an understanding that plant/animal/human microbiome/ microbiota comprises all microorganisms, including pathogens, and beneficial microorganisms.

The scope covers plant/animal/human/food microbiome interactions that can provide healthier food and reduce human health and environmental risks, and contribute to restoring biodiversity, enhanced circularity, and climate change adaptation.

A better understanding of the potential (direct or indirect) interactions between plant/animal/human/food microbiomes should be achieved. Successful proposals should directly link their R&I coverage with other related intervention actions developing microbiome products and knowledge. In the medium term, food products grown and processed under optimised conditions favouring positive interactions with the microbiome shall be harvested and delivered at comparable costs to those originating in today's conventional farming or intensive agriculture systems. This must be achieved while ensuring that the microbiome-solutions have low risk for consumers, farmers and other users, and the environment, maintaining the economic balance of production facilities and preventing dramatic economic losses, in particular to primary producers. New products may seek EU market regulatory approval, thus proposals will need to address relevant EU regulatory requirements as well as EFSA safety guidance and risk assessment and health outcomes verification.

Proposals are expected to address the following:

- The characterisation and development of microbiomes and their downstream products providing dietary diversity for improved human and animal health, and resilient food production systems.
- Mapping and provision of the arising co-benefits relevant to the four Food 2030 priorities: nutrition for sustainable healthy plant-based food and feed as well as those relevant to different socio-economic and cultural groups.
- Increasing knowledge and understanding of the biological and ecological processes involved in the assembly and dynamics of plant microbial communities, particularly microbial invasion and persistence, all along the production chains to deploy microbiota shaping-based strategies to improve the quality and safety of food products.
- Designing multi-objective multi-region microbiome/diet transition pathways for EU food systems, gathering all aspects of sustainable food systems and diets, health and safety parameters, biodiversity climate and environmental factors, circularity and resource efficiency, innovation and empowerment of communities, traditional and cultural resources.
- Seek international cooperation (such as with the International Bioeconomy Forum, the One Planet Sustainable Food Systems Programme, etc.), along with early and wide communication of microbiome science and applications.
- Address food industry needs, particularly personnel training in classical microbiology and modern microbiome skills; the closing of regulatory loopholes for microbial products; and the demarcation of research levels providing better differentiation to the companies developing the products.

Proposals should implement the multi-actor approach by involving a wide diversity of food system actors and conducting inter- and trans-disciplinary research engaging consumers and civil society organisations. Proposals are encouraged to build on past or ongoing EU-funded

research, research infrastructures and collaborate with relevant initiatives, including the Horizon Europe Mission in the area of Soil Health and Food International cooperation, the International Bioeconomy Forum, the One Planet Sustainable Food Systems Programme, etc. The proposals will set out a clear plan on how it will collaborate with other related proposals selected under this and any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals shall ensure that any data produced during the project will comply with FAIR principles. In addition, they will adopt an open access and open data approach whereby research outcomes, tools and data will be freely shared. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

HORIZON-CL6-2022-FARM2FORK-01-11: Integrated surveillance system to prevent and reduce diet-related Non Communicable Diseases (NCDs)

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 3-5 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050, the successful proposal will support R&I to reduce diet-related non-communicable diseases (NCDs). It will contribute to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Project results are expected to contribute to all of the following outcomes:

- Improving citizens' health status through improved NCDs biomarkers.
- Better understanding of human (male and female) physiology, metabolic regulation and the links between all aspects of nutrition with health, microbiome and disease development.

- Robust and reliable knowledge base on variations in human health in response to nutrition and other relevant factors. Translation of this knowledge into innovative and effective food and nutrition solutions to improve citizen health and wellbeing adapted to women and men, while simultaneously taking into account other dimensions of sustainability such as the climate and environmental dimension.
- Comprehensive evidence base on nutrition-health/disease linkages through the conduct of hypothesis-driven studies and more integrated research approaches.
- Improved citizen awareness and healthier dietary intakes that will reduce NCDs in particular in vulnerable population groups across Europe in order to address health inequalities.

Scope: Unsustainable and unhealthy diets, with an increased demand for livestock products and calorie-dense and nutrient-poor food that are often highly processed (high in calories, sugars, sodium/salt, saturated fat and alcohol, and low in wholegrain, fruits and vegetables, legumes, nuts and seeds), are the leading NCD risk factor and a driver of high obesity rates. In Europe, at present, more than half of the adult population is overweight or obese and, children and population groups of lower socio-economic status are the most severely affected. NCDs such as cardiovascular diseases, cancers, chronic respiratory diseases and diabetes are responsible for the deaths of 41 million people each year, equivalent to 71% of all deaths globally (IPES FOOD, 2019; ECIPE Europe's Obesity Challenge, 2016). NCDs have a negative impact on both lives and health budgets but are largely preventable through effective interventions that tackle shared risk factors (such as unhealthy diets, physical inactivity, tobacco use and abuse of alcohol).

The complexity of the interactions between diet and human health requires multi-level engagement and inter- and transdisciplinary approaches to improve public health and reduce Europe's major health and economic burden. The development of new societally acceptable approaches/strategies/tools for healthy and sustainable diets that reduce diet-related NCDs requires a systemic approach involving a wide diversity of actors and sectors at different levels (from local to international). These include policy makers and public authorities, health care providers, schools and higher education establishments, food producers and processors, retailers, hospitality and food services (e.g. restaurants, canteens), researchers, non-governmental consumer and patient organizations, science brokers and citizens.

Proposals should consider a range of diet-related NCDs, geographic, socio-economic, behavioural and cultural factors. The gender dimension of the research is particularly important for this topic. Data collected and integrated by the private and public sectors should be disaggregated by sex and by socio-economic groups and be made freely available, searchable and reusable in accordance with the FAIR data principles.

Where relevant, activities should build on and expand the results of past and ongoing research projects. Selected projects under this topic (including also projects of the topic HORIZON-HLTH-STAYHLTH-2021-01-01: "*Prevention of obesity through the life course*") are strongly encouraged to participate in joint activities as appropriate. These joint activities could

take the form of clustering of projects, participation in workshops etc. The proposals will also be expected to demonstrate support to common coordination and dissemination activities. Applicants should plan the necessary budget to cover those activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

Proposals are expected to address the following:

- Mapping and monitoring of the diet-related NCD situation (e.g. cardiovascular and heart diseases, obesity, diabetes, cancer and allergy) at EU level based on literature review to better understand the relationship between lifestyle (including diet, nutrition and alcohol, physical activity), physiological and genetic parameters including the human microbiome, gender and sex, geographical placement (national/regional/neighbourhood and rural/urban zone), socio-economic, cultural and environmental (with particular reference to the human exposome) factors, biological parameters (including genomics and microbiomes), and the risk of NCDs.
- Develop standardized methods for collecting (missing) data, using existing data/studies/cohorts and increase the utilization of big data and artificial intelligence to elucidate the complex interactions between diets and human health.
- Develop advanced and easy to use biomarkers of risk/response for NCDs including non-invasive and microbiome-based ones.
- Assessment and monitoring of the impact of existing measures/interventions/policies in the EU to reduce NCDs.
- Investigate and generate strong evidence base for the key physiological processes involved in the development of NCDs and how they may be affected by nutrition (from specific nutrient, dietary components to foods and dietary patterns) and other factors (e.g. geographical, biological, socio-economic, cultural, environmental, education), taking into account individual genotype-phenotype status.
- Develop a strong evidence base for the risks of unhealthy diet and unhealthy food (high in calories, sugars, sodium/salt, saturated fat and alcohol, low in wholegrain, fruits and vegetables, legumes, nuts and seeds, and often highly processed) within the development of NCDs versus healthy food/products.
- Identify high risk/vulnerable populations across Europe, better understand their predisposition to diet-related diseases, and design concrete hypothesis-driven research and well-controlled intervention studies with very strict conditions to reduce dietary and health inequalities in different countries, regions, rural and urban areas.
- Develop more targeted recommendations for effective and cost-efficient integrated policies (such as social, fiscal, regulatory, marketing) at short, medium and long term to support Member States/Associated Counties and policy makers to design effective and cost-efficient policies for more prevention and promotion of healthy diets to reduce diet-

related NCDs, taking into account environmental, gender, social and economic sustainability aspects.

- Undertake risk /benefits cost analyses for the different options proposed to better predict and understand effective and long-term impacts and facilitate informed policy decisions and societal debate.

Proposals should implement the multi-actor approach²¹² by involving a wide diversity of food system actors and conducting inter-disciplinary research and trans-disciplinary research.

HORIZON-CL6-2022-FARM2FORK-01-12: Effective systems for authenticity and traceability in the food system

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 3-5 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, the successful proposal will support R&I to improve traceability and combating food fraud along the food supply chain. It will contribute to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Project results are expected to contribute to all of the following outcomes:

- A robust knowledge base of the underlying reasons for/drivers of food fraud (e.g. economic and social) and the extent of food fraud.
- Innovative strategies and solutions (tools and devices) to prevent fraudulent practices by improving traceability and safeguarding authenticity, and fostering solutions for fraud prevention.
- Improved assistance to control bodies and authorities in fraud prevention.

²¹² See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

- Improved transparency through digital solutions (such as IoT, Artificial Intelligence, blockchain and distributed ledger technologies) that meet consumer demand for food transparency, with a focus on demonstrating authenticity of food as a mean to reduce food fraud and boost consumer confidence in food origin and quality.
- Contribution to further development of policies for food authentication and traceability and for fighting food fraud/food crime.
- Support official control by providing guidance on detection and mitigation of fraudulent practices.

Scope: To contribute to the Farm to Fork Strategy the EU will scale up its fight against food fraud to achieve a level playing field for operators and strengthen the powers of control and enforcement authorities. The new EU Official Controls Regulation (Regulation (EU) 2017/625) includes key provisions in relation to food fraud. Recently, the issue of food fraud has been thrust into the spotlight and is of increasing concern to society and to the food industry, and can have very different impacts on consumers ranging from direct health threats (e.g. consumption of toxic adulterants and contaminants) to violation of consumer rights (e.g. mislabelling). With the complexity of the global market and the addition of e-commerce, the safety risks of food fraud are likely to increase. Therefore, there is a constant need for sensitive and accurate authentication methods and innovative traceability methods to prevent food fraud and help the industry and official control authorities. Maintaining the integrity of European foods is vital to protect both consumers and the legitimate producers, industry and retail, and foster consumer confidence in the authenticity of all food products.

Proposals responding to this topic are expected to address both areas (area A and area B):

Area A:

- Take stock and determine the current state of the art, identify gaps, and suggest short-, medium- and long-term strategies for closing gaps in research addressing various aspects of fraud such as societal and economic drivers, fraud opportunities, mitigation and prevention measures.
- Quantify the economical dimension of the food fraud problem and understand the behaviour of food criminals perpetrating food fraud.
- Carry out translational research on fraud detection methods to provide the required evidence base for harmonisation and standardisation of methods and harmonisation of strategies for regulatory use.
- Develop and validate rapid food fraud detection tools and real-time in-situ/on-line analytical methods for authenticity and quality testing.
- Develop and implement new food fraud detection models (based on data by applying Artificial Intelligence techniques) and tracing methods through the use of new and emerging technologies, such as blockchain and smart labelling tools.

- Establish common platforms and tools for sharing information across stakeholders.

Area B:

- Support the development of an Early Warning System (EWS) for detection and possible further prevention of fraudulent practices and an efficient usage of artificial intelligence, taking into consideration the data protection rules in place.
- Evaluate the utility of different food authenticity related databases existing in Member States and the EU institutions, and creation of a central database/data portal for further use of these data by authorised users to improve fraud detection and enforcement actions by the competent authorities.
- Develop consumer tools in order to increase their confidence in the authenticity and quality of the food supply, in line with the relevant legal frameworks.
- Investigate food chain stakeholders' attitudes towards adulterated food to understand better their motivation to commit fraud and trade-in inferior quality goods.

Proposals should implement the multi-actor approach²¹³ by involving a wide diversity of food system actors and conducting inter-disciplinary research. Proposals should bring together major stakeholders and scientific expertise to protect consumers and industry from food fraud.

Projects relevant to this topic will deliver on supporting policymaking and implementation relevant to fighting food fraud.

Proposals will explain how they will contribute to achieve the objectives of the Farm to Fork Strategy and deliver co-benefits to the four Food 2030 priorities.

Proposals will involve a wide diversity of actors and implement an inter- and trans-disciplinary approach. Proposals are encouraged to build on past or ongoing EU-funded research, and are strongly encouraged to cluster with upcoming projects under the topic "HORIZON-CL6-2022-FARM2FORK-01-05: *Innovative solutions to prevent adulteration of food bearing quality labels: focus on organic food and geographical indications*", research infrastructures and collaborate with relevant initiatives including specifically the European Commission's Joint Research Centre (JRC) Knowledge Centre for Food Fraud and Quality, which provides expertise in food science, authenticity and quality of food supplied in the EU. The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding. Proposals are encouraged to link with relevant EIT Knowledge and Innovation Communities.

Proposals will set out a clear plan on how they will collaborate with other projects selected under this and any other relevant topic, by participating in joint activities, as well as common communication and dissemination activities. Proposals shall ensure that any data produced during the project will comply with the FAIR principles. In addition, projects will adopt an open data approach whereby research data will be freely shared. Applicants should plan the

²¹³ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage.

Targeted international cooperation

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-FARM2FORK-01-13: Agro-ecological approaches in African agriculture systems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 26.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Procedure</i>	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering the agro-geographical regions of Africa, grants will be awarded to applications not only in order of ranking but at least also to one project per geographical region that is the highest ranked, provided that the applications attain all thresholds.
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy, and its promotion of global transitions on sustainable food systems, successful proposals will provide a comprehensive and integrated response to current and future challenges benefiting people, nature and economic growth in Europe and in Africa.

Projects results are expected to contribute to all the following expected outcomes:

- EU – Africa jointly tackle climate change and environmental-related challenges (e.g., biodiversity loss, natural habitats alteration, landscape degradation) and meet the objectives of the Paris Agreement on climate change, and contribute to the Sustainable Development Goals, in particular ensuring food and nutrition security and decent livelihoods.
- Identification of optimal combinations of agro-ecological practices that increase the climate change mitigation and adaptation of different farming systems in different agro-ecological zones in Africa while ensuring the financial viability of businesses.

- Quantification and assessment of socio-economic and environmental performance of agro-ecological strategies contributing to sustainable agriculture practices, supporting small farmers and access to local and international markets.
- Increased end user adoption and implementation of agro-ecological practices by farmers supporting rural communities, ensuring farm resilience and viability at individual and system levels.
- Strengthened transdisciplinary research and integrated scientific support for relevant EU policies and priorities (EU strategy for Africa, Green Deal objectives, etc.).

Scope: The EU's relationship with Africa is a key priority for the EU. The effects of the COVID-19 pandemic and the growing urgency of the climate crisis put pressure both on domestic/local food production and on ecosystems that generate higher health risks with the emergence of new pest and diseases for plants, animals and humans.

The implementation of agro-ecological approaches will alleviate the pressure that agri-food production places on natural ecosystems, contributing to resilience of agri-food systems and facilitating nature-based responses to current and future agri-food risks and threats. Agro-ecological transitions of food systems requires strong food governance with interventions at different level (local, territorial, and value chain) and coherent public policies.

Proposals will build on existing and develop new knowledge, data, models (including indicators) to:

- Identify and evaluate the most suitable agro-ecological strategies for various farming systems in different agro-ecological zones, in Africa.
- Deliver a method to identify the best combination of agro-ecological practices for different farming systems, identifying barriers to and drivers of (socioeconomic and ecological) its wide implementation and the conditions, means and tools to support agro-ecological transitions at individual, territorial and systems levels, and including prospective related to access to local and international markets.
- Develop indicators to monitor and measure the qualitative and quantitative impacts of these strategies for different farming systems, the carbon neutrality potential and trade-offs, nutrients flows, biodiversity and improvement of in farm socio-economic resilience.
- Support farmers, advisory services and actors in value chains in implementing agro-ecological practices by establishing communities to support capacity building, knowledge exchange, and share best practices across different human communities in relation to agro-ecological practices that contribute to mitigating climate change and other environmental impacts.
- Identify approaches and methods to enhance the demand for food products resulting from agro-ecological practices, from local, national, regional and international markets.

Proposals should fall under the concept of the 'multi-actor approach'²¹⁴ and ensure adequate involvement of the farming sector and, as relevant, bio-based industries active in rural areas.

HORIZON-CL6-2022-FARM2FORK-01-14: AU-EU Combatting all forms of malnutrition

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair, healthy and environmentally friendly food system, as well as with the EU's climate ambition for 2030 and 2050, the EU's "Comprehensive Strategy with Africa" calls to "Partner with Africa to maximise the benefits of the green transition and minimise threats to the environment", and states: "The EU and Africa must join efforts to reach the Sustainable Development Goal of zero hunger and address the challenges of nutrition and food security by boosting safe and sustainable agri-food systems." In support of this strategy, the EU and the African Union are implementing a ten-year roadmap (2016-2026) on research and innovation in food and nutrition security and sustainable agriculture to which the successful proposal will contribute. It will help to transform food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses. An estimated 821 million people are currently undernourished, 151 million children under 5 are stunted, At the same time, overweight and obesity are increasing rapidly in Europe and Africa, with no signs of slowing.

This Research and Innovation action (RIA) will build on the international dimension of the Farm to Fork communication. It relates to evidence presented by the EAT Lancet report and the 2020 Global Nutrition Report. It contributes to the agenda and follow-up of the 2021 UN World Food Systems Summit.

A successful proposal will develop and test approaches to Innovations to improve nutrition by a deep understanding of the unmet nutritional needs, aspirations, behaviours and preferences of consumers who remain underserved by markets and face limited access to affordable nutritious foods.

214 Insert definition

Projects results are expected to contribute to all of the following expected outcomes:

- Contribute to better informed nutrition policies which can be scaled-up by initiatives such as SUN (scaling-up nutrition).
- A shift to improved nutrition in African countries reducing all forms of malnutrition through safe, healthy and affordable diets, including dietary shifts, that reduce the pressure of food production on land and water use and reduces the climate footprint of downstream activities from farm to fork.

Scope: Proposals are expected to address the following:

- Mapping and monitoring of dietary patterns at national/regional/rural/urban levels relevant to different socio-economic and cultural groups, including low-income settings, the most vulnerable, rural food environments and for those in conflict or protracted-crisis situations to better understand what people are eating and how they make food choices.
- Contribute to standardised metrics and tools to measure the food environment. In many food systems the absence of formal channels to acquire food lead to a dynamic, self-sufficiency and unregulated retail food environment with a large proportion of informal food vendors. This results in enormous variety in metrics in terms of reference points (i.e. food accessibility), media coverage (i.e. food promotion) and level of implementation (i.e. policies).
- Improved knowledge and measurement of the factors influencing dietary behaviour in selected African countries, and development of effective means for each food system actor to share food knowledge and improve food behaviour.
- Assess the value and potential for scaling-up of sustainable traditional food knowledge based on access to biodiverse agro-ecological situations.
- Assess innovations to improve nutrition, driven by a deep understanding of the unmet nutritional needs, aspirations, behaviours and preferences of consumers who remain underserved by markets and face limited access to affordable nutritious foods.
- Innovative and effective tools to improve education, communication, engagement and training on sustainable healthy nutrition and diets, and more generally on sustainable food systems adapted to different population groups in respect of their age, culture and needs and considering gender.
- Provision of scientific basis for sharing food knowledge and developing dietary advice to support policy makers that will empower individuals to adopt healthy and sustainable food behaviour, as a win-win for both their health and the environment.
- Support for the development of new integrated policy-making and implementation efforts such as the scaling-up nutrition initiative within and across countries (at multiple levels) to support healthier and sustainable dietary behaviours and lifestyles with the

provision of innovative, efficient, effective, evidence-based and ready-to-use tools/strategies including cost-benefit assessment for the different proposed options.

- Contribute to mapping and monitoring of mycotoxin effects in unsafe foods and diet-related Non-Communicable Diseases (NCDs) to better understand the relationship between lifestyle (including mycotoxin levels, diets, nutrition and alcohol), gender, geographical, socioeconomic and environmental factors, biological parameters, and the risk of development of diet related NCDs.
- Development of innovative and effective policies/strategies/tools contributing to reduce dietary and health inequalities as precursors of NCDs, in particular of vulnerable population groups.
- Proposals should include a space for mentoring and acceleration of innovative business concepts, including social innovation and upscaling for promising approaches using cascading funding opportunities.
- Only when relevant, creating links to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS)..
- Proposals should have a clear plan on how they will collaborate with other projects selected under this topic, other nutrition related EU projects and similar projects funded under the EU-AU HLPD-FNSSA priority from different funding sources including Horizon 2020 and Horizon Europe, ERA-Nets, African Union Research Grants, DeSIRA or PRIMA. They should participate in joint activities, and workshops, as well as common communication and dissemination activities and show potential for upscaling. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.
- Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2022-FARM2FORK-01-15: African Food cities

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 5.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Research and Innovation Actions

<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.
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Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050, the EU's "Comprehensive Strategy with Africa" calls to "Partner with Africa to maximise the benefits of the green transition and minimise threats to the environment". In support of this strategy, the EU and the African Union are implementing a ten-year roadmap (2016-2026) on research and innovation in food and nutrition security and sustainable agriculture to which the successful proposal will contribute. It will also contribute to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Urban areas contribute substantially to global food-system related emissions and food waste. Urban growth is often happening at the expense of natural resources. Urban areas are increasingly affected by the double burden of malnutrition: high prevalence of undernourishment and undernutrition and increasing obesity and the spread of Non Communicable Diseases.

A successful proposal will build upon initiatives like the Milan Urban Food Policy Pact (MUFPP), the FAO urban food agenda and upon the recommendations of the Task Force Rural Africa report. It will address big, intermediate and small cities and towns. Poorly planned urban food systems lack opportunities to link rural and urban food producers, markets and consumers. They limit the access of vulnerable groups to safe and healthy nutrition.

Projects results are expected to contribute to all or some of following expected outcomes:

- A shift to food security and improved nutrition in 5 African cities (could encompass rural urban centres to cities) through healthy and affordable diets that reduces the pressure of food production on land and water use and reduces the climate footprint of downstream activities from farm to fork.
- Contribute to reduce the food system-related environmental footprint, improve circularity (e.g. food and packaging waste), and provide new, sustainable and healthy products to consumers.

Scope: Proposals are expected to address the following:

- Understanding: It will promote multi-stakeholder collaborations in assessing data on the food challenges (including harmful marketing and advertising; unequal access to healthy food for the urban poor), and identify opportunities and indicators in developing urban food policies.

- **Engaging:** mobilizing a wide diversity of food system actors (from farm to fork, public and private sector, and society, organic and conventional); in particular higher education institutions and research centres to collaborate with local actors in support of evidence-based food policy development and to help provide local solutions to integrated food system challenges.
- **Mutual learning:** reinforcing or creating new networks of African cities and towns to share good practices and learn from and support each other. This will imply also involving cities (in Africa, Europe or elsewhere) with well-developed food policies to provide guidance and lessons learned, as well as new forms of collaboration/twinning.
- **Innovation:** Proposals should foresee a space for mentoring and accelerating innovative business concepts, including social innovation and upscaling in view of African or European food business entrepreneurs with special consideration of women and the diaspora using cascading funding opportunities. Proposals may involve financial support to third parties e.g. to academic researchers, startups, SMEs and other multidisciplinary actors, to, for instance, develop, test or validate developed assessment approaches or collect or prepare data sets or provide other contributions to achieve the project objectives. A maximum of € 60 000 per third party might be granted. Conditions for third parties support are set out in Part B of the General Annexes. Consortia need to define the selection process of organisations, for which financial support will be granted. Maximum 20% of the EU funding can be allocated to this purpose. The financial support to third parties can only be provided in the form of grants.
- Only where relevant, creating links to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS).
- Explore how the food environment can become “crisis-proof” (whether something can be learnt from or has changed with the COVID-19 crisis): resilient local, regional food systems with border regimes, which do not disrupt supply chains.
- **Governance:** developing and evaluating innovative multi-actor urban food systems governance processes and capacities for science-backed integrated policy making and implementation actions that deliver on the international collaboration dimension of the Farm to Fork strategy objectives and Food 2030 co-benefits for health, environment, climate, circularity and inclusion, while minimizing trade-offs.
- **Partnership:** Proposals should have a clear plan on how they will collaborate with other projects selected under this topic and similar projects funded under the EU-AU HLPD-FNSSA priority from different funding sources including Horizon 2020 and Horizon Europe, ERA-Nets, African Union Research Grants, DeSIRA or PRIMA. They should participate in joint activities, and workshops, as well as common communication and dissemination activities and show potential for upscaling. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete

common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

- Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2022-FARM2FORK-01-16: Support for international research on infectious animal diseases

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 3.00 million.
<i>Type of Action</i>	Coordination and Support Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: Legal entities established in non-associated third countries may exceptionally participate in this Coordination and support action.

Expected Outcome: In line with the Farm to Fork Strategy, for a transition to fair, healthy and resilient livestock production systems, including the reduction of anti-microbial usage, a successful proposal will support R&I to help research funders, policy makers and business operators in decreasing the burden of infectious animal diseases, thus contributing to sustainable agriculture and to public health at global level. Considering the transboundary nature of infectious animal diseases and relate issues such as anti-microbial resistance, providing support to the STAR-IDAZ International Research Consortium activities will facilitate international coordination of research in these domains. Such a support will enhance and leverage capacity to prevent and control diseases not only globally, but also in the EU and Associated Countries, to reduce the risk to human health arising from infectious animal diseases and anti-microbial resistance, and to contribute to global food security.

At EU level, this will contribute to supporting the Farm to Fork Strategy, for a transition to fair, healthy and resilient European livestock production systems, including the reduction of anti-microbial usage while improving the efficiency and competitiveness of livestock production,

Project results are expected to contribute to all following expected outcomes:

- Ensure public access and active dissemination of pertinent information on research activities, needs, and research outputs on priority infectious animal diseases, including zoonoses, and related issues

- Foster the delivery of new or improved prevention, control and surveillance tools or strategies.

Scope: Infectious animal diseases and related issues can cause serious social, economic and environmental damage and in a number of cases threaten human health (zoonoses, anti-microbial resistance). These diseases do not respect borders and can often spread quickly through out the globe. These global threats, the diversity of pathogens and livestock species and the scarce resources available for animal health research make the case for international cooperation on priority diseases and issues, in order to expedite the development of better prevention and control methods, ensure the sustainability of livestock industries and protect human health and the environment. This initiative will consolidate and deepen international research cooperation in the area of infectious animal diseases and related issues such as anti-microbial resistance. It will support the activities of the STAR-IDAZ International Research Consortium (Star-IDAZ IRC), aiming to strengthen the global network of research programme owners and funding organisations in order to achieve specific targets relating to the prevention and control of priority infectious animal diseases, including zoonoses, and related issues such as anti-microbial resistance and new emerging threats. The action will facilitate the work of the Executive and Scientific Committee as well as the Working Groups, organise research gap analyses as appropriate, maintain the tools and other work resources, disseminate pertinent information and results to the stakeholders and users, organise interaction with relevant projects and initiatives, organise activities to leverage resources and enlarge the partnership as appropriate.

Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption

HORIZON-CL6-2022-FARM2FORK-02-two-stage

Conditions for the Call

Indicative budget(s)²¹⁵

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ²¹⁶	Number of projects expected to be funded
		2022		

²¹⁵ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

²¹⁶ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

Opening: 28 Oct 2021				
Deadline(s): 15 Feb 2022 (First Stage), 06 Sep 2022 (Second Stage)				
HORIZON-CL6-2022-FARM2FORK-02-01-two-stage	RIA	10.00	Around 5.00	2
HORIZON-CL6-2022-FARM2FORK-02-02-two-stage	RIA	7.00	Around 7.00	1
HORIZON-CL6-2022-FARM2FORK-02-03-two-stage	RIA	12.00	Around 6.00	2
HORIZON-CL6-2022-FARM2FORK-02-04-two-stage	IA	15.00	Around 5.00	3
HORIZON-CL6-2022-FARM2FORK-02-05-two-stage	IA	18.00	Around 6.00	3
Overall indicative budget		62.00		

General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Enabling sustainable farming

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-FARM2FORK-02-01-two-stage: Agroecological approaches for sustainable weed management

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: A successful proposal will support the Farm to Fork Strategy objective for a transition to a fair, healthy and resilient European agriculture, notably its objective to promote agroecology, and the target to reduce the overall use and risk of chemical pesticides²¹⁷. They will do so by unfolding the potential of agroecology to provide alternative weeding strategies that reduce or eliminate the use of pesticides used as herbicides. This will support the transition to sustainable, safe, productive, climate-neutral and resilient farming systems that minimise pressure on ecosystems while ensuring fair economic returns for farmers.

Project results are expected to contribute to all of the following expected outcomes:

- Evidence of optimal and innovative combinations of holistic alternative weeding techniques based on agroecological approaches in different European pedo-climatic conditions for a wide range of crops and farming systems, including conventional, organic and mixed farming
- Quantitative and qualitative evidence of the social, economic and environmental sustainability and performance, as well as trade-offs, of different alternative weeding strategies across Europe at farm, landscape and regional levels, and in the medium-to long term
- Robust evidence of factors influencing farmers’ decision-making and improved knowledge co-creation and feedback among actors in the food value chain, resulting in ease of use, end user acceptance and increased implementation of alternative and holistic weeding strategies based on an integrated use of agroecological approaches
- Improved, open access to data on current weed management practices and use of herbicides across several representative European agro-ecosystems.

Scope: Herbicides have become the foundation of weed management in EU farming systems. Given that herbicides can have harmful effects on the environment, non-target organisms, and

²¹⁷ The Farm to Fork strategy sets the target to reduce by 50% the overall use and risk of chemical pesticides and reduce use by 50% of more hazardous pesticides

on animal and human health, reducing reliance on these products has become a policy objective. Sustainable and effective non-chemical alternatives to reduce or eliminate the use of herbicides are largely lacking for most crops and farming systems in the EU. Weed-related challenges can be better addressed as a part of broad-based, holistic strategies such as agroecology²¹⁸ that, by relying on and maximizing the use of ecological processes to support agricultural production, have the potential to advance ecosystem sustainability while ensuring profitability of the farming activity. Agroecology is a holistic approach that relies on and maximizes the use of ecological processes to support agricultural production. By working more with nature and ecosystem services, agroecology has the potential to increase the circularity, diversification and autonomy of farms, and drive a full transformation of farming systems, from input substitution and beyond. In parallel, progressing towards digitalisation or the implementation of new digital technologies is one of the main ambitions facing European agriculture. The development and promotion of alternative weed management techniques and strategies that do not only rely on chemical herbicides are required. Moreover, factors such as soil and climatic conditions, as well as the type of crop and the farming system can largely determine the spatial and temporal development of major weeds and, therefore, the effectiveness and efficiency of these strategies. Agroecological or nature-based principles can provide systemic, sustainable, context-specific and socially acceptable alternatives to address these challenges. Activities will advance knowledge, build capacities and deliver innovative systemic and holistic solutions to reduce and eventually eliminate the use of chemical pesticides used as herbicides, and will address the needs of a wide range of crops (arable and permanent) and farming systems, both conventional and organic. Proposals should cover all European biogeographical/pedo-climatic regions. Projects will fall under the concept of 'multi-actor approach'²¹⁹ and will build on and expand the achievements of relevant past and ongoing EU-funded research projects.

Proposals should include a clear plan on how they will collaborate with other projects funded under this topic. Projects will ensure collaboration with projects funded under calls HORIZON-CL6-2021-CLIMATE-01-05: *Agroecological approaches for climate change mitigation, resilient agricultural production and enhanced biodiversity* and HORIZON-CL6-2021-FARM2FORK-01-04: *Digitalisation as an enabler of agroecological farming systems* in this Work Programme. Projects will identify optimal combinations of agroecological solutions for socially, economically and environmentally sustainable alternative weed management strategies that reduce or eliminate the use of herbicides. They will do so by capitalising on the opportunities offered by cropping system design, mechanical weed management techniques, soil management practices, breeding, bio-based herbicides, precision and site-specific weeding and digitalised weed monitoring, including by using technology and knowledge of weed biology. Projects will test and evaluate the sustainability, performance and profitability of these strategies *versus* classical chemical weed management approaches in the medium- to long-term and at farm, landscape and regional levels, undertaking qualitative and quantitative estimates of trade-offs, and identifying gaps and needs towards non-chemical

²¹⁸

<http://www.fao.org/3/i9037en/i9037en.pdf>

²¹⁹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

weed management. Projects will undertake comprehensive analysis of the socio-economic aspects involved in the adoption of alternative weeding strategies based on agroecological approaches and of the factors influencing farmers’ decision-making, including consumer and market aspects, like risk perception and acceptance of food produced with new weed management strategies. Projects will develop and test strategies involving all relevant actors for knowledge co-creation and feedback to demonstrate and accompany farmers in implementing and/or switching to agroecological weed management. Proposals will develop a repository of current weed management practices and use of herbicides in several representative European agro-ecosystems.

HORIZON-CL6-2022-FARM2FORK-02-02-two-stage: Emerging and future risks to plant health

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 7.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy for a transition to fair, healthy and resilient European agriculture and forestry, including an ambitious target of reduced use of plant protection products ²²⁰, the successful proposal will support R&I to help the agricultural/forestry sector to remain productive and contribute to sustainable agriculture and/or forest health.

Project results are expected to contribute to all of the following expected outcomes:

- Find adequate responses to new and/or emerging plant pests
- Improve the understanding of drivers of plant pest emergence including the influence of climate change and globalisation
- Develop economic and environmentally sound solutions for effective pest management in farming and forestry in line with the principles of integrated pest management
- Support to relevant EU and Associated Countries’ plant health policies

²²⁰ The Farm to Fork strategy sets the target to reduce by 50% the overall use and risk of chemical pesticides and reduce use by 50% of more hazardous pesticides

Scope: Proposals will target one or more new or emerging plant pests²²¹ (regulated, non-regulated, introduced or native) that are causing or likely to cause, significant (socio) economic and/or environmental losses to agriculture and/or forestry in the EU and/or Associated Countries. Within the scope of this topic are pests exhibiting an altered and higher probability of entry and spread in a new area that might be the result of changes in their biology or changes in agriculture or forestry pest management practice or rapid spread in new areas. The choice of target pest(s) will consider the potential threat in terms of development and spread, its potential exacerbation under climate change as well as the potential impact on agricultural production, forestry, trade and the wider environment (including soil and water). Activities will consider both the conventional and the organic sector.

Proposals will:

- Increase knowledge of the biology, pathways of entry, behaviour in the plant-soil system where relevant, and drivers of spread including the influence of climate change and globalization of pest(s).
- Improve methods and strategies for early detection, prevention and (bio) control.
- Develop and uptake rapid and effective tools for the prevention of entry, spread and establishment, early detection, surveillance, treatment and control of plant pests for a sustainable and integrated pest management.
- Identify and introduce resistance traits to support long term sustainability of agriculture and forestry in EU and/or Associated Countries
- Assess the social and economic implications for farmers affected by the plant pest(s) and the development of approaches on how to best cope with these situations
- Integrate citizen-science as a tool to monitor emerging pests

International cooperation with countries affected or threatened by the same pest(s) is encouraged. Proposals should fall under the concept of the “multi-actor approach”²²² including a range of actors to ensure that knowledge and needs from various sectors such as research, plant health services and the farming/forestry sector are brought together. The Joint Research Centre (JRC) may participate as a member of the consortium but is not eligible for funding.

HORIZON-CL6-2022-FARM2FORK-02-03-two-stage: Animal disease ecology

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless,

²²¹ A pest is defined here as any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (EU legislation, Regulation 2016/2031)

²²² See definition of the 'multi-actor approach' in the introduction to this Work Programme part

<i>project</i>	this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the Farm to Fork Strategy, for a transition to fair, healthy and resilient livestock production systems, including the reduction of anti-microbial usage, a successful proposal will support R&I to help policy makers and relevant actors (e.g. business operators) in the prevention and control of infectious animal diseases in a changing environment, thus contributing to sustainable agriculture and to public health.

The project results are expected to contribute to all of the following expected outcomes:

- Improving the capacity for risk-based surveillance thanks to a better understanding of sources and pathways of emergence and spread of animal diseases
- Enhancing the capacity to prevent and control diseases in animals, and their potential impact in human population
- Improving understanding of impact of climate change on pathogen ecology and animal diseases to predict and possibly anticipate with appropriate countermeasures

Scope: Disease emergence, persistence and spread are the result of a number of factors linked to the dynamic biological, or ecological, interplay, among and between the infectious agents, the hosts (intermediary or definitive), the community of hosts (intermediary or definitive, including wildlife), of vectors in case of vector-borne diseases, the environment, including other living organisms found in agro-ecosystems, and human activity. Understanding this interplay, at various spatial scales (herd, farm, landscape) in particular the capacity of infectious agents, vectors, or hosts to persist in different agro-ecosystems, to circulate between them, or to evolve and potentially become more pathogenic or jump between species is often incomplete for known diseases, and virtually non-existent for new diseases, like the emergence of Coronavirus infections highlighted.

The proposals should address relevant areas of research in terrestrial livestock, and related wildlife as appropriate:

1. Understanding population dynamics of pathogens in and outside hosts, including interactions within and between humans and animals
2. Understanding the drivers of pathogen evolution (e.g. mutations) and their impact on virulence and cross-species transmission
3. Understanding the impact of the host immune response on pathogen adaptation/evolution
4. Understanding of mechanisms of behaviour/persistence of pathogens in animals, animal products, vectors and outside the host (e.g. environment, fomites)

5. Inactivation of pathogens
6. Antimicrobial resistance development, where relevant

The choice of the infectious agent / diseases should take into account their importance for the EU policy and regulatory framework, not least for epizootic diseases such as African swine fever, avian influenza or African horse sickness, or for zoonotic pathogens, or major diseases, including production diseases, responsible for high antimicrobial usage and potential transfer of resistance to human pathogens or microbiota. Where appropriate for the diseases targeted, cooperation with relevant professionals outside the animal health domain (e.g. public health, environment) is recommended, as highlighted in the One Health approach. Proposals may use priorities identified under the SCAR²²³ Collaborative Working Group on Animal Health and Welfare²²⁴, Discontools²²⁵, or STAR-IDAZ International Research Consortium²²⁶. They should draw on lessons learned from other EU funded projects on selected diseases and clearly underline how they will bring new knowledge and impacts. International research cooperation with third countries where selected diseases are endemic is encouraged to maximise the impact.

HORIZON-CL6-2022-FARM2FORK-02-04-two-stage: Smart solutions for the use of digital technologies for small- and medium-sized, farms and farm structures

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy and the Headline ambitions of a Digital Age and Economy that works for all, the successful proposals will support the development of small- and medium sized farms to benefit from digital technologies and strengthen their capacities to their effective and efficient deployment. Projects will therefore contribute to the development of sustainable, productive and climate-neutral and resilient farming systems providing consumers with affordable, safe, healthy and sustainable food, minimising pressure on ecosystems, improving public health and generating fair economic returns for farmers through the development of smart solutions for the use of digital

223 Standing Committee on Agricultural Research

224 https://www.scar-cwg-ahw.org/wp-content/uploads/2018/04/Final-Report-CWG-AHW-CASA_updated-EU-AH-SRA.pdf

225 www.discontools.eu

226 www.star-idaz.net

technologies for small- and medium-sized, farms and farm structure. Project results are expected to contribute to all of the following expected outcomes:

- Innovative solutions for the use of digital technologies (fostering soft- and hardware) tailored to the needs of small- and medium-sized farms and farm structures, including crop- and livestock production;
- Increased uptake of innovative digital technologies by farmers;
- Contribution to avoiding an increased digital divide between small and large farms;
- Increase in the environmental and economic performance of small- and medium-sized farms in the EU and AC.

Scope: Despite the potential of digital technologies to increase the economic and environmental performance of the agricultural sector, there is still need to increase the uptake of precision farming tools, particularly among small- and medium-sized farms. – An increase in the digital divide between small and large farms is to be avoided.

While one main reason for this circumstance is – as for many investments in agricultural equipment – investments in digital technologies frequently only become cost-effective, if a critical mass of production volume is given. In addition, small- and medium sized farms and farms structures have in some areas specific needs and strengths, because of e.g. a small average parcel seize, which should be considered in the development of digital solutions for the sector.

Proposals should cover all of the following aspects:

- Development and piloting of cost-effective digital solutions for small- and medium-sized farms and farm structures for at least grass land and arable crops under representative consideration of the diverse environmental, climatic and socio-economic conditions across the EU and ACs.
- Development of business and/ or governance models facilitating the roll-out of the piloted innovation at larger scale in several countries; if relevant, models may not only consider financing the purchase of the digital solutions but also the establishment of other framing conditions or propose public intervention (e.g. data provision) or public-private partnerships or cooperative (digital) service provision and taking.

A multi-actor approach²²⁷ is to be followed, involving at least scientists, representatives, SMEs, and of the agricultural sector. Proposals are expected to demonstrate how networking activities fostering the exchange of experiences and knowledge transfer are organized. Exchange/ collaborate with Digital Innovation Hubs²²⁸ and the consideration of the potential of social innovation to increase efficiency and effectiveness in the wider application of the

²²⁷ See definition of the multi-actor approach in the introduction to this Work Programme part.

²²⁸ For more information on Digital Innovation Hubs, please see <https://ec.europa.eu/digital-single-market/en/digital-innovation-hubs>.

developed innovative digital solutions are encouraged. Special attention might also be given to certain crops and/ or sub-branches, and or specific production processes for which currently less dedicated precision farming technologies are available on the market.

Proposals may involve financial support to third parties to provide direct support (e.g. in the form of cascading grants) to researchers, developers, SMEs, start-ups and other multidisciplinary actors in particular for for populating, testing and validating use cases and/ or other actions contributing to the objectives of the project. A maximum of € 60 000 per third party might be granted. Conditions for third parties support are set out in Part B of the General Annexes. Consortia need to define the selection process of organisations, for which financial support will be granted. Maximum 20% of the EU funding can be allocated to this purpose. The financial support to third parties can only be provided in the form of grants.

Enabling sustainable fisheries and aquaculture

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-FARM2FORK-02-05-two-stage: Innovative food from marine and freshwater ecosystems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 18.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives, the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, the EU Bioeconomy Strategy and Blue Growth Strategy, the successful proposal will support environmentally friendly, inclusive, safe and healthy seafood production through innovation in the supply chain.

Projects results are expected to contribute to all of the following expected outcomes:

- Implementation of the ecosystem approach for sustainable management of marine and freshwater fisheries as well as in aquaculture development.
- Wider and more diverse range of seafood (including from fresh waters) available to European consumers, and greater overall seafood consumption.

- Tools to limit the waste and discarding of seafood during production, processing, transport and consumption, including the minimisation of the environmental impacts of fisheries and aquaculture through better gears or practices.
- Verification of existing and development of new seafood processing methods that add nutritional and economic value and minimise the environmental impact.
- Improved professional skills and competences of those working and being trained to work within the blue economy.

Scope: Despite the vast diversity of biota in the European seas, rivers and lakes, consumers prefer only a few species for consumption. This is even more pronounced for aquaculture production where only a very limited number of fish and shellfish species are farmed. Moreover, some of the farmed species are higher predators and, despite improvements in feeds, fishing for feed is still a sad reality. Waste of seafood during production, processing, transport and consumption is massive; valorisation of fish and shellfish biomass is still far from achieving its full potential in the context of a circular economy.

Innovation under this topic should explore and test solutions for more sustainable fishing and aquaculture practices and diversify production through low trophic level fisheries and aquaculture. This could include animals (herbivorous, filter-feeders), algae (micro- and macro-), bacteria and fungi. Issues of biology, feeding, metabolism, disease, pathology, environmental sustainability, gear technology, processing, and marketing of products should be addressed.

Innovation should additionally focus on improving the environmental impact of fisheries and aquaculture, e.g. with more selective and less impacting fishing gear, low carbon fishing approaches, nutritious and safe feeds, recirculating aquaculture systems, integrated multitrophic aquaculture, disease control and sustainable solutions in fish and shellfish rearing. It should also identify captured species of high abundance and high nutritional value and reach out to consumers to promote their consumption.

Innovative processing, including digital and packaging solutions as well as formulation and/or fortification, should also be considered to minimise loss of fish and shellfish biomass, add nutritional and economic value to the chain (including by-products), enhance the shelf life of the products, and reduce food waste.

The projects that will be selected should also address issues of proximity between seafood production and consumption, e.g. by exploring possibilities to turn artisanal fisheries more environmentally friendly and economically viable. Innovative processing possibilities should also be explored.

A strong communication component and a genuine co-creation approach with stakeholders and end-users, including from industry, consumers and NGOs, are key for a successful introduction, in the medium-term, of innovative and sustainably produced seafood in the EU and in Horizon Europe associated countries. Training and education activities should be included.

International co-operation with third country partners across the Atlantic Ocean, the Mediterranean Sea, the Baltic Sea and the Black Sea and across international freshwater bodies is encouraged as a win-win scenario, while contributing to the European competitiveness and resilience.

This topic links with potential activities under the Mission Ocean, seas and waters and the forthcoming partnership on Blue Economy²²⁹. It can also have potential links with activities funded by the European Maritime and Fisheries Fund.

Social innovation should be considered when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

DRAFT

Destination 3 – Circular economy and bioeconomy sectors

This destination and its topics target climate-neutral **circular and bioeconomy transitions**, covering safe **integrated circular solutions at territorial and sectoral levels**, for important material flows and product value chains, such as the textile, electronics, plastics and construction sectors, as well as **key bioeconomy sectors** such as **sustainable bio-based systems, sustainable forestry, small-scale rural bio-based solutions, and aquatic value chains**. With this approach, the Destination supports the European Green Deal, and other European initiatives such as the Industrial Strategy, SME Strategy, Circular Economy Action Plan, Bioeconomy Strategy, Biodiversity Strategy, Farm to Fork Strategy, Textile Strategy, Plastics Strategy, the Action Plan on Critical Raw Materials, and the Forest Strategy.

More specifically, the focus on **circularity**²³⁰ aims at less waste and more value by extending the lifetime and retaining the value of products and materials. It supports a sharing, reusing, and material-efficient economy, in a safe way, and minimises the non-sustainable use of natural resources. The cascading use of materials and innovative upcycling of waste to new applications is encouraged. The safe and sustainable use of biomass and waste²³¹ for the production of materials and products, including nutrients, can reduce Europe's dependence on non-renewable resources, cut GHG emissions, offer long-term circular carbon sinks and substitutes to fossil-based and carbon-intensive products, and reduce pressures on biodiversity and its wide range of ecosystem services. The potential of biological resources goes beyond biomass processing into renewable products. It includes the use of organisms and their parts in “green” (i.e. more environmentally friendly) bio-based industrial processes. Marine and land-based biotechnology can provide new sustainable and safe food and feed production methods, greener industrial products and processes, new health-related products, and can help characterise, monitor and sustain the health of marine and terrestrial ecosystems. The potential of marine resources and biotechnology will contribute to the coming “blue economy”, accelerating the transition towards a circular and climate-neutral economy that is sustainable and inclusive. The concepts of the circular economy, bioeconomy and blue economy converge and altogether provide an opportunity to balance environmental, social and economic goals, with their sustainability ensured by the life cycle assessment approaches.

Acknowledging the multiple benefits of circularized material/substance and energy flows, such circularity however has to be achieved in a safe, non-hazardous way without (re-)connecting epidemiological pathways or introducing pathogen/toxin enrichment cycles when involving biogenic materials. Established circularized material/substance flows have to be complemented with accompanying research in their safety and non-hazardous to health,

²³⁰ In synergy with Horizon Europe Clusters 4 and 5, in particular, [Cluster 4 dealing with industrial and technological aspects and raw materials supply, including construction with lower environmental footprint, through modularisation, digital technologies, circularity and advanced materials](#), while [Cluster 6 has a systemic approach across sectors including civil society, covering the whole value chain: including technological, business, governance and social innovation aspects](#).

²³¹ EU Waste Framework legislation: <https://ec.europa.eu/environment/waste/legislation/>

society, economy and nature. In addition, a **local and regional focus**²³² is crucial for a circular economy and bioeconomy that is sustainable, regenerative, inclusive and just. Innovative urban and regional solutions and value chains can create more and better quality jobs and help our economies rebound from the COVID-19 crisis.

A systemic and science-based circular transition with the help of research, innovation and investments will address all issues from material selection and product design via resource efficiency along the value chain to an optimised after-use system, incorporating reuse, repair and upgrade, refurbishment, remanufacturing, collection, sorting and new forms of recycling and upcycling also to improve the waste cycle management. It will tackle all barriers and mobilise all key stakeholders. The development of definitions, taxonomies, indicators and targets will inform and support policy and decision making. The use of advanced life cycle methods such as the European Commission Product Environmental Footprint (PEF), data and information will enable economic actors, including consumers, to make sustainable choices. The development and deployment of specific technological and non-technological circular solutions, including new business models, will cover intra- and inter-value chain collaboration between economic actors. The development of a working after-use system for plastic-based products, incorporating reuse, collection, sorting, and recycling technologies will provide insights into the transition towards a circular economy for key material flows including plastics. The Circular Cities and Regions Initiative (CCRI)²³³ under the European Circular Economy Action Plan will expand the circular economy concept beyond traditional resource recovery in waste and water sectors and support the implementation, demonstration and replication of systemic circular solutions for the transition towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale. Water use will be tackled from a circularity perspective, aiming at pollution prevention, resource efficiency and business opportunities.

Bio-based innovation lays the foundations for the transition away from a fossil-based carbon-intensive economy by encompassing the sustainable sourcing, industrial²³⁴²³⁵ and small scale processing and conversion of biomass from land and sea into circular bio-based materials and products with reduced carbon and environmental footprint including lower impacts on biodiversity and long-term circular carbon sinks in sustainable products substituting carbon-intensive ones, with improved end-of-life including biodegradability in

²³² In synergy with Horizon Europe Cluster 4, with focus on the industrial dimensions; and Cluster 5, covering cross-sectoral solutions for decarbonisation (including on community level), whereas Cluster 6 targets systemic regional and local (i.e. territorial) circular and bioeconomy approach.

²³³ <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

²³⁴ In synergy with Horizon Europe Clusters 4, 5 (including their European Partnerships), whereas Cluster 4 targets industrial dimension (including digitisation and circular and climate neutral / low carbon industry, including developing bio-integrated manufacturing), and Cluster 5 covers cost-efficient, net zero-greenhouse gas energy system centred on renewables (including R&D necessary to reduce CO₂ emissions from the power and energy-intensive industry sector, solutions for capturing, utilisation and storage of CO₂ (CCUS), and bioenergy and other industrial sectors), while Cluster 6 covers the research and innovation based on sustainable biological resources (bioeconomy sectors), in particular for new sustainable feedstock development and through the development of integrated bio-refineries).

²³⁵ In synergy with the European Partnership on Circular Bio-based Europe (CBE), under Horizon Europe Cluster 6.

specific natural as well as controlled environments. It also capitalises on the potential of living resources, life sciences and industrial biotechnology for new discoveries, products, services and processes, both terrestrial and marine. Bio-based innovation can bring new and competitive economic activities and employment to regions and cities in the recovery from the COVID-19 crisis, revitalising urban, rural and coastal economies and strengthening the long-term circularity of the bioeconomy, including through small non-food bio-based solutions. Furthermore, targeted and well-tailored investments can increase and diversify the income of primary producers and other rural actors (e.g. SMEs).

To enable the bio-based innovation, environmental objectives and climate neutrality will build on a robust understanding of environmental impacts and trade-offs of bio-based systems at the European and regional scale, including the comparisons to similar aspects on the fossil and carbon-intensive counterparts. Systemic impacts of bio-based systems on biodiversity and its wide range of ecosystem services as well as how we restore and use them, need to be assessed, and negative impacts avoided in line with the “do no harm” principle of the European Green Deal. Implementing sustainable and just bio-based value chain requires symbiosis across primary production and industrial ecosystems in regions, Member States and Associated Countries and improved environmental performance of products, processes, materials and services along value chains and life cycles.

The **multifunctional and sustainable management of European forests** as well as the environmentally sustainable use of wood and woody biomass as a raw material have a crucial role to play in the achievement of the EU’s climate and energy policies, the transition to a circular and sustainable bioeconomy as well as the preservation of biodiversity and the provision of ecosystem services such as climate regulation, recreation, clean air, water resources and erosion control among many others. Furthermore, forestry and the forest-based sector offer important opportunities for wealth and job creation in rural, peripheral and urban areas. The condition of European forests is increasingly threatened by a growing number of social, economic and environmental and climatic pressures. The European Green Deal and the EU Biodiversity Strategy for 2030 recognise that the EU’s forested area needs to improve, both in quality and quantity, for the EU to reach climate neutrality and a healthy environment. The multifunctionality and the sustainable forest management under rapid climate change will be enabled through a variety of approaches, including the use of intelligent digital solutions, enhanced cooperation in forestry and the forest-based sector as well as the establishment of an open-innovation ecosystem with relevant stakeholders.

Aquatic biological resources and blue biotechnology are crucial to delivering on the Green Deal’s ambition of a ‘blue economy’, which alleviates the multiple demands on the EU's and the Associated Countries’ land resources and tackles climate change.

The immense marine and freshwater biodiversity both faces and offers solutions to multiple challenges such as climate, biodiversity loss, pollution, food security, green products, and health but remains largely unexplored. Unprecedented advances in the biotechnology toolbox (e.g. -omics, bioinformatics, synthetic biology) have triggered an increased interest in the potential of aquatic bioresources. Further research and innovation will be key to unlocking the

value of the marine and freshwater biological resources available in Europe, including its outermost regions by learning from the functioning and processes of aquatic living organisms to provide a sustainable products and services to the society, whilst avoiding systemic impacts on biodiversity. Algae biomass is becoming increasingly important not only as food but also as a sustainable source of blue bioeconomy products such as pharmaceuticals, cosmetics, and speciality chemicals. Although only a small fraction of marine microbial diversity has been characterised to date, advances in genetic and sequencing technologies are opening new avenues for the understanding and harnessing marine microbiomes such as for the biodiscovery of new products and services for the environment and society.

Expected impacts

Proposals for topics under this Destination should set out a credible pathway to developing circular economy and bioeconomy sectors, achieving sustainable and circular management and use of natural resources, as well as prevention and removal of pollution, unlocking the full potential and benefits of the circular economy and the bioeconomy, ensuring competitiveness and guaranteeing healthy soil, air, fresh and marine water for all, through better understanding of planetary boundaries and wide deployment and market uptake of innovative technologies and other solutions, notably in primary production (forestry) and bio-based systems.

Specifically, the topics will target one or several of the following impacts, for circular economy, bio-based sectors, forestry and aquatic value chains:

- **Regional, rural, local/urban and consumer-based transitions** towards a sustainable, regenerative, inclusive and just circular economy and bioeconomy across all regions of Europe based on **enhanced knowledge and understanding of science**, in particular regarding biotechnology-based value chains, for all actors, including policy makers, to design, implement and monitor policies and instruments for a circular and bio-based transitions.
- **European industrial sustainability, competitiveness and resource independence** by lowering the use of primary non-renewable raw materials and reducing greenhouse gas emissions and other negative environmental footprint (including on biodiversity), enabling climate-neutrality and higher resource efficiency (e.g. by circular design, improved waste management, cascading use of biomass) along and across value chains, developing innovative and sustainable value-chains in the bio-based sectors, substituting fossil-based ones, increasing circular practices in textiles, plastics, electronics and construction, developing recycling technologies and industrial symbiosis, increasing circular bio-based systems from sustainably sourced biological resources replacing carbon-intensive and fossil-based systems, with inclusive engagement of all stakeholders;
- **Improved consumer and citizen benefits**, including in the rural settings by establishing circular and bio-based systems based on sustainability, inclusiveness, health and safety;

reaching a significantly higher level of involvement of all actors (manufacturers, retailers, consumers, public administration, primary biomass producers etc.);

- **Multi-functionality and management of forests** in Europe based on the three pillars of sustainability (economic, environmental and social);
- **Enlarged potential of marine and freshwater biological resources and blue biotechnology** to deliver greener (climate-neutral circular) industrial products and processes, and to help characterise, monitor and sustain the health of aquatic ecosystems for a healthy planet and people.

In addition to the impacts listed above, topics under this destination will address the following impact areas of the Horizon Europe Strategic Plan for 2021-2024: “Climate change mitigation and adaptation”, “Enhancing ecosystems and biodiversity on land and in waters”, “A resilient EU prepared for emerging threats”; “Inclusive growth and new job opportunities”; “Industrial leadership in key and emerging technologies that work for people”.

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2021	2022	
HORIZON-CL6-2021-CircBio-01	93.00		01 Sep 2021
HORIZON-CL6-2022-CircBio-01		66.00	15 Feb 2022
HORIZON-CL6-2022-CircBio-02-two-stage		71.00	15 Feb 2022 (First Stage) 01 Sep 2022 (Second Stage)
Overall indicative budget	93.00	137.00	

Call - Circular economy and bioeconomy sectors

HORIZON-CL6-2021-CircBio-01

Conditions for the Call

Indicative budget(s)²³⁶

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ²³⁷	Number of projects expected to be funded
		2021		
Opening: 15 Apr 2021 Deadline(s): 01 Sep 2021				
HORIZON-CL6-2021-CircBio-01-01	IA	20.00	5.00 to 10.00	3
HORIZON-CL6-2021-CircBio-01-02	CSA	10.00	Around 2.00	5
HORIZON-CL6-2021-CircBio-01-03	IA	8.00	6.00 to 8.00	1
HORIZON-CL6-2021-CircBio-01-04	IA	12.00	Around 6.00	2
HORIZON-CL6-2021-CircBio-01-05	IA	10.00	Around 6.00	1
HORIZON-CL6-2021-CircBio-01-06	IA	6.00	Around 6.00	1
HORIZON-CL6-2021-CircBio-01-07	CSA	9.00	Around 3.00	3
HORIZON-CL6-2021-CircBio-01-08	IA	18.00	Around 9.00	2
Overall indicative budget		93.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General
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²³⁶ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

²³⁷ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

	Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Enabling a circular economy transition

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-CircBio-01-01: Circular Cities and Regions Initiative (CCRI)'s circular systemic solutions

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 5.00 and 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 20.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: The successful proposals will support the delivery of solutions for the implementation of the European Green Deal, the Circular Economy Action Plan and the Bioeconomy Strategy. The topic will support transitions towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale across regions of Europe.

Proposals funded under this topic will form part of the demonstration projects for the implementation of the European Commission's Circular Cities and Regions Initiative

(CCRI).²³⁸ Proposals are expected to provide policy-makers, public and private investors and local communities with concrete and demonstrated examples of circular systemic solutions. In the context of this topic, a circular systemic solution is a demonstration project for the deployment of a circular and climate-neutral economy at urban and/or regional scale, involving key stakeholders and, ideally, address more than one economic sector.

Projects results are expected to contribute to some of the following expected outcomes:

- improved circularity and reduced GHG emissions in economic sectors, natural ecosystems, and efficient valorisation of local resources in cities, regions or their groupings;
- creation of business opportunities in the circular economy at urban and/or regional scale;
- increased circular and climate-neutral practices among citizens and their participation in circular systemic solutions;
- enhanced knowledge transfer between the cities, regions or their groupings involved in the proposals financed under this topic and other cities and regions across EU member states and associated countries;
- creation of jobs in the short to medium-term perspective;
- more effective widespread uptake and easier replication, scalability and visibility of circular systemic solutions and hence multiplication of their economic, social and environmental benefits to achieve the policy targets of the European Green Deal, Circular Economy Action Plan, EU Bioeconomy Strategy and the European Industrial Strategy at local, regional, national, European and international levels.

Scope: Proposals are expected to implement and demonstrate circular systemic solutions for the deployment of the circular economy (including the circular bioeconomy) in cities, regions or their groupings.

The circular systemic solutions implemented should address economic, social and environmental dimensions of the transition towards a circular economy and include science, technology and governance components. They should demonstrate circular governance models and support the active participation of all relevant actors in cities, regions or their groupings. Examples of relevant actors are: public administrations and utilities; private sector services and industries, including small and medium enterprises (SMEs); scientific and innovator communities including incubators and accelerators; financial intermediaries with a focus on environmental and social impact; venture capitalists and business angels; civil society, including citizens; and non-governmental organisations and philanthropy.

Circular systemic solutions implemented may consider to apply the circular economy principle not only to waste and water management, but also to other sectors including, for example, one or more of the new Circular Economy Action Plan key product value chains,

²³⁸ <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

i.e.: batteries and vehicles, electronics and ICT, packaging, plastics, textiles, construction and buildings, food, water and nutrients.²³⁹ The circular systemic solutions might also include nature-based solutions. The circular systemic solutions and the economic sectors involved in them should be selected and based on a detailed analysis of the cities, regions or their groupings' socio-economic and environmental needs to be addressed, circular potential to be exploited and challenges to be tackled.

Circular systemic solutions should identify, analyse and, when feasible, quantify the economic, social and environmental benefits and trade-offs/challenges related to its implementation and demonstration. They should include the monitoring and evaluation of the transition towards a circular economy, identify its strengths and weaknesses as well as their causes. They should analyse the experimented regulatory obstacles and drivers and provide clear and precise policy recommendations to improve circular economy. Each circular systemic solution should address environmental externalities and contribute to preserve and, when possible, increase the well-being and the health conditions of the local communities involved in the transition towards a circular economy.

It is crucial that the circular systemic solutions implemented and their business models have a high replicability and scalability potential. This is fundamental to facilitate that circular systemic solutions demonstrated in specific areas will be replicated in others. During their implementation and by the end of their life cycle, proposals are expected to share with all stakeholders clear and comprehensive guidelines on the circular systemic solutions adopted, including their strengths and weaknesses experienced.

It is essential that proposals also ensure complementarity and cooperation with existing and future relevant European projects on the circular economy and the circular bioeconomy, with special reference to those on local and regional scale, and avoid overlapping and repetitions. In particular, cooperation and complementarity should be ensured with the projects under the European Green Deal Call's topic 'LC-GD-3-2-2020 - Demonstration of systemic solutions for the territorial deployment of the circular economy'.²⁴⁰

HORIZON-CL6-2021-CircBio-01-02: Circular Cities and Regions Initiative's Project Development Assistance (CCRI-PDA)

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting

²³⁹ <https://ec.europa.eu/environment/circular-economy/>

²⁴⁰ <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/lc-gd-3-2-2020;freeTextSearchKeyword=green%20deal;typeCodes=1;statusCodes=31094501,31094502,31094503;programCode=H2020;programDivisionCode=null;focusAreaCode=31087050;crossCuttingPriorityCode=null;callCode=H2020-LC-GD-2020;sortQuery=submissionStatus;orderBy=asc;onlyTenders=false;topicListKey=topicSearchTablePageState>

<i>project</i>	different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The successful proposal will support the delivery of services and solutions for the implementation of the European Green Deal, the Circular Economy Action Plan, the Bioeconomy Strategy. The topic will support transitions towards a sustainable, regenerative, inclusive and just circular economy across regions of Europe at local and regional scale.

The Circular Cities and Regions Initiative's Project Development Assistance (CCRI-PDA) will form part of the instruments for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI).²⁴¹ It will be implemented in close coordination and cooperation with the CCRI.

Investors and lenders need to gain more confidence on investment projects related to circular economy which are still seen as risky. European added value can be realised, for example, where projects introduce innovation to the market regarding financing solutions minimising transaction costs and engaging the private finance community. European added value could also be realised where projects demonstrably address legal, administrative and other market opportunities and challenges for innovative and sustainable circular economy investment schemes.

Projects results are expected to contribute to some of the following expected outcomes:

- Delivery of innovative financing schemes that are operational and ready to finance circular economy investments at local and regional scale;
- Delivery of a series of sustainable circular economy projects and innovative financing solutions/schemes at local and regional scale across Europe;
- Demonstration of innovative and replicable investment financing solutions, documenting feedback/uptake from potential replicators.

Scope: The CCRI-PDA services will be provided to public and private project promoters such as local and regional authorities or their groupings, public/private infrastructure operators and bodies, utilities and services, industry (including SMEs). The action will support building technical, economic and legal expertise needed for project development and leading to the launch of concrete investments.

The purpose of the CCRI-PDA is to help project promoters develop their projects and to bring together the technical, economic and legal expertise needed for the development of circular

²⁴¹ The CCRI is part of the European Circular Economy Action Plan (CEAP) and aims to support circular solutions for the transitions towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

economy investment projects at local and regional scale resulting in the actual launch of investments during the action. Ultimately, PDA projects should demonstrate the financial viability and sustainability of circular economy investment projects at local and regional scale and provide tangible showcases that should trigger further market replication.

The CCRI-PDA will pay for those activities necessary to prepare and mobilise finance for investment programmes, such as feasibility studies, stakeholder and community mobilisation, business plans and preparation for tendering procedures or setting up a specific financing scheme/financial engineering.

Proposals should address the development or replication and implementation of innovative financing schemes for circular economy investments at local and regional scale.

CCRI-PDA services should support public and private project promoters to launch investments for activities aimed at increasing circularity in economic sectors that are relevant for the transition towards a sustainable circular economy at local and/or regional scale. The economic sectors involved in each CCRI-PDA service should be selected according to local and/or regional circular economy needs, resources and potential. This selection must be clearly justified and explained.

Proposals should clearly focus their activities on the launch of significant circular economy investment programmes at local and regional scale. Ideally, the proposed investments should be launched before the end of the action, which means that projects should result in signed contracts for circular economy investments at local and regional scale to that effect.

In addition, proposals should include some of the following features:

- Clearly focus their activities on the launch of significant circular economy investment programmes at local and regional scale;
- An exemplary/showcase dimension in their ambition to increase circularity in specific sector(s) at local and regional scale and/or in the size of the expected investments and leverage factors²⁴²;
- Deliver organisational innovation in the mobilisation of the investment programme (e.g. bundling, pooling or stakeholder engagement);

Moreover, all proposals should demonstrate a high degree of replicability and include a clear action plan to communicate experiences and results towards potential replicators across EU member states and associated countries.

Indicatively, the CCRI-PDA focuses on small and medium-sized circular economy investments of up to 20 million.²⁴³

The EU contribution per proposal should not exceed 10% of the respective investment.

²⁴² i.e. amount of investments in the circular economy triggered per each EUR of Horizon Europe support.

²⁴³ The Circular Economy Technical Assistance Facility (CETAF) will focus on projects and programmes with a minimum total investment volume of EUR 20 million.

Proposals shall justify the budget for the PDA provided to public and private project promoters based on the expected investment portfolio to be set up including the expected amount of investments to be triggered and the respective leverage factors to be achieved.

Proposals are expected to ensure synergies and complementarities with other EU financial schemes for circular economy projects. Examples and background information on already existing PDA facilities are available at the following link: <https://ec.europa.eu/easme/en/project-development-assistance-pda>

HORIZON-CL6-2021-CircBio-01-03: Innovative solutions to over-packaging and single-use plastics, and related microplastic pollution

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 6.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to all Destination 3 impacts related to consumers and industry, in particular to European industrial sustainability, competitiveness and resource independence by lowering the environmental footprint, enabling climate-neutrality and higher resource efficiency, through increased circularity and a resulting reduction in GHG emissions.

Project results are expected to contribute to at least three of the following outcomes:

- Increased deployment and market uptake of innovative solutions, through better design, alternative materials, business models promoting reuse, deposit systems, smart labelling, etc.
- Increased reuse, recyclability and upcycling of packaging and single-use plastics
- Significant reduction in over-packaging and single-use plastics in consumer goods and food packaging
- Significant reduction in packaging waste and single-use plastic waste
- Significant reduction in management costs for the respective waste streams

- Significant reduction in the release of microplastics from packaging and single-use plastics into the environment

Scope: The amount of materials used for packaging is growing continuously and in 2017 packaging waste in Europe reached a record – 173 kg per inhabitant, the highest level ever. In order to ensure that all packaging on the EU market is reusable or recyclable in an economically viable way by 2030, the essential requirements for packaging relate to reducing (over)packaging and packaging waste, designing for re-usable and recyclable packaging, including alternative reusable products or systems, and reducing the complexity of packaging materials.

Plastics continue to be one of the key areas in the 2020 Circular Economy Action Plan (CEAP). This is due to their circularity potential, but also due to concerns about their environmental footprint and the use of primarily fossil-based feedstock for their production. One of the main sources of pollution is the amount of single-use plastics and plastics packaging that is wasted daily and that overburdens our waste and water management systems. A particular issue regarding plastics is the pollution from microplastics and disintegrating material, which reaches the soils and oceans and whose possible health impacts on animals and humans still need to be assessed in depth. Some of these microplastics are added intentionally to products such as cosmetics, while other pollution comes from the disintegration and migration of various types of plastics during their use and waste phases.

In line with the EU Strategy for Plastics in a Circular Economy and the Single Use Plastics (SUP) Directive, and in line with the priorities on plastics and packaging in the CEAP, projects shall combine at least three of the following elements: a reduction of (over)packaging and packaging waste, design for reuse and recyclability of packaging, a reduction of material complexity including the number of materials used (including diverse polymers), the restriction of intentionally added microplastics, increasing the uptake of alternatives decreasing the dependency on fossil fuels and the related pollution, and measures to prevent the release of microplastics at all relevant stages of the product life cycle.

Projects should demonstrate at large scale and validate innovative solutions that are quantitatively relevant and replicable under diverse economic and social conditions, through better design, alternative materials (including biobased and biodegradable), business models promoting reuse, recycling, upcycling, deposit systems, smart labelling, sensor-based sorting, etc. to tackle over-packaging and single-use plastics in consumer goods and food packaging. Where the use of alternative materials is concerned, projects should address aspects to assure quality and safety of these new alternatives.

All solutions should be based on life-cycle approaches. Proposals shall integrate life cycle assessment using the European Commission's Product Environmental Footprint (PEF) method and relevant costing methods. Projects should choose a systemic approach to value chains and end-users, including consumers as key actors. All achieved outcomes should be demonstrated using quantitative indicators and targets wherever possible.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

Innovating sustainable bio-based systems and the bioeconomy

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-CircBio-01-04: Novel, non-plant biomass feedstocks for industrial applications

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will contribute to the Destination 3 impacts, and European policies it supports, in particular the European Green Deal, the Circular Economy Action Plan and the Bioeconomy Strategy, and as related to improving European industrial²⁴⁴ sustainability, competitiveness and resource independence by lowering environmental footprint (including on biodiversity), enabling climate-neutrality and higher resource efficiency (in particular upcycling and cascading use of biomass) along and across value chains, developing innovative bio-based products, with inclusive engagement of all stakeholders, as well as enhancing knowledge and understanding of science, in particular biotechnology-based value chains, for all actors.

Projects results are expected to contribute to all of the following expected outcomes::

- More effective prospecting and greater use of the biological diversity to generate verifiably more sustainable biomass feedstocks, including through improved harvesting, and processing, and commercially valuable climate-neutral circular bio-based, materials and products. This covers more robust verification of sustainability via life-cycle assessment approaches.
- Greater resource efficiency of production pathways, by applying upcycling and cascading use of biomass residues or side-streams (e.g. as growing substrates), leading to

²⁴⁴ In synergy with European Partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

lower land dependence for biomass²⁴⁵, and thus reducing any conflict with food/feed production.

- Higher capacity and engagement of SMEs, contributing to skilled job creation and economic benefits, with an improvement of industrial competitiveness due to expanded range of natural ingredients for the new applications in industrial sectors. Higher functional performance of the pursued value chains and products, and more sustainable industrial practices and resource independence of the EU and Associated Countries.
- Better public understanding across Europe, of biotechnology, and of the biodiversity conservation and enhancement objectives enshrined in the EU Biodiversity Strategy and respect to the principles of Access and Benefit Sharing (UN Biodiversity Convention), via clear, inclusive and transparent communication strategies.

Scope: The innovative bioeconomy sectors need to diversify and to deliver technological and industrial solutions based on available and sustainably accessible biomass. In particular, current plant-based biorefining may need upgrading to leave more land available for biodiversity protection and food production, while allowing the substitution of fossil-based resources with bio-based ones. The scope covers production of key bio-based products such as food and feed ingredients, including proteins, lipids and fibres, antioxidants and other substances with biological activities, as well as important bio-based materials (e.g. bio-based plastics, composites, fibres) or chemicals²⁴⁶, in a resource-efficient approach²⁴⁷. This calls for identifying and optimising such sources as microorganisms, insects, fungi or mixotrophic algae, which requires setting out their growing conditions in suitable systems such as biofermentors²⁴⁸, from where they need to be efficiently processed, extracted and converted into industrial outputs of interest. The scope covers addressing increased circularity, in particular for the use of biomass residues or side-streams used as feed material, as well as delivering the necessary upgrades to and upscaling of the strategies for the cultivation, production and extraction systems.

Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing research projects (especially under the Bio-based Industries Joint Undertaking or on microbiomes). Proposals will:

- a. Develop and demonstrate techno-economic viability of the bio-based production platforms applying the resource efficiency principles (ensuring savings on water, energy, chemical inputs, biomass waste, side-streams or residues), getting more out of less by using the complementarity of autotrophic plants and heterotrophs, and applying the modern biotechnological principles. This covers the development of a bio-based microbial production platform for high-value biologically active substances, food/feed

²⁴⁵ Lowering the negative environmental impacts of growing biomass without use of land (zero pesticides, reduced emissions and energy use)

²⁴⁶ Production of bioethanol and other biofuels falls outside the scope of this topic

²⁴⁷ e.g. by fully exploiting the cascading use of biomass resulting from agricultural production as growing substrates

²⁴⁸ With synergy with topic HORIZON-CL6-2021-CircBio-01-05 “Contained biomass solutions for sustainable and zero-ILUC production systems for high value applications”

ingredients, or bio-based materials as well as efficient approaches of separation and extraction of products of interest.

- b. Identify and implement the best combination of appropriate technical solutions and practices for specific industrial value chains (justifying the choice, including on innovativeness and business viability), as well as the barriers and drivers derived from e.g. governance and market aspects, while seeking engagement and understanding of all actors.
- c. Develop and transparently communicate the key parameters to monitor and measure the qualitative and quantitative impacts of these solutions and practices for different sourcing, optimization and production systems, the potential of replacing available traditional alternatives, if relevant, and trade-offs, including on biodiversity, and the associated improvement in socio-economic resilience of businesses, for the creation of jobs and industrial competitiveness.
- d. Develop and test mechanisms involving all actors and specifically including bio-based industries in knowledge co-creation, exchange, feedback and communication to demonstrate and accompany all actors (e.g. agricultural operators, farmers, SMEs and civil society) in implementing and understanding of solutions for new or improved bio-based products and processes and for addressing other environmental impacts e.g. lowered pressure on land and on biodiversity sourcing.
- e. Consider to contribute data and results to the European Commission’s Knowledge Centre for Bioeconomy hosted by JRC

HORIZON-CL6-2021-CircBio-01-05: Contained biomass solutions for sustainable and zero-Indirect Land Use Change (ILUC) production systems for high value applications

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will contribute to the Destination 3 impacts, and the European policies it supports, in particular the European Green Deal, the Circular Economy

Action Plan and the Bioeconomy Strategy, and as related to improving European industrial²⁴⁹ sustainability, competitiveness and resource independence, developing innovative bio-based products, with inclusive engagement of all stakeholders, enhancing knowledge and understanding of science, in particular biotechnology-based value chains, for all actors, as well as improving consumer and citizen benefits.

Projects results are expected to contribute to all of the following expected outcomes:

- Lower production costs, improved safety and access to final efficient, specific, high-yield and high-value, climate-neutral circular applications²⁵⁰
- Lower dependence on land-based production systems, minimising the risk of Indirect Land Use Change (ILUC)²⁵¹, with specific technical solutions and strategies for innovative, high-output, multi-source high-value contained applications, based on a variety of biological organisms²⁵² and their cultivation systems and technologies involved.
- Methodologically robust verification of sustainability of the production system via life-cycle assessment approaches. This covers the greater resource efficiency of production pathways, by applying the upcycling and cascading use of biomass residues or side-streams.
- More mature and advanced biotechnology solutions for the innovative culture, screening and processing of the selected organisms, as well as the related digital applications, thus contributing to European industrial competitiveness.
- Higher engagement of SMEs, for creating skilled jobs and bringing other socio-economic benefits for end users and/or patients, through expanding the range of natural ingredients for new applications in industrial sectors, enhancing the functional performance of the investigated value chains and products, and contributing to more sustainable industrial practices and resource independence of the EU and Associated Countries.
- Increased and more informed public understanding across Europe of biotechnology, and of biodiversity preservation and enhancement objectives enshrined in the EU Biodiversity Strategy and respect to the principles for Access and Benefit Sharing (UN Biodiversity Convention), via clear, inclusive and transparent communication strategies.

International cooperation is encouraged, to allow exchange of best practice, while ensuring win-win scenarios and contributing to the European competitiveness.

²⁴⁹ In synergy with European Partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).
²⁵⁰ e.g. production of engineered proteins such as reagents, diagnostics, innovative (e.g. scalable plant-based) vaccines or metabolites for specific industrial products (pharmaceuticals, veterinary products, biological reagents)

²⁵¹ As defined by the [recast Renewable Energy Directive](#) (EU) 2018/2001 from December 2018

²⁵² Such as algae, fungi, plant cells, invertebrates, microorganisms, including complex multi-species communities. See a complementary topic HORIZON-CL6-2021-CircBio-01-04: Novel non-plant feedstocks for industrial applications

Scope: The innovative bioeconomy sectors need to diversify and to deliver technological and industrial solutions based on available and sustainably sourced biomass. In particular, this covers sustainable application in various industrial systems for high value products and uses, such as pharmaceutical, diagnostic and veterinary sectors²⁵³, especially in the context of biorefining and other (industrial) high-value uses²⁵⁴.

This calls for identifying, optimising, screening and monitoring of the growing conditions in suitable systems such as bioreactors²⁵⁵, from where they need to be efficiently processed, extracted and converted into industrial outputs of interest. The scope covers innovative multi-scale bioreactor designs, as well as by related innovations such as hydroponics systems and phenotyping platforms for increased sustainability of biomass production, and its efficient, pathogen-free processing and use.

Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing research projects (under Horizon 2020 and other EU-funded initiatives). Proposals will:

- a. Develop bio-based production platforms applying resource-efficient principles (ensuring savings on water, energy, chemical inputs, biomass side-streams or residues), including the study of mixed multi-species communities, and applying modern biotechnological principles, as well as efficient approaches of separation and extraction of products of interest.
- b. Identify and implement the best combination of appropriate technical solutions and practices for specific industrial value chains (justifying the choice, including on business viability), as well as the barriers and drivers derived from governance and market aspects, while seeking engagement and understanding of all actors. Participation of industry and SMEs is considered essential.
- c. Develop and transparently communicate the key parameters to monitor and measure the qualitative and quantitative impacts of these solutions and practices for different optimization and production systems, the potential of replacing available traditional alternatives, if relevant, and trade-offs, including with respect to biodiversity, patient perspective, and the associated improvement of socio-economic resilience of the businesses for the creation of jobs and industrial competitiveness.
- d. Develop and test mechanisms involving all actors and specifically including research community and bio-based industries in knowledge co-creation, exchange, feedback and communication to demonstrate and accompany all actors (e.g. civil society including patient and other related groups) in implementing and understanding of solutions for improved bio-based products and processes and for addressing other environmental

²⁵³ e.g. antibodies, vaccines, proteins, peptides, bioactive metabolites, with synergy with Horizon Europe Cluster 1 Health and topic HORIZON-CL6-2021-CircBio-01-04: Novel non-plant feedstocks for industrial applications

²⁵⁴ e.g. cosmetics, food ingredients

²⁵⁵ The proposals should cover the issue of size of the chosen contained systems, to allow the issue of upscaling and replication.

impacts, and by developing specific recommendations for policy makers while seeking involvement of broader civil society.

- e. Consider to contribute data and results to the European Commission’s Knowledge Centre for Bioeconomy hosted by JRC.

HORIZON-CL6-2021-CircBio-01-06: Microbiomes for bio-based innovation and environmental applications

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal will contribute to the Destination 3 impacts, and the European policies it supports, in particular the European Green Deal, the Circular Economy Action Plan and the Bioeconomy Strategy, and as related to improving European industrial²⁵⁶ sustainability, competitiveness and resource independence, developing innovative bio-based products, with inclusive engagement of all stakeholders, enhancing knowledge and understanding of science, in particular biotechnology-based value chains, for all actors, as well as improving consumer and citizen benefits.

Projects results are expected to contribute to all of the following outcomes:

- Deeper understanding of the structural composition of microbiomes, their structure, functions, mechanisms, and potentials, as related to the bio-based innovation (i.e. bio-based materials, biochemicals, products and services, including the environmental applications), as well as improved methods of their isolation and cultivation, leading to innovative solutions to engineer and control microbiomes to guarantee safety and efficacy for specific applications.
- Improved interdisciplinary cooperation for R&D&I between academia and industrial sectors (e.g. industrial biotechnology, food, pharma and ICT/data industries) and higher engagement of industry and SMEs.
- More systematic adoption of recent advances in molecular biology and biotechnology to increase industrial uptake of R&D&I on microbiota and especially on their complex

²⁵⁶ In synergy with European Partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

communities via biotechnology approaches, leading to more cost- and resource-efficient production of high-value complex molecules, lowering pressure on natural resources, or increasing their use in environmental applications.

- Greater and more inclusive understanding, awareness and trust in innovations, via societal dialogue and transparent communications with all stakeholders (academia, industry, including SMEs, NGOs, regulatory institutions, international partners etc.).

Scope: Microbiomes is the term given to the collective genomes of mixed nature-based microorganism populations. In recent years, scientific-technological progress in genome sequencing and other -omics technologies as well as in the bioinformatic analysis and interpretation of the data has opened up the opportunity to better understand the composition of (often difficult to cultivate with existing approaches) microbial communities, the functions and interaction of their members, and their interaction with their environment (e.g. soil) or hosts (humans, animals, plants).

The scope covers the development of the methods for molecular cartography, quantitative determination of genus and metabolites as well as establishment of R&D resources (e.g. inventories, catalogues, “reference microbiomes”, databases etc.). Marine microbiomes are excluded from the scope, to avoid overlaps with the parallel topic²⁵⁷.

The international cooperation is encouraged as a win-win scenario, while contributing to the European competitiveness and resilience.

Proposals will:

- a. Develop and apply a toolbox of technologies to identify, characterise and sustainably exploit (including isolation and cultivation aspects) the microbiomes and their genetic and metabolic diversity relevant for the bio-based sectors, e.g. to enable industrial manufacturing of high-value bio-based substances or materials (excluding biofuels), at sufficiently large scale, or for the environmental protection applications (e.g. decomposition of persistent and hazardous contaminants or industrial, municipal waste and residues).
- b. Identify and characterise the key aspects of the environmental and safety aspects, and potential impacts, while adhering to the binding EU and international regulatory framework.
- c. Outline the necessary scale-up production processes for novel bio-based innovations in order to reach a critical mass for a given application, to achieve economies of scale, address different market segments and potential applications, etc. This covers addressing process and product safety, including occupational and consumer safety aspects, and taking into account best international practice and initiatives.

²⁵⁷ HORIZON-CL6-2022-CircBio-01-07: Marine microbiome for healthy oceans and a sustainable blue bioeconomy

- d. Ensure transparent and inclusive engagement of all actors, including industry and SMEs, scientific community, regulatory institutions, and broader civil society, including NGOs, to ensure necessary impact and awareness.
- e. Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing research projects, including on Food Systems, Health and industrial value chains, as related to microbiomes.

HORIZON-CL6-2021-CircBio-01-07: Mainstreaming inclusive small-scale bio-based solutions in European rural areas

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 9.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In line with the European Green Deal objectives and the EU Bioeconomy Strategy, successful proposals will support innovators to scale-up inclusive and small-scale biobased solutions in rural areas contributing to regional, urban and consumer-based transitions towards a sustainable, regenerative, inclusive and just circular economy and bioeconomy across all regions of Europe at local and regional scale.

Project results are expected to contribute to all of the following expected outcomes:

- Enhanced cooperation of key players and knowledge holders resulting in sustainable business model pathways for bio-based innovations in rural areas.
- Provision of tailored and independent support to innovators in order to accelerate the development of marketable products and services and to improve the market penetration of bio-based solutions in Europe.
- Successful deployment of existing scientific and practical knowledge and increased number of implemented bio-based solutions in rural areas in line with relevant policy initiatives (e.g. Bioeconomy Strategy, European Green Deal, Common Agricultural Policy, Long-Term Vision for Rural Areas, etc.).

Scope: Europe's future economic growth and jobs will increasingly have to come from innovation in products, services and business models. This is why considerable investments in research and innovation are currently taking place. However, barriers to adoption and implementation of research results exist and cooperation between research, advisory services, farmers, foresters and other actors in the supply chain is not sufficiently facilitated. Regional

platforms for innovation support services are needed to assist European regions in developing their bio-based economies and to increase the awareness and knowledge about emerging opportunities as well as the environmental and socio-economic impacts relating to the valorisation of locally or regionally available biomass.

Proposals will:

- Establish regional platforms providing innovation support services to multi-actor partnerships (e.g. farmers, foresters, clusters, business support organisations, civil society organisations including non-governmental organisations, etc.) and increase awareness, education and understanding of the bioeconomy, its potential and impacts among regional actors and further, build capacity among regional stakeholders to identify innovative bio-based business models.
- Based on previous research results (e.g. BE-RURAL²⁵⁸, Power4Bio²⁵⁹, BioeastUp²⁶⁰, etc.), activities will provide support to match information on regionally available biomass, waste and residue streams with market information and technologies for full utilisation and sustainable production of bio-based products.
- Contribute to transferring knowledge and sharing best practice examples for better nutrient recycling in the circular bioeconomy, by identifying synergies between different agricultural/forestry and industrial value chains, raising awareness and sharing best practice examples of residue uses as soil improvers and fertilizer in the bio-based economy.
- Consider to contribute data and results to the European Commission's Knowledge Centre for Bioeconomy hosted by JRC.

Proposals shall apply the concept of the 'multi-actor approach'²⁶¹, and ensure adequate involvement of the farming sector and other actors in rural areas.

Clustering and cooperation with other selected projects under this topic and other relevant topics (e.g. HORIZON-CL6-2021-COMMUNITIES-01-02: Expertise and training centre on rural innovation) is strongly encouraged.

Social innovation²⁶² is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

²⁵⁸ <https://cordis.europa.eu/project/id/818478>

²⁵⁹ <https://cordis.europa.eu/project/id/818351>

²⁶⁰ <https://cordis.europa.eu/project/id/862699>

²⁶¹ See definition of the multi-actor approach in the introduction to this Work Programme part.

²⁶² As defined by the European Commission: *innovations that are social in both their ends and their means. Specifically, [...] social innovations [are] new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act.*" according to the European Commission Bureau of European Policy Advisors ([BEPA, 2011, p. 9](#); see also [Regulation \(EU\) No 1296/2013 on a European Union Programme for Employment and Social Innovation \("EaSI"\)](#)).

Innovating for blue bioeconomy and biotechnology value chains

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-CircBio-01-08: Unlocking the potential of algae potential for a thriving European blue bioeconomy²⁶³

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 18.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives, EU Bioeconomy Strategy and Blue Growth Strategy, the successful proposal will support the development of algae-based greener aquatic industrial products/processes and/or environmental services sustaining the health of aquatic ecosystems for a healthy planet and people.

- Leveraging of the potential of algae as an industrial feedstock by upscaling and demonstration of the techno-economic viability of algae cultivation and biotransformation concepts with positive environmental, social and economic impacts. Implementation of the European Green Deal’s sustainable blue economy and the EU Bioeconomy Strategy.
- Provision of market knowledge to align the development of new algae products to the uses and needs of various sectors.
- Strengthen the competitiveness of the European marine biotechnology industry by reducing technical bottlenecks and developing promising business models making the whole algae sector more attractive to investment.
- Provision of scientific evidence on environmental benefits - including possibly ecosystem services - and risks of algae-based cultivation including when applicable a comparison of the environmental footprint of algae-based products with their land based counterparts. Assessment of possible ecosystems services of algae cultivation.

Scope: The farm production of micro- and macro-algae is one of the most promising emerging ocean sectors. Algae can be developed and processed into an almost endless number

²⁶³ Cyanobacteria are in scope of this topic.

of products, thus enabling a shift to aquatic biomass production reducing the pressure on plant biomass derived from agriculture and forestry. Total algae production in the EU experienced an increase of 76% between 2006 and 2016.

EU policy is set to unlock the versatility and potential of algae. The European Green Deal and the Farm to Fork Strategy foster the role of algae in the protein transition and its contribution to a sustainable food system. Moreover, the 2018 EU Bioeconomy Strategy stresses the potential of algae as a source of innovative aquatic bio-based products such as pharmaceuticals, cosmetics and fine and speciality chemicals. The integrated processing of algae offers an interesting way to exploit, profitably and sustainably, most or all of the potential inherent in algae through recovering and separating the biomass components and by minimizing waste production.

Applicants should carry out activities along the following lines of research:

- Demonstrate viable concepts for the cost-effective cultivation and processing of algae into circular bio-based products and/or environmental services (e.g. medical, cosmetics, fine and speciality chemicals, remediation). The potential integration with food/feed production or with other processes (such as water treatment, crop and livestock farms and carbon sequestration) could be considered if they can add to the economic, environmental and social viability of the whole concept.
- Scale-up the production of algae products and bring them nearer to the market by addressing key challenges such as optimising strains' biology (including if relevant associated microbiomes) and the mechanisms regulating cell performance for rapid growth and high yields of novel valuable compounds; pest and disease control; engage on the standardisation of the product and production lines; post-harvest treatment and storage; assessment of risks of escape of propagules with the potential to affect local genetic biodiversity; secured the safety of the selected applications. Improve production systems both in terms of efficiency and capacity. Downstream processing and fractionation of components enabling the practical implementation of multiproduct algal biorefineries.
- Establish European strategic development plans for algae farming considering key factors such as the carrying capacity of the European seas and the availability and use of land/light/energy; market demand for algae products and of the market structure.
- Quantified assessment of environmental benefits and risks of algae farming and products, including vs. land-based products. Assessment of possible ecosystem services of algae farming.

Strong weight is placed on industrial leadership in the projects. Emphasis is to be placed on the delivery of tangible social and environmental benefits. Proposals should carry out an LCA of the proposed concept. The improvement of professional skills and competences of those working and being trained to work within the blue bioeconomy is expected;

Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing research projects funded under Horizon 2020, European Maritime and Fisheries Fund and other funding streams.

Cooperation with other selected proposals under this topic and complementary topics²⁶⁴ included in this work programme is encouraged.

Call - Circular economy and bioeconomy sectors

HORIZON-CL6-2022-CircBio-01

Conditions for the Call

Indicative budget(s)²⁶⁵

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ²⁶⁶	Number of projects expected to be funded
		2022		
Opening: 28 Oct 2021 Deadline(s): 15 Feb 2022				
HORIZON-CL6-2022-CircBio-01-01	CSA	10.00	Around 2.00	5
HORIZON-CL6-2022-CircBio-01-02	IA	14.00	Around 7.00	2
HORIZON-CL6-2022-CircBio-01-03	CSA	4.00	Around 2.00	2
HORIZON-CL6-2022-CircBio-01-04	IA	8.00	Around 8.00	1
HORIZON-CL6-2022-CircBio-01-05	RIA	8.00	Around 8.00	1
HORIZON-CL6-2022-CircBio-01-06	RIA	4.00	Around 4.00	1
HORIZON-CL6-2022-CircBio-01-07	RIA	18.00	Around 9.00	2

²⁶⁴ Other algae-relevant topics included in this WP are “HORIZON-CL6-CircBio-02-05-two-stage:: Photosynthesis revisited: climate emergency, “no pollution and zero-emission” challenge and industrial application” and “HORIZON-CL6-2022-FARM2FORK-02-05-two-stage: Innovative food from marine and freshwater ecosystems”

²⁶⁵ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

²⁶⁶ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Overall indicative budget		66.00		
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General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Enabling a circular economy transition

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-CircBio-01-01: Circular Cities and Regions Initiative's Project Development Assistance (CCRI-PDA)

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The successful proposal will support the delivery of services and solutions for the implementation of the European Green Deal, the Circular Economy Action Plan, the Bioeconomy Strategy. The topic will support transitions towards a sustainable,

regenerative, inclusive and just circular economy across regions of Europe at local and regional scale.

The Circular Cities and Regions Initiative's Project Development Assistance (CCRI-PDA) will form part of the instruments for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI).²⁶⁷ It will be implemented in close coordination and cooperation with the CCRI.

Investors and lenders need to gain more confidence on investment projects related to circular economy which are still seen as risky. European added value can be realised, for example, where projects introduce innovation to the market regarding financing solutions minimising transaction costs and engaging the private finance community. European added value could also be realised where projects demonstrably address legal, administrative and other market opportunities and challenges for innovative and sustainable circular economy investment schemes.

Projects results are expected to contribute to some of the following expected outcomes:

- Delivery of innovative financing schemes that are operational and ready to finance circular economy investments at local and regional scale;
- Delivery of a series of sustainable circular economy projects and innovative financing solutions/schemes at local and regional scale across Europe;
- Demonstration of innovative and replicable investment financing solutions, documenting feedback/uptake from potential replicators.

Scope: The CCRI-PDA services will be provided to public and private project promoters such as local and regional authorities or their groupings, public/private infrastructure operators and bodies, utilities and services, industry (including SMEs). The action will support building technical, economic and legal expertise needed for project development and leading to the launch of concrete investments.

The purpose of the CCRI-PDA is to help project promoters develop their projects and to bring together the technical, economic and legal expertise needed for the development of circular economy investment projects at local and regional scale resulting in the actual launch of investments during the action. Ultimately, PDA projects should demonstrate the financial viability and sustainability of circular economy investment projects at local and regional scale and provide tangible showcases that should trigger further market replication.

The CCRI-PDA will pay for those activities necessary to prepare and mobilise finance for investment programmes, such as feasibility studies, stakeholder and community mobilisation, business plans and preparation for tendering procedures or setting up a specific financing scheme/financial engineering.

²⁶⁷ The CCRI is part of the European Circular Economy Action Plan (CEAP) and aims to support circular solutions for the transitions towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

Proposals should address the development or replication and implementation of innovative financing schemes for circular economy investments at local and regional scale.

CCRI-PDA services should support public and private project promoters to launch investments for activities aimed at increasing circularity in economic sectors that are relevant for the transition towards a sustainable circular economy at local and/or regional scale. The economic sectors involved in each CCRI-PDA service should be selected according to local and/or regional circular economy needs, resources and potential. This selection must be clearly justified and explained.

Proposals should clearly focus their activities on the launch of significant circular economy investment programmes at local and regional scale. Ideally, the proposed investments should be launched before the end of the action which means that projects should result in signed contracts for circular economy investments at local and regional scale to that effect.

In addition, proposals should include some of the following features :

- Clearly focus their activities on the launch of significant circular economy investment programmes at local and regional scale ;
- An exemplary/showcase dimension in their ambition to increase circularity in specific sector(s) at local and regional scale and/or in the size of the expected investments and leverage factors²⁶⁸;
- deliver organisational innovation in the mobilisation of the investment programme (e.g. bundling, pooling or stakeholder engagement).

Moreover, all proposals should demonstrate a high degree of replicability and include a clear action plan to communicate experiences and results towards potential replicators across EU member states and associated countries.

Indicatively, the CCRI-PDA focuses on small and medium-sized circular economy investments of up to 20 million.²⁶⁹

The EU contribution per proposal should not exceed 10% of the respective investment.

Proposals shall justify the budget for the PDA provided to public and private project promoters based on the expected investment portfolio to be set up including the expected amount of investments to be triggered and the respective leverage factors to be achieved.

Proposals are expected to ensure synergies and complementarities with other EU financial schemes for circular economy projects. Examples and background information on already existing PDA facilities are available at the following link: <https://ec.europa.eu/easme/en/project-development-assistance-pda>

²⁶⁸ i.e. amount of investments in the circular economy triggered per each EUR of Horizon Europe support.

²⁶⁹ The Circular Economy Technical Assistance Facility (CETAF) will focus on projects and programmes with a minimum total investment volume of EUR 20 million.

Innovating sustainable bio-based systems and the bioeconomy

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-CircBio-01-02: Marginal lands and climate-resilient and biodiversity-friendly crops for sustainable industrial feedstocks and related value chains

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 14.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will contribute to the Destination 3 impacts, and European policies it supports, in particular the European Green Deal, the Circular Economy Action Plan and the Bioeconomy Strategy, and as related to improving European industrial²⁷⁰ sustainability, competitiveness and resource independence by lowering environmental footprint (including on biodiversity), enabling climate-neutrality and higher resource efficiency (in particular upcycling and cascading use of biomass) along value chains, developing innovative bio-based products, with inclusive engagement of all stakeholders.

Projects results are expected to contribute to all following expected outcomes:

- Identification of co-benefits and potential risks and upscaling of sustainable biomass production with a low potential for Indirect Land Use Change (ILUC) with focus on marginal lands²⁷¹, for the use of non-edible (industrial) biomass use (such as in biorefineries of various scale and types for climate-neutral circular materials and products); introducing new industrial cropping systems (such as perennial crops);
- Improved understanding of the actual available land in the EU and Associated Countries that has been and could be envisaged for biomass production that can be certified as ‘low ILUC’ for use in bio-based sectors; taking into account increasing resilience to environmental climate change effects such as soil erosion and water stress of the identified crops,

²⁷⁰ In synergy with European Partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

²⁷¹ Elbersen, et al. Definition and Classification of Marginal Lands Suitable for Industrial Crops in Europe (EU Deliverable), WUR: Wageningen, The Netherlands, 2018; p. 44

- Increased understanding of the biodiversity challenges and potentials, and the ecosystem services, with due attention to protection measures, coupled with end-user adoption and implementation of environmentally sound practices by all operators (farmers, researchers, and bio-based industry active in rural areas) including the replication of such practices across Europe;
- Enhanced functional performance of the specific value chains and products, coupled with improved resource efficiency, via improved application of the cascading use of biomass.

Scope: Achieving sustainable biomass provision by primary land sectors (agriculture and forestry) that fosters climate change mitigation and adaptation is a policy objective that implies finding a balance between productivity, ecosystem services notably biodiversity and social sustainability goals.

The topic explores two main aspects. First, enhancing ecosystem services to prepare for increased water stress and water scarcity due to climate change-related effects (including the increasing desertification of significant parts of the EU, especially of the Mediterranean and Central European Member States), and second, serving multi-purpose and optimized²⁷² biomass production, with a specific focus on improving biodiversity-related benefits, with opportunities for European rural development and enhanced industrial competitiveness.

The scope covers the identification and development of environmentally and economically viable sources of pollinator-supporting industrial crops (e.g. by exploring the traits supporting the pollinators such as nectar provision, or resistance to pests and diseases, as well as the optimization of a related agronomic practice). Furthermore, the scope covers identification and upscaling of suitable crops such as non-edible oil and fibre crops, dryland shrubs and woody crops, and their optimization, including by modern biotechnology tools, for low-water/low-input use in the related value chains with applications in industrial sectors such as biochemicals, composites or elastomers, and aiming at the replacement of their respective fossil-based counterparts.

The topic aims to engage all relevant actors, especially from the farming community, but also bio-based industry and academia, and civil society, calling for participatory approaches and co-creation, to co-develop solutions with the involvement of end users and taking into account a comprehensive business case at farm/production level.

Proposals will contribute to increase the resilience of farming systems to climate change and will boost the sustainability of biomass provision through the implementation of sound agronomic practices, with particular focus on high resource efficiency (including water, and nutrients e.g. via nature-based solutions, biodiversity-friendly solutions) and circular use of biomass and other natural resources.

²⁷² including by the modern biotechnology approaches, as appropriate

Proposals will develop Key Performance Indicators and Life Cycle Assessment (LCA) criteria for operators, or identify biodiversity hotspots along the value chains and test them against established benchmarks; as part of the overall recommendations.

Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing EU and Associated Country research projects (especially under the Bio-based Industries Joint Undertaking and the future Circular Bio-based Europe Partnership).

Proposals will:

- a. Identify and evaluate the most suitable feedstock options for different farming systems and pedo-climatic conditions representative of the diversity of EU and Associated Country' agriculture, that most efficiently contribute to climate change mitigation/adaptation (with a focus on water scarcity and water stress) and biodiversity preservation and enhancement (with special attention to marginal lands under high risk of desertification), while ensuring overall business case viability.
- b. Develop sustainable diversification strategies that can contribute to optimising the production of agricultural feedstock in the emerging bio-based economy (e.g. through intercropping systems, logistics and storage), identification and production of crops suited to marginal lands, optimisation of intermediary / catch crops to increase biomass production in a sustainable way or perennial crops and short-rotation coppice plantations in annual crops-dominated agricultural production systems;
- c. Identify and implement the best combination of appropriate technical solutions and practices for specific industrial value chains (a proposal should select and justify the choice), analysing the scale-dependent effects from farm to landscape level, as well as the barriers and drivers derived from governance and market aspects, while seeking engagement and understanding of all actors.
- d. Develop and transparently communicate the parameters to monitor and measure the qualitative and quantitative impacts of these solutions and practices for different farming systems, the climate neutrality/negativity potential and trade-offs, including for biodiversity, and the associated improvement in farm/business socio-economic resilience.
- e. Develop and test mechanisms involving all actors and specifically including the research community, the bio-based industry, in knowledge co-creation, exchange, feedback and implementation to demonstrate, communicate and accompany rural economy actors (farmers, foresters) and the broader civil society in implementing and understanding the solutions that contribute to mitigating and adapting to climate change and other environmental impacts such as water stress, or biodiversity loss, including through biotechnology approaches.
- f. Encourage engaging in international cooperation, for exchange of best practice, and looking for win-win scenarios, while contributing to European competitiveness.

HORIZON-CL6-2022-CircBio-01-03: Benefits of the transition towards sustainable circular bio-based systems from linear fossil-based

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Successful proposals will support policy makers at all levels to develop sustainable pathways deploying circular bio-based systems at the EU and regional scale replacing fossil and carbon-intensive systems, in line with the 2030 Climate Target Plan towards the transformation of EU's economy for a sustainable future envisaged in the European Green Deal. Projects outcomes will contribute to foster European industrial sustainability, competitiveness and resource independence.

Projects results are expected to contribute to the following expected outcome:

- Policies are designed encompassing priorities in the transition from linear fossil-based to circular bio-based systems.

Scope: Abandoning the current linear fossil-based economy is a prerequisite for all the objectives of the European Green Deal and, in general, for preserving the planet and the life on it. Biogenic resources represent important means to mitigate climate change by strengthening the natural and anthropogenic land carbon sinks. Circular bio-based systems are part of the solution, where they replace carbon-intensive and fossil-based systems with bio-based systems from sustainably sourced biological resources. Policies must ensure that the transition from linear fossil-based towards circular bio-based systems happens sustainably aiming at climate change mitigation and adaptation, increasing resource efficiency and circularity, preserving and restoring natural resources, their ecosystems services and biodiversity, and ensuring a just transition for all citizens. Such holistic policies should be designed coherently with the critical assessment of environmental/social/economic impacts of the current linear fossil-based economy in order to set priorities.

To support the design of policies aiming at the transition towards sustainable circular bio-based systems from linear fossil-based ones, proposals will:

- a. Consolidate the knowledge on current trends in environmental, economic, social limits of a linear carbon-intensive and fossil-based economy. Limits are meant in terms of barriers and/or incapacity of reaching local and global objectives on sustainable development, namely the SDGs, the targets on climate change mitigation and the objectives of the European Green Deal. Cultural limits should be included as well as

barriers and/or incapacity to design the transition towards the above-mentioned goals of humanity within policies based on the linear fossil-based paradigm;

- b. Develop new/improve existing methodologies for the assessment of environmental/social/economic impacts of linearity vs circularity in the economy in terms of, but not limited to, waste production and disposal, non-renewable resources exploitation and loss, geographically (and socially) unbalanced distribution of resources and growth, biodiversity loss at global and local scale. The methodology will consider indicators, methods and concepts of circular economy developed or under development in existing initiatives, including ongoing work within the European Commission and ESTAT, the Circular Economy Monitoring Framework, and R&I activities²⁷³;
- c. Assess the environmental/social/economic impacts of current linear fossil-based economy in EU. Assessment will include aspects related to geographical distribution of oil origins and global trade, direct and indirect environmental impacts of fossil-based value chains on a life cycle base, including on, but not limited to, climate change, resource use including land, water and marine space, air/water/soil quality, ecosystems services and biodiversity. Costs due to environmental and social impacts should be internalized in the economic impacts assessment;
- d. Develop and compare alternative scenarios of transition from fossil-based to circular bio-based, modelling the replacement of the fossil-based activities, focussing on the most carbon-intensive ones, with bio-based systems, including innovative solutions, at EU and global scale,. Environmental/social/economic impacts of bio-based systems will be assessed with validated methodology, considering also the benefits of applying circular approach to the bio-based systems. Biogenic Carbon Capture Utilization (BCCU) solutions²⁷⁴ for bio-based systems via nature-based solutions (e.g. in soils or long-term circular bio-based materials) will be part of the assessment. Scenarios will be estimated comparing the impacts of fossil-based with bio-based solutions. Social aspects and social innovation will be included in scenarios, especially at the socio-technical interfaces of innovative solutions. Multiple scenarios with different combinations of replacement of fossil-based activities and different application of circularity paradigm will result;
- e. Identify knowledge gaps in the assessment of the sustainability of the transition from fossil-based to circular bio-based and in the comparison of alternative scenarios as described under point d);
- f. Identify priorities in the transition from fossil-based to circular bio-based systems, according to scenarios developed in the project and develop guidelines and recommendations to policy.

²⁷³ For example, topic « HORIZON-CL6-CIR-2021-00-00 – Indicators and methods for measuring transition, its benefits and challenges and trade-offs”

²⁷⁴ In synergy with European Partnerships under Clusters 4, 5, and 6.

HORIZON-CL6-2022-CircBio-01-04: Maximizing economic, environmental and social synergies in the provision of feedstock for bio-based sectors through diversification and increased sustainability of agricultural production systems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives and the EU Bioeconomy Strategy, successful proposals will demonstrate the potential of diversification strategies in the primary production sector for the provision of feedstock in bio-based value chains contributing to regional, urban and consumer-based transitions towards a sustainable, regenerative, inclusive and just circular economy and bioeconomy across all regions of Europe at local and regional scale. Project results are expected to contribute to all of the following expected outcomes:

- Sustainable primary production systems to diversify income for farmers, while supporting the development of bioeconomies in rural areas within planetary boundaries.
- Targeted policies at EU/national and regional level promoting sustainable agricultural production systems in full respect of biodiversity protection and enhancement objectives.
- Improved knowledge of primary producers on co-benefits and potential risks through the introduction of new production systems.
- Better management of the actual available land in the EU and associated countries that has been and could be envisaged for biomass production that is certifiable as ‘low ILUC’ for the use in bio-based sectors²⁷⁵.

Scope: Securing long-term supply of affordable and sustainable biomass is a key challenge for the European bioeconomy. It is crucial to limit negative (indirect) changes in land use, which can lead to losses of biodiversity, carbon or other ecosystem services and to follow a pathway for a sustainable bioeconomy that operates within sustainable parameters. The diversity and diversification of farming systems can contribute to a sustainable European bioeconomy by

²⁷⁵ According to Directive (EU) 2018/2001

securing stable revenues for farmers, lowering environmental negative impacts and increasing resilience to climatic, economic and biological risks.

Proposals will:

- Explore alternative systems and designs improving the overall sustainability of local and regional agricultural production systems in a variety of landscapes, soil and climatic conditions, across the EU and associated countries;
- Consider the environmental, economic and social impacts of primary production systems and contribute to the characterisation of diversity and its relation to expected functions and benefits;
- Develop sustainable diversification strategies that can optimise the production of agricultural feedstock in the emerging bio-based economy, such as the co-production of food and non-food products (e.g. through intercropping systems), diversification and optimisation of crops cultivated in greenhouses for high value products, optimisation of intermediary/catch crops to increase the biomass production in a sustainable way and circular low-emission livestock or mixed farming systems.
- Optimise diversification strategies for different European agricultural production models/sectors with a view to minimise potential land conflicts and in line with agro-ecological practices.
- Consider to contribute data and results to the European Commission's Knowledge Centre for Bioeconomy hosted by JRC.

Proposals shall apply the concept of the 'multi-actor approach' and ensure adequate involvement of the farming sector and other actors in rural areas²⁷⁶.

Social innovation²⁷⁷ is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2022-CircBio-01-05: EU-China international cooperation on unlocking the potential of agricultural residues and wastes for circular and sustainable bio-based solutions

Specific conditions	
<i>Expected EU</i>	The EU estimates that an EU contribution of around EUR 8.00 million

²⁷⁶ See definition of the multi-actor approach in the introduction to this Work Programme part
²⁷⁷ As defined by the European Commission: *innovations that are social in both their ends and their means. Specifically, [...] social innovations [are] new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act.*" according to the European Commission Bureau of European Policy Advisors ([BEPA, 2011, p. 9](#); see also [Regulation \(EU\) No 1296/2013 on a European Union Programme for Employment and Social Innovation \("EaSI"\)](#)).

<i>contribution per project</i>	would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the European Green Deal objectives, EU Bioeconomy Strategy and Farm to Fork Strategy, successful proposals will explore opportunities for the valorisation of waste, by- and co-products contributing to regional, urban and consumer-based transitions towards a sustainable, regenerative, inclusive and just circular economy and bioeconomy across all regions of Europe at local and regional scale. Project results are expected to contribute to all of the following expected outcomes:

- Strengthened international cooperation with actors from China in the areas of agricultural residues and wastes for circular, biosecure and sustainable bio-based solutions
- Establishment of bio-based production systems that are optimised in view of sustainability, circular resource use and economic viability
- Increased resource efficiency through reduction of waste and better waste management practices in primary production systems.
- Increased opportunities for valorisation of waste, by- and co-products resulting in environmental and economic benefits for the farming sector (e.g. development of new products and processes).
- Improvement in overall environmental performance (soil health, water quality, low-carbon livestock, reduction of emissions, biodiversity etc.) of bio-based sectors.

Scope: Agriculture generates co-products, by-products and waste streams that are often not treated adequately in environmental and economic terms. In crop cultivation, losses can be observed at farm and post-harvest levels and downstream along the value chain. Co-products or by-products are generated, for instance in the wine, fruit and vegetable, olive oil, starch and sugar sectors, which offer potential for further valorisation of the resources. In livestock production, and in particular in large-scale production systems, appropriate management of manure and other waste sources from livestock production and transformation is a challenge. Therefore, this topic addresses opportunities for new processes and concepts enabling innovative uses of these materials while quantifying the impact of deviating biomass streams from their current flow (e.g. in terms of biodiversity impacts, soil fertility, etc.).

Proposals will:

- Evaluate existing techniques and develop new innovative approaches for efficient use of agricultural wastes, co-products and by-products, thereby contributing to the creation of sustainable value chains in the farming and processing sectors.
- Address, if applicable, innovative solutions for protein recovery and/or microbial protein production from agricultural wastes/by-products for food and feed applications to meet the demand for new protein-based products at local and global levels.
- Examine the safety and risks of circularised substance flows, particularly reutilisation of food waste and (animal) by-products, and prevention of the creation of pathogen/toxin enrichment cycles and introduction or reconnection of epidemiological pathways.
- Demonstrate environmentally-friendly and economically viable approaches in sector-specific case studies and test the possible take-up of proposed approaches and technologies in practice.
- Examine the synergies/conflicts and interdependencies amongst the different agri-waste feedstock and develop coherent indicators for the evaluation of their quantity, quality and sustainability attributes, as well as costs associated with their production, collection and processing.
- Consider environmental, economic and social safeguards, such as e.g. sustainable extraction rates of residues, with a view to maintaining low-emissions, soil health and fertility, as well as possible conflicts with alternative uses.
- Address, if applicable, the nutrient and energy recovery as well as the overall minimisation of environmental impacts in the context of good agricultural practices and possible sanitary implications.
- Improve data collection (e.g. data on residue quantities, residue management, feed requirement, etc.) at the farm-level, link them with relevant information systems (e.g. the Farm Accountancy Data Network (FADN)) and enhance the knowledge on availability, demand and market prices of agricultural waste and residue streams.

Proposals shall apply the concept of the 'multi-actor approach' and ensure adequate involvement of the farming sector²⁷⁸.

Actions will contribute to implementing the EU-China Food, Agriculture and Biotechnology (FAB) flagship initiative, which aims to ensure sustainability of agri-food systems, catering for the needs of a growing population, the reduction of food and agricultural losses and waste, and the provision of safe and healthy foodstuffs.

Due to the scope of this topic, international cooperation is strongly encouraged, in particular with China.²⁷⁹

²⁷⁸ See definition of the multi-actor approach in the introduction to this Work Programme part

Safeguarding the multiple functions of EU forests

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-CircBio-01-06: Strengthening the European forest-based research and innovation ecosystem

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: With a view to the new EU Forest Strategy, successful proposals will assess supporting research needs and funding possibilities in forestry and the forest-based sector contributing to the multifunctionality and management of forests in Europe based on the three pillars of sustainability (economic, environmental and social). Project results are expected to contribute to all of the following expected outcomes:

- Better insights into existing funding sources (including Horizon Europe, rural and regional development funds) and streamlining of research and innovation actions in Europe.
- Establishment of a co-creative environment allowing stakeholders to identify jointly existing research gaps and future priorities to coordinate research efforts at regional, national and European level.
- Intensified trans-national R&I cooperation in forestry and the forest-based sector on research priorities, critical and key technologies.
- Creation of an open-innovation ecosystem with relevant stakeholders in the EU and associated countries to support the evolution of the forest-based sector.

Scope: One of the main challenges for research and innovation in the coming years is to address the complexity of the forest-based sector in environmental terms (long life cycle, ecosystem functioning and diversity, spatial variability, interface between the soil and the atmosphere, in the middle between cultivated and natural assets), in the economic sphere (multiple forest owners and SMEs, competitiveness on global markets) and in the policy arena

²⁷⁹ TBC co-funding (ONLY IF AGREEED WITH CHINA) *China based participants in projects selected under this topic are invited to apply for co-funding from the ministry of Science and Technology - MOST.*

(many forest-related policies including biological diversity, climate and energy, bioeconomy, rural development, trade, agriculture, etc.).

A successful transition of the forest-based sector towards sustainability will need a holistic scientific assessment and better coordination of research activities in order to overcome fragmentation of public research efforts and to strengthen the link between forest managers, industries and society and to streamline the activities of European, national and regional stakeholders.

Proposals will:

- Analyse the forest-based sector in an integrated approach, considering different issues regarding biodiversity, bioeconomy, societal expectations and risks under climate change that call for intensification of European and international collaboration.
- Design a suitable method for conducting foresight on issues that are likely to have a future impact on forests in European regions and globally.
- Consider the future availabilities and demands for different forest resources, and assess their sustainability within the global context of changing economic, social and environmental conditions.
- Provide evidence and knowledge on how existing funding sources at EU (including Horizon Europe, rural and regional development funds), Member State, associated countries' and regional levels are mobilised to support research and innovation initiatives in the forest-based sector.
- Address the necessity for new knowledge to support major transitions and innovations in forestry and the forest-based sector in view of the new EU Forest Strategy as well as other major policy initiatives.
- Develop a structured framework for a European network of research funding and research policy organisations across the different parts of the forest-based and related sectors to enhance the cross-fertilisation between different areas of knowledge generation and innovation activities.
- Develop an R&I roadmap at EU-level and prepare for a possible implementation of European Partnership in Horizon Europe.
- Provide scenarios and information how to maximise synergies and minimize trade-offs between the different funding instruments and research needs (environmental, economic and social dimensions)
- Assess the potential of flagship projects in selected key strategic domains in the forest-based sector (e.g. integrated forest research across several dimensions of sustainable forest management; landscape-level integration of forest research at the interface with other sectors (agriculture, cities, water); increased, sustainable wood production and

mobilisation; renewable building materials for healthier living; role of new wood-based products to reach climate neutrality by substitution effects; contributions of the forest-based sector in the green recovery).

Proposals will fall under the concept of ‘multi-actor approach’ and ensure a value chain approach, with adequate involvement of the forestry and forest-based sector²⁸⁰.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.

Innovating for blue bioeconomy and biotechnology value chains

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-CircBio-01-07: Marine microbiome for healthy oceans and a sustainable blue bioeconomy ²⁸¹

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 18.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to range between TRL 3 and 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives, EU Bioeconomy Strategy and Blue Growth Strategy, the successful proposal will support the development of microbiome-based greener aquatic industrial products/processes and/or environmental services sustaining the health of aquatic ecosystems for a healthy planet and people.

- Provision of the scientific base needed for enhance the efficient production of high-quality marine microbiome data, increased data interoperability and facilitation of its use by a wide range of stakeholders. Improvement of capacity building in bioinformatics in Europe and overcoming fragmentation.

²⁸⁰ See definition of the multi-actor approach in the introduction to this Work Programme part.

²⁸¹ In the context of this topic marine microbiome is understood as the global collective of all microorganisms in marine and aquatic environments. The term refers also to the specific communities of microbes that live in and on individual aquatic ecosystems, including their creatures.

- Increased engagement of all actors in the marine microbiome biodiscovery pipeline, including industry, the scientific community, and societal stakeholders in full consideration of the sustainability objectives while at the same time accelerating the profitability and economic prospects of marine microbiome-enabled products and processes.
- Proven biodiscovery strategies based on whole microbiome communities enlarging the spectrum of biotechnology-enabled products and processes of value to society based on marine bioresources.
- Improvement of the protection and sustainable use of marine (genetic) bioresources by advancing new intellectual property rights (IPR) approaches to securing clear access while ensuring fair and equitable sharing of benefits arising from their utilisation.
- Raised awareness on the potential of marine microbiome to boost the sustainable blue bioeconomy.

Scope: The ocean represents the Earth's largest microbiome. Microorganisms represent nearly 90% of the ocean biomass and largely determine the functioning and health of marine ecosystems. Moreover, they contain a great variety of metabolic pathways that can yield beneficial products and processes such as medicines, high value industrial compounds and environmental services. The marine microbiome is one of the fastest growing segments of the blue bioeconomy and its study is vital to advance the discovery, understanding, protection and harnessing of the oceans.

The aim of the action is the development of novel tools and approaches to produce, analyse and use marine microbiome data for the discovery and production of high value sustainable industrial products/processes and/or environmental services sustaining the health of aquatic ecosystems.

Applicants should address:

- Scientific and technological challenges cutting across marine microbiome fields such as the development of new methods to analyse and model microbiome communities and take full advantage of post-genomic technologies along with bioinformatic analysis pipelines; development of standards and common methodologies that are coherent across marine microbiome exploration, monitoring and engineering, adaptable to the capacity of the different sectors (science, industry, citizens and society); optimisation of the use of (pre-existing) databases and research infrastructures through ensuring interoperability and enhanced networking;
- Bioprospecting to discover biological compounds or functions that are obtained only through complex interactions involving whole microbiome communities; targeted cultivation strategies beyond lab grown monocultures; manipulate and bioengineer microbiome products that ensure the sustainable use of marine bioresources; ensure open

access and benefit sharing in balance with agreements and negotiations to protect intellectual property.

Collaboration between private industry and academia, as well as the link with end-users and society, is essential. The improvement of professional skills and competences on marine microbiomes of those working and being trained to work within the blue bioeconomy should be ensured.

Proposals should assess the risks and ethics related to microbiome science & technology and guarantee the preservation of biodiversity and the compliance with the EU regulation on access to genetic resources and the fair and equitable sharing of benefits arising from their utilisation (ABS) in the Union. Fostering long-term preservation in biobanks, proper documentation of rights for redistribution and full traceability of their use and benefits.

Dissemination and public engagement should be an essential element of the proposals which should establish links between researchers and the array of end-users. Projects should seek synergies and capitalise on the results of past or ongoing research. Cooperation with other selected proposals under this topic and complementary topics included in this work programme²⁸² is encouraged.

International co-operation is encouraged as a win-win scenario, while contributing to the European competitiveness and resilience.

Call - Circular economy and bioeconomy sectors

HORIZON-CL6-2022-CircBio-02-two-stage

Conditions for the Call

Indicative budget(s)²⁸³

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ²⁸⁴	Number of projects expected to be funded
		2022		

²⁸² Another microbiome-related topic presented in this Work Programme is “HORIZON-CL6-2021-CircBio--01-06: Microbiomes for bio-based innovation and environmental applications.”

²⁸³ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

All deadlines are at 17.00.00 Brussels local time.

The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

²⁸⁴ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

Opening: 28 Oct 2021				
Deadline(s): 15 Feb 2022 (First Stage), 01 Sep 2022 (Second Stage)				
HORIZON-CL6-2022-CircBio-02-01-two-stage	IA	8.00	6.00 to 8.00	1
HORIZON-CL6-2022-CircBio-02-02-two-stage	IA	8.00	6.00 to 8.00	1
HORIZON-CL6-2022-CircBio-02-03-two-stage	RIA	10.00	Around 5.00	2
HORIZON-CL6-2022-CircBio-02-04-two-stage	IA	12.00	Around 6.00	2
HORIZON-CL6-2022-CircBio-02-05-two-stage	RIA	6.00	Around 6.00	1
HORIZON-CL6-2022-CircBio-02-06-two-stage	RIA	12.00	Around 6.00	2
HORIZON-CL6-2022-CircBio-02-07-two-stage	IA	15.00	6.00 to 8.00	2
Overall indicative budget		71.00		

General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Enabling a circular economy transition

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-CircBio-02-01-two-stage: Increasing the circularity in textiles, plastics and/or electronics value chains

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 6.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to all Destination 3 impacts related to consumers and industry, in particular to European industrial sustainability, competitiveness and resource independence by lowering the environmental footprint, enabling climate-neutrality and higher resource efficiency, through increased circularity and a resulting reduction in GHG emissions.

Project results are expected to contribute to at least four of the following outcomes:

- Increased deployment and market uptake of new technological solutions to waste management and recycling, and the measurement of recycled content
- Enhanced diffusion and demonstrated benefits of advanced digital solutions in circular businesses
- Emergence of new value chains using upcycled, recycled and/or biobased resources
- Increased upcycling and recycling rates for the targeted material streams
- Increased uptake of recycled material and upcycling to new higher-value products
- Increased resource efficiency along and across value chains, causing a measurable reduction in GHG emissions
- Increased diffusion of new circular business practices, in particular in the uptake of repair, reuse and remanufacturing
- A significantly higher level of involvement of all actors (manufacturers, retailers, consumers, CSOs, public administration etc.) in circular practices

- Increased level of information and awareness of citizens regarding circular and climate-neutral products and services
- Strengthened competitiveness and job retention and creation potential of circular value chains under different economic and social conditions

Scope: The 2020 Circular Economy Action Plan (CEAP) highlights the four material streams textiles, plastics, electronics including ICT equipment, and construction as particularly important with regard to their circularity potential and their environmental footprint. The circularity deficits for these streams are mainly due to the: lack of trust in secondary raw materials; lack of control over supply chains; lacking focus on material efficiency and design for circularity; unsustainable product lifetimes; lack of repair services; price gap between primary and secondary material; lack of secondary material markets; insufficient collection and sorting systems; insufficient and unpredictable input quality for recycling; insufficient information about quality and quantity of materials, including knowledge about possible microplastics pollution and substances of concern, lack of communication along the lifecycle between manufacturers and recyclers; lack of involvement and empowerment of citizens that would allow environmentally informed purchases.

Projects should address the priorities set in the CEAP, which states that “electrical and electronic equipment continues to be one of the fastest growing waste streams in the EU, with current annual growth rates of 2%. It is estimated that less than 40% of electronic waste is recycled in the EU. Value is lost when fully or partially functional products are discarded because they are not repairable.” Textiles are “the fourth highest-pressure category for the use of primary raw materials and water, after food, housing and transport, and fifth for GHG emissions, as well as one of the highest sources of emissions of synthetic microfibers in the EU. It is estimated that less than 1% of all textiles worldwide are recycled into new textiles.” “In the light of the complexity of the textile value chain, to respond to these challenges the Commission will propose a comprehensive EU Strategy for Textiles.” It will be necessary to boost “sorting, re-use and recycling of textiles, including through innovation”, while “tackling the presence of hazardous substances”. Beside the continuous implementation of the EU Plastics Strategy, the CEAP has a strong focus on microplastics, but also calls for mandatory recycled content and the controlled use of bio-based, biodegradable plastics and alternative materials. In view of the feasibility problems of plastic recycling, this will require the deployment of technologies that are still in their infancy, such as the various forms of chemical and enzymatic recycling.

Projects should deal with one of the three priority material streams (plastics, textiles, electronics), taking however into account the complexity of some materials currently in use (such as composites) and that the three streams are related and to some extent overlapping (plastics-textiles; plastics-electronics), and that specific solutions might require an integrated approach.

Projects should demonstrate and deploy at large scale innovative solutions and designs for increased quality, non-toxicity and durability of secondary materials and increased share of

secondary materials in new products. Projects should demonstrate increased recovery, recycling and upcycling rates and a higher uptake of secondary materials for high value applications. Projects should also demonstrate circular business practices, in particular in the uptake of repair and reuse, remanufacture, product-service-systems, and in the full lifetime of products or services. To achieve this, targeted market size, economic feasibility, cost efficiency and social acceptance need to be addressed. To break down the barriers for this transition, it will be important that proposals involve and address the different perspectives of all relevant actors, e.g. manufacturers, retailers, consumers and civil society organisations (CSOs). The projects should consider the use of digital solutions and demonstrate their benefits for increased circularity. Projects should also help produce harmonised and robust methods to assess the amount of recycled content in sectoral products, which is key for a future review of green claims through authorities and consumer organisations. Environmental, social and economic impacts shall be assessed from a lifecycle perspective as product, organisation and consumption environmental footprints, using the respective methods developed by the European Commission (Product Environmental Footprint, PEF, shall be used for the assessment of the environmental impacts) and through costing methods; relevant data will be fed into the European Platform on Life Cycle Assessment, following the specific Environmental Footprint data and format requirements. The functional performance of technologies and secondary materials can be assessed through the EU Environmental Technology Verification (ETV) scheme. Considering the microplastics and microfiber pollution and hazardous substances that are present in the targeted waste streams, their removal from the materials used for the products in concern as well as from the recovered material is crucial, in addition to applying less-polluting production and consumption procedures. Decontamination levels need to be properly addressed and accumulation prevented. All achieved outcomes should be demonstrated using quantitative indicators and targets wherever possible.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2022-CircBio-02-02-two-stage: Integrated solutions for circularity in buildings and the construction sector

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 6.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology</i>	Activities are expected to achieve TRL 6-8 by the end of the project –

<i>Readiness Level</i>	see General Annex B.
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Expected Outcome: A successful proposal will contribute to all Destination 3 impacts related to consumers and industry, in particular to European industrial sustainability, competitiveness and resource independence by lowering the environmental footprint, enabling climate-neutrality and higher resource efficiency, through increased circularity and a resulting reduction in GHG emissions.

Project results are expected to contribute to at least four of the following outcomes:

- Increased deployment and market uptake of innovative climate-neutral circular solutions for construction, waste prevention, lifetime extension and significant improvement of lifecycle performance of buildings and their components, including GHG emissions
- Increased deployment and market uptake of innovative solutions to design and manufacture for disassembly, waste prevention and management, reuse and recycling in the construction sector, including production and assembling
- Enhanced diffusion and demonstrated benefits of advanced digital solutions, ensuring coherence with other initiatives such as digital logbooks for logistics of construction materials and the energy-efficient operation of buildings
- Increased recovery and recycling rates of construction and demolition waste
- Improved elimination of hazardous substances from secondary materials
- Increased upcycling of reused and recycled material in construction materials, products and buildings
- Increased knowledge about the overall environmental footprint of buildings and construction materials, including the integrated assessment of material and energy efficiency with regard to possible trade-offs and synergies, and increased practical application of the Commission’s Product Environmental Footprint method.

Scope: The 2020 Circular Economy Action Plan (CEAP) states that “the built environment has a significant impact on many sectors of the economy, on local jobs and quality of life. It requires vast amounts of resources and accounts for about 50% of all extracted material. The construction sector is responsible for over 35% of the EU’s total waste generation. Greenhouse gas (GHG) emissions from material extraction, manufacturing of construction products, construction and renovation of buildings are estimated at 5-12% of total national GHG emissions. Greater material efficiency could save 80% of those emissions.” Measures should strive for the use of more climate-neutral circular materials with low environmental footprint and tackle material recovery, upcycling, recycled content in products, durability and adaptability of buildings, and they will have a strong life cycle and digitalisation focus. They should also focus on circular design that facilitates reuse and recycling beforehand.

This activity will demonstrate at large scale and deploy innovative climate-neutral circular solutions that prevent waste, expand the lifetime and improve the life cycle performance of buildings and their components, but also improve the quality of and the confidence in reused and recycled material. This targets materials, products, equipment and systems, their sourcing, design, upgradability, durability, material efficiency, dismantling, recyclability, etc. Dismantling and deconstruction should be embedded already in the design phase, with the adoption of circular economy principles, and thus reduce construction and demolition waste (CDW). As part of an overall digitalisation of the construction ecosystem, projects should use digital tools such as Building Information Modelling (BIM) or Digital Twin, which are key to traceability and circularity, and can be further used during deconstruction. Appropriate material recycling within construction operations, waste material identification, sorting and decontamination solutions should be considered to improve material logistics, processing and upgrading. Projects shall aim to support the strengthening of preferably local or regional secondary material markets. All solutions should be based on life-cycle approaches and proposals shall integrate life cycle assessment using the European Commission’s Product Environmental Footprint (PEF) method and relevant costing methods. The projects shall also propose, test and demonstrate new business models. All achieved outcomes should be demonstrated using quantitative indicators and targets wherever possible.

With regard to the territorial aspects of all proposed solutions, proposals seek to contribute to the goals and cooperate with the services of the European Commission’s Circular Cities and Regions Initiative (CCRI). Joint activities with CCRI projects are encouraged.

Proposals should seek to build synergies with projects funded under Cluster 4 Destination 1, section “A new way to build, accelerating disruptive change in construction”. Projects are therefore strongly encouraged to organise joint activities, ensure synergies and undertake clustering activities with projects under Cluster 4.

Innovating sustainable bio-based systems and the bioeconomy

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-CircBio-02-03-two-stage: Exploring extreme environments: novel adaptation strategies at molecular level for bio-based innovation

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology</i>	Activities are expected to achieve TRL 4-5 by the end of the project –

<i>Readiness Level</i>	see General Annex B.
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Expected Outcome: Projects will contribute to the expected impacts identified for Destination 3, and to the European policies it supports, in particular the European Green Deal, the Circular Economy Action Plan and the Bioeconomy and Biodiversity Strategies. Their results will contribute to improving European industrial²⁸⁵ sustainability, competitiveness and resource independence by lowering the environmental footprint (including on biodiversity), enabling climate-neutrality and higher resource efficiency (in particular upcycling and cascading use of biomass) along and across value chains, developing innovative bio-based products, with inclusive engagement of all stakeholders, as well as enhancing knowledge and understanding of science, in particular biotechnology-based value chains, for all actors.

Projects results are expected to contribute to all of the following expected outcomes::

Deeper understanding of the molecular, biochemical and cellular mechanisms of ecological adaptation of terrestrial and aquatic organisms in response to life under extreme or changing environments, while strengthening the remediation options at macro level for the studied populations, including by their interactions, thus contributing to expanding the range of potential climate change mitigation strategies.

- Stronger innovation capacity by applying the discovered principles (including via biotechnology routes) to the development of more resilient innovative feedstocks needed for sustainable bio-based products²⁸⁶
- Significantly improved environmental footprint of novel feedstocks based on discovered principles²⁸⁷, while broadening the range of sustainable biomass resources available to European industry, important for industrial competitiveness and SMEs participation, thus contributing to skilled job creation and economic benefits;
- Increased public understanding across Europe of biotechnology, and of biodiversity preservation and enhancement objectives enshrined in the EU Biodiversity Strategy and respect to the principles of Access and Benefit Sharing (UN Biodiversity Convention), via clear, inclusive and transparent communication strategies.

Scope: The topic covers R&D needed to advance and potentially exploit knowledge on the ways terrestrial and aquatic organisms and their populations adapt, on molecular, physiological, and ecological levels, to the effects of climate change, such as by tolerance to extreme temperatures, drought/water stress, salinity or increased biotic pressures (new pests), as observed at macro-scale (e.g. shifting ecological niches). The scope covers understanding the complex interactions between the affected populations (e.g. molecular signalling), and broader outcomes on an ecological level. International cooperation is encouraged to maximise the impact.

²⁸⁵ In synergy with European Partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

²⁸⁶ i.e. molecular traits linked with sustainable intensification of production, quality of the concerned feedstocks, or enhanced defence ability

²⁸⁷ e.g. by lowered requirement for pesticides or irrigation

Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing research projects. Proposals will:

- a. Identify and justify the choice of the selected organism or system under investigation, specifying the level and characteristics of the environmental stimuli covered (i.e. extreme or changing environment linked to climatic conditions)
- b. Consider the broader level of climate adaptation in the systems identified, in order to shed light on the possibility and magnitude of applying the discovered principles as part of a mitigation strategy.
- c. Engage with industrial actors including SMEs to identify and implement the best combination of appropriate technical solutions and in particular biotechnology for specific industrial value chains, for sustainable biomass generation, taking into account the barriers and drivers derived from governance and market aspects, while seeking engagement and understanding of all actors.
- d. Develop and transparently communicate the key parameters to monitor and measure the qualitative and quantitative impacts of these solutions and practices for different biomass sourcing, optimization, processing and production systems, the potential of replacing available traditional alternatives, if relevant, and trade-offs, including for biodiversity, and the associated improvement in socio-economic resilience of businesses for the creation of jobs and industrial competitiveness.
- e. Develop and test mechanisms involving all actors and specifically including research community, bio-based industry for knowledge co-creation, exchange, feedback and communication to demonstrate and accompany all actors (such as agricultural operators, farmers, fishers, foresters, SMEs and civil society) in implementing and understanding the solutions for improved bio-based products and processes and addressing other environmental impacts such as on biodiversity.

HORIZON-CL6-2022-CircBio-02-04-two-stage: Sustainable biodegradable novel bio-based plastics: innovation for sustainability and end-of-life options of plastics

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 7-8 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will support the uptake of bio-based innovation with high environmental and functional performance of products, processes and services along value chains and life cycles by bio-based industry, in line with the objectives of the European Green Deal. Projects outcomes will contribute to foster European industrial sustainability, competitiveness and resource independence, by lowering the environmental footprint and enabling climate-neutrality and higher resource efficiency along value chains.

Projects results are expected to contribute to the following expected outcome:

- Bio-based plastics value chains are deployed with enhanced functionalities and environmental performances, lower toxicity substances, lower waste production and improved products' safety control along the whole value chain.

Scope: There is a need to develop innovative, sustainable bio-based and biodegradable plastics with novel properties and production processes to deliver environmentally friendly materials with desired properties for novel long-term circular applications, markets and uses. This should be aligned to the new policy developments concerning plastics. A key approach will be the combination of environmental sustainability, circularity and functionality of the developed products and the supply chain.

Proposals will:

- a. Develop novel sustainable bio-based circular biodegradable plastics with enhanced functionalities, circularity and environmental sustainability, based on their non-toxic nature and improved end-of-life behaviour, for specific applications. The bio-based plastic should be mechanically recyclable and its biodegradability in specific environments should allow for more sustainable managed end-of-life such as either composting or anaerobic digestion or home composting or in 'in-situ' degradation (i.e. natural soil and marine environments).
- b. Develop and optimize innovative aspects of the production process, for example green chemistry and/or fermentative production, especially with respect to catalysts, higher yield, bio-based plastic quality, while ensuring the sustainability of biological feedstock used in the manufacturing, including biological waste and residues, and of production processes, aiming at a low environmental footprint and economic viability.
- c. Test the biodegradability in the specific environment selected for the specific bio-based plastic developed, i.e. either composting plant or anaerobic digester, or home composting, or in 'in-situ' degradation (i.e. natural soil and marine environments);
- d. Address process and product safety (and thus from the production to the use) as elements for consideration in any value chain, especially when new products and materials are obtained, following national or EU regulation. The toxicological evaluation of products and the EU regulatory requirements for product safety should be systematically addressed as part of proposals/projects, in particular where uses may be linked to critical exposure routes (e.g. food contact materials).

- e. Demonstrate the scaled-up production processes and cost competitiveness for novel sustainable bio-based biodegradable plastics in order to reach a critical mass for a given bio-based plastic, to achieve economies of scale.

Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing research projects. They will require a multidisciplinary approach, involving many stakeholders and aspects along the value chain of bio-based plastics production, including the EU regulatory context of products' safety. They will consider to contribute data and results to the European Commission's Knowledge Centre for Bioeconomy hosted by JRC.

HORIZON-CL6-2022-CircBio-02-05-two-stage: Photosynthesis revisited: climate emergency, “no pollution and zero-emission” challenge and industrial application

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal will contribute to the Destination 3 impacts, and the European policies it supports, in particular the European Green Deal, the Circular Economy Action Plan and the Bioeconomy Strategy, and as related to improving European industrial²⁸⁸ sustainability, competitiveness and resource independence, developing innovative bio-based products, with inclusive engagement of all stakeholders, enhancing knowledge and understanding of science, in particular biotechnology-based value chains, for all actors, as well as improving consumer and citizen benefits.

Projects results are expected to contribute to all of the following expected outcomes:

- Wider application of recent advances in molecular biology and biotechnology to increase photosynthetic efficiency of plants and/or algae and other autotrophic organisms, increasing their assimilation of carbon dioxide, boosting biomass yields, their processing and recovery of substance and materials of economic interest, and resulting in potential contribution to climate change mitigation and adaptation.
- Increased industrial uptake of plants and photoautotrophic organisms via biotechnology approaches, for production of high-value complex molecules, for cost- and resource-

²⁸⁸ In synergy with European Partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

efficiency. Wider uptake of life sciences and biotechnology innovations, supporting high engagement of industry and SMEs in Europe.

- Greater understanding and application of biotechnology to address air pollution (especially ozone) by crops and plants related with heat waves and environmental stress.
- Greater and more inclusive understanding and awareness of innovations, via transparent communication and societal dialogue with all stakeholders (academia, industry, including SMEs, NGOs, regulatory institutions, international partners etc.).

Scope: The photosynthetic capacity of plants, algae and other photosynthetic organisms to assimilate atmospheric carbon dioxide positions them at the centre of the global climate change adaptation and mitigation challenge^{289 290}. Their autotrophic lifestyle also makes them ideal platform organisms for sustainable production of biomolecules²⁹¹, including molecules of high socio-economic value, of interest to diverse industrial sectors, by increasingly sophisticated synthetic and molecular biology approaches²⁹².

This nexus creates new opportunities for the industrial production, beyond improved yields, while contributing to the increased and more efficient CO₂ assimilation capacity, with important contributions to the reduction of pollution in Europe. In particular, recent research confirm a strong correlation between plant physiological reactions during drought and heat waves, which are increasing in frequency and intensity in Europe, notably by contributing to ozone pollution²⁹³, the so-called ‘climate penalty of plants’^{294 295}.

The topic covers innovative technologies with potential to boost the efficiency of photosynthesis, reduce the ‘climate penalty of plants’, and increase their sustainable industrial application. All photoautotrophic organisms such as plants, micro- and macro algae, cyanobacteria and purple sulphur bacteria are in the scope. The international cooperation is encouraged, as a win-win scenario, while contributing to the European competitiveness.

Proposals will:

- a. Develop and apply a toolbox of technologies to optimize the photosynthesis pathways and structures of plants and algae to enable industrial manufacturing of large quantities of high-value bio-based compounds, substances or materials (excluding biofuels), while

²⁸⁹ For instance, see Ort et al. Redesigning photosynthesis to sustainably meet global food and bioenergy demand. *Proc. Natl Acad. Sci. USA* **112**, 8529–8536 (2015).

²⁹⁰ Notwithstanding the recognized need for even stronger emission reductions.

²⁹¹ O’Neill E. and Kelly, S. 2016 Engineering biosynthesis of high-value compounds in photosynthetic organisms,

²⁹² Schander et al., A synthetic pathway for the fixation of carbon dioxide in vitro, *Science* **18** (Nov 2016): 900-904

²⁹³ Lin *et al.* Vegetation feedbacks during drought exacerbate ozone air pollution extremes in Europe. *Nat. Clim. Chang.* **10**, 444–451 (2020). <https://doi.org/10.1038/s41558-020-0743-y>

²⁹⁴ Sadiq, M. The climate penalty of plants. *Nat. Clim. Chang.* **10**, 387–388 (2020). <https://doi.org/10.1038/s41558-020-0765-5>

²⁹⁵ *Air quality in Europe – 2019 report* Report no. 10/2019 (European Environment Agency, 2019); <https://www.eea.europa.eu/publications/air-quality-in-europe-2019>

addressing the CO₂ assimilation and the zero-pollution goals (especially ozone pollution) at sufficiently large scale.

- b. Identify and characterise the key aspects of the environmental and safety aspects, as well as the future scenarios of increasing environmental pressures under climate change conditions (water, gaseous inputs, land use etc.), for the selected crops, beyond the model species.
- c. Outline the necessary scale-up production processes for novel bio-based innovations in order to reach a critical mass for a given application (including the crop/species selection), to achieve economies of scale, address different market segments and applications.
- d. Address process and product safety, including occupational and consumer safety aspects, as elements for consideration in any value chain, as stipulated in the national or European regulation.
- e. Ensure transparent and inclusive engagement of all actors, including industry and SMEs, the scientific community, regulatory institutions, and broader civil society, including NGOs, to ensure the necessary impact and awareness.
- f. As relevant, proposals will seek synergies and capitalise on the results of past²⁹⁶ and ongoing²⁹⁷ research projects, taking care to avoid overlaps.

HORIZON-CL6-2022-CircBio-02-06-two-stage: Life sciences and their convergence with digital technologies for prospecting, understanding and sustainably using biological resources

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal and other European initiatives such as the Circular Economy Action Plan, the Industrial Strategy, the Bioeconomy Strategy and

²⁹⁶ E.g. FP7 project “[3to4](#)”: Converting C3 to C4 photosynthesis for sustainable agriculture

²⁹⁷ E.g. Horizon 2020 call [BIOTEC-02-2019](#): Boosting the efficiency of photosynthesis (RIA), with projects CAPITALISE, GAIN4CROPS and PhotoBoost.

the Biodiversity Strategy, the successful proposal will support the uptake of bio-based innovation improving European industrial²⁹⁸ sustainability, competitiveness and resource independence, developing innovative bio-based products using the full benefits from artificial intelligence and other digital technology innovation, with inclusive engagement of all stakeholders, enhancing knowledge and understanding of science, in particular biotechnology-based value chains, for all actors, as well as improving consumer and citizen benefits.

Projects results are expected to contribute to all of the following expected outcomes:

- Use the full potential of artificial intelligence applications for prospecting, understanding and sustainably using biological resources within safe planetary boundaries.
- Digital tools, sensors and methods for improved efficiency, climate change adaptation and sustainability of industrial processes in the bio-based sectors considering the needs of stakeholders are integrated in innovative engineering solutions.
- Enhanced monitoring, reporting and management of natural resources using artificial intelligence and other digital technology applications.

Scope: Applications of engineering biology have grown beyond chemical production to include the generation of biosensor organisms for the lab, animal, and field, modification of agricultural organisms for nutrition and pest/environmental resilience, production of organisms for bioremediation, and live cell and gene/viral therapies. The rapid expansion of the field has resulted in new tools and new approaches. However, we are still challenged by the need for novel and more robust and interoperable computational tools and models for engineering biology. For example, improved models of synthetic systems (synthetic biology) and of their interaction with their host organisms will facilitate more successful engineering.

This information infrastructure for biological design is in a nascent state compared to engineering disciplines such as mechanical and electrical engineering, due to the recent emergence of the biomanufacturing field. A critical bottleneck is a lack of established “design rules,” core aspects of biological and biomolecular function that apply to diverse systems and applications. Furthermore, technologies for the utilization, manufacture, and deployment of innovative bio-based systems are still under development. These roadblocks have hampered the development of standard computational frameworks to represent, process and store information about biological components, predict system behaviour, and diagnose failures. Therefore, widespread automation in the bio-based sectors remains out of reach.

A mature computational infrastructure for biodesign requires powerful access to information about biological parts and systems, their environments, their manufacturing processes, and their operations in and beyond the laboratory in which they are created. This in turn requires findable, accessible, interoperable, and reusable data that enable effective aggregation information on bio-based systems, their environments, and their processes of manufacture, and the establishment of standard models of data processing and analysis, including

²⁹⁸ In synergy with European Partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

bioinformatics, biosensors, bioindicators, ‘-omics’ technologies that allow open-development and scalable execution in the bio-based sectors.

The topic aims at preventing pollution and achieving sustainable management and circular use of natural resources within safe planetary boundaries, including in the deployment of the bioeconomy and the bio-based sectors. The topic focuses on bioinformatics, “cheminformatics” and artificial intelligence as approaches and tools to transform available information into biologically or biotechnologically applicable knowledge. The topic aims also at efficiently integrating digital technologies into bio-based operations to optimise value chains from a technical, economic, social and environmental point of view.

Proposals will:

- a. Enable prospecting, understanding and sustainable use of biological resources based on their convergence with digital technologies that lead to optimised and more efficient bio-based operations.
- b. Identify and characterise advanced technologies, including artificial intelligence, and their benefits for the utilization, manufacture, and deployment of innovative bio-based systems.
- c. Develop integrated biological designs and data models for improved prospecting, understanding and deployment of higher efficiency and sustainability of biological resources and industrial bio-based operations (e.g. bioinformatics, biosensors, bioindicators, data analysis, ‘-omics’ technologies).
- d. Improve the economic and environmental sustainability of bio-based operations.
- e. Focus on the integration of -omics and machine learning techniques such as active learning for the design-build-test-learn (DBTL) cycle.
- f. Develop improved models and model standards of synthetic systems (synthetic biology) and of their interaction with their host organisms to facilitate more successful engineering and broader application in the bio-based sectors.
- g. Establish bio computer-aided design (BioCAD) tools and design-of-experiment (DoE) approaches.
- h. Reinforce and maintain scientific infrastructures to integrate existing biodiversity information (species, habitats and environmental processes).
- i. Consider to contribute data and results to the European Commission’s Knowledge Centre for Bioeconomy hosted by JRC.

Safeguarding the multiple functions of EU forests

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-CircBio-02-07-two-stage: Harnessing the digital revolution in the forest-based sector

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 6.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: In line with the EU Forest Strategy and the European Digital Strategy, successful proposals will demonstrate the potential of digital solutions in forestry and forest-based value chains contributing to the multifunctionality and management of forests in Europe based on the three pillars of sustainability (economic, environmental and social). Project results are expected to contribute to all of the following expected outcomes:

- Deployment of ICT innovations in forestry to optimise productivity as well as the delivery of ecosystem services.
- Application of innovative approaches along the forest-based value chain by more accurate tracing methodologies of forest resources.
- Greater competitive advantage for European industries that utilise forest resources more efficiently.

Scope: Improved utilisation of information flows and intelligent digital solutions, increasingly available in forest monitoring, management and forestry operations, provide huge potential to improve and unlock the efficiency of wood supply chain activities. Modern digital applications offer also promising possibilities to support forest managers in improving decision making in a precious and complex forest environment and to improve ecosystem monitoring.

This topic addresses innovations in information systems for forest managers, forest-based industries and policy makers as well as advances in precision forestry, harvesting systems and forest nursery operation, optimised harvest planning, operations management, timber transport and logistics, as well as safety, ergonomics and smart assistance for human workers. The synergetic use of geo-spatial, statistical, and modelling technologies together with information and communication technologies such as aerial and satellite retrievals, (in particular from the Copernicus Programme) and the ‘web of things’ combined with big-data analytics is highly encouraged.

The aim is to realise the potential of ICT and new technologies to improve the sustainability of forest management and logging operations with a view to sharing data throughout the wood value chain, thereby driving greater sustainability, to offer new business models along the value chain and to improve the traceability of forest resources for optimised and transparent supply chains. The integration in the new technologies of climate change impacts on these wood chains should be an essential component. Activities may also include robust and transparent methods and tools for high resolution forest and ecosystems services assessments, natural disturbance risk monitoring and analysis (including pests and forest fires) and disaster response systems.

Besides activities such as prototyping, testing, demonstrating and piloting in a near to operational environment, proposals may include limited research activities. Assessing and deepening the understanding of economic, social and environmental impacts through an enhanced application of digital technologies for foresters, SMEs and industries, as well as end-consumers will be of special interest, including the assessment of risks and opportunities for jobs in forestry, the wider forest-based sector and rural communities. Proposals shall apply the concept of the 'multi-actor approach'²⁹⁹ and ensure adequate involvement of the primary sector and the wider forest-based value chain.

If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, they must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Cooperation with other selected projects under this topic and other relevant projects is strongly encouraged.

The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.

²⁹⁹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

Destination 4 – Clean environment and zero pollution

Anthropogenic pollution undermines the integrity of Earth ecosystems and severely affects natural resources essential for human life. Keeping our planet clean and our ecosystems healthy will not only contribute to addressing the climate crisis but also help regenerate biodiversity, ensure the sustainability of primary production activities and safeguard the well-being of humankind. In line with the objectives of the European Green Deal, particularly its Zero Pollution Ambition, and the 2030 Climate Target Plan, and other relevant EU legislation³⁰⁰, Destination 4 seeks to halt and prevent pollution by focussing the Work Programme 2021-2022 on fresh and marine waters, soils, air, including from nitrogen and phosphorus emissions, as well as on the environmental performance and sustainability of processes in the bio-based systems. Synergies with other Clusters (notably 1 and 5), relevant Destinations (1,2,3,5) as well as Missions and Partnerships will be exploited.

Halting emissions of pollutants to soils and waters is of fundamental significance for the planet. Diffuse emissions of pollutants from land and urban sources, including atmospheric depositions, are a major stress factor for terrestrial and aquatic ecosystems, threatening the quality of surface waters and aquifers, and affecting soil quality and all water-dependent sectors that require a holistic understanding of the pollution sources, key vectors and pathways. Projected impacts of climate change will alter, and notably reduce, the hydrological flows in many parts of Europe, while eutrophication could be exacerbated by increasing temperatures. Climate change and increasing water demand will exert significant pressures on surface and groundwater quality³⁰¹, notably where the combined effect of water table depletion and sea level rise will endanger the integrity of coastal aquifers and groundwater quality. This is due to saline water intrusion or extreme events (e.g. higher tides, storm surges or inland flooding events), which will put coastal wetlands and reservoirs, estuaries and ecosystems at risk. While recognising its essential role in aquatic ecosystems functioning and services, the sediments originating mostly from run-off and erosion are likely the major source of physical pollution of water bodies (excessive turbidity, impacts of deposition, accumulation of litter and debris) and contribute to a large extent to chemical and biological pollution of receiving waters. Beside land use practises, the increasing intensity and variability of precipitation will exacerbate erosion risks, affect the deposition and transport of sediments and could lead to a remobilisation of legacy contaminants and further deteriorate the quality of soils, sediments and water bodies, including aquifers, estuaries and coastal areas, and of their ecosystem function and services.

Keeping nitrogen (N) and phosphorus (P) cycles in balance is another crucial challenge. N and P flows from anthropogenic sources, mostly from excessive or inefficient input of fertilisers (including manure, sewage sludge, etc.) in agriculture, currently exceed planetary

³⁰⁰ cf. European Green Deal deliverables Farm to Fork Strategy, Biodiversity Strategy, Soil Strategy, but also Bioeconomy Strategy, Marine Strategy, the 2030 Agenda for Sustainable Development etc., the Missions on Soil Health and Food as well as on Ocean, seas and waters, etc.

³⁰¹ Member States identified that diffuse pollution is still a significant pressure that affects 35 % of the area of groundwater bodies, while quality standards (pesticides, herbicides...) were exceeded in 15 % of the groundwater bodies

boundaries. Their leaching and run-off negatively affect soil biodiversity, pH, organic matter concentration and carbon sequestration capacity, and cause the eutrophication of water bodies while ammonia and nitrous oxide emissions affect air quality and climate. As all environmental media are concerned, a systemic approach is necessary to limit N/P emissions from different sources, for example through the deployment of alternative fertilising products, and considering regional conditions (geography, climate zones, economy activities, soil properties, eco-system condition, agricultural practices, governance structures etc.), and to bring N/P flows back within safe ecological boundaries

Protecting drinking water and managing water pollution in rural settlements, and in increasingly dense urban areas requires innovative and holistic approaches at city/catchment level to ensure water quality, resilient to the impacts of climate and global change, by considering different spatial and temporal scales and contexts, aging water infrastructures, as well as pollution derived from point and non-point sources, and natural/human-made disasters. Protective measures should consider current and future land use, environmental needs and socioeconomic interests as essential elements for improving water quality and its management and governance. Re-emerging pollutants, such as polychlorinated biphenyls (PCB) or mercury, and contaminants of emerging concern (CECs) in water bodies may have impacts on ecological and human health, and some are not well regulated under existing environmental legislation. Sources of these pollutants include e.g. industry, agriculture, urban runoff, household products, coatings, paints and pharmaceuticals that are normally disposed of to sewage treatment plants and subsequently discharged into water bodies. Micro-pollutants, plastics, pathogens and CECs, individually or combined, represent a concern for a safe and good quality drinking water supply. Increasing water temperatures, notably due to climate change could deteriorate the quality of aquatic ecosystems and drinking water sources by favouring the conditions for enhanced eutrophication as well as pathogen development or the spread of invasive species. Emerging concerns are also growing at the level of drinking water treatment and distribution, notably in relation with disinfection operations and possible harmful effects of by-products and metabolites.

Addressing pollution on seas and oceans is a prerequisite for a healthy planet. Oceans are being polluted and destroyed due to the release of substances or energy in marine waters which initiate a range of subsequent effects. According to a new European Environment Agency report, all four regional seas in Europe have a large-scale contamination problem, ranging from 96% of the assessed area in the Baltic Sea and 91% in the Black Sea, to 87% in the Mediterranean and 75% in the North-East Atlantic Ocean. The main sources of pollution include industrial, agricultural and municipal waste runoff, other human activities (e.g. transport), underwater noise, light, atmospheric deposition, etc. into marine waters.

Increasing the environmental performance and sustainability of processes and products plays a significant role in keeping our planet clean. Environmental pollution resulting from human activity is detrimental to ecosystems at different functional levels, representing, also, an important economic burden for society. Circular bio-based systems, including biotechnology, have the potential to substantially contribute to the European Green Deal objectives, provided that they are developed sustainably and systemically aiming at mitigating the climate change

and its impacts, increasing resource efficiency and circularity, preserving and restoring ecosystems services, natural resources, air/water/soil quality and biodiversity. Indicators of such sustainability are needed, building on dynamic perspectives at scales ranging, in space, from planetary to local ecosystems and, in time, from next decade to the end of century and beyond. Environmental impacts should be traced along value chains and trades to enable responsible production and consumption.

Expected impacts

Pollution must be halted and eliminated to guarantee clean and healthy soils, air, fresh and marine water for all. To reach this objective, it will be paramount to advance the knowledge of pollution sources and pathways to enable preventive measures, improve monitoring and control, apply planetary boundaries in practice and introduce effective remediation methods.

Proposals for topics under this Destination should set out a credible pathway to contribute to the aforementioned goal to achieve a clean environment and zero pollution, and more specifically to one or several of the following impacts:

- Advanced understanding of diffuse and point sources of water pollution in a global and climate change context, enabling novel solutions to protect water bodies, aquatic ecosystems and soil functionality, and further enhancing water quality and its management for safe human and ecological use, while fostering the EU's position and role in the global water scene.
- Balanced N/P flows well within safe ecological boundaries at EU, regional and local scale, contribute to restoring ecosystems
- Clean, unpolluted seas in the EU as a result of successful behavioural, social-economic, demographic, governance and green-blue transitions
- Circular bio-based systems reversing climate change, restoring biodiversity and protecting air, water and soil quality along supply chain of biological feedstock and industrial value chains, within the EU and across borders
- Innovative biotechnology creating zero-pollution bio-based solutions

Actions should develop scientifically robust and transparent approaches and methodologies, building on achievements from previous research activities, where possible and appropriate. To ensure deployment, trustworthiness, swift and wide adoption by user communities, and to support EU and national policy-makers, they should adopt high standards of transparency and openness, going beyond ex-post documentation of results and extending to aspects such as assumptions, models and data quality during the life of projects.

Topics under this destination will address the following impact areas of the Horizon Europe Strategic Plan for 2021-2024: “Climate change mitigation and adaptation”; “Enhancing ecosystems and biodiversity on land and in waters”; “Good health and high-quality accessible

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

healthcare”; “Clean and healthy air, water and soil”; “A resilient EU prepared for emerging threats”; and “Inclusive growth and new job opportunities”.

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2021	2022	
HORIZON-CL6-2021-ZEROPOLLUTION-01	65.00		01 Sep 2021
HORIZON-CL6-2022-ZEROPOLLUTION-01		51.00	15 Feb 2022
Overall indicative budget	65.00	51.00	

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Call - Clean environment and zero pollution

HORIZON-CL6-2021-ZEROPOLLUTION-01

Conditions for the Call

Indicative budget(s)³⁰²

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ³⁰³	Number of projects expected to be funded
		2021		
Opening: 15 Apr 2021 Deadline(s): 01 Sep 2021				
HORIZON-CL6-2021-ZEROPOLLUTION-01-01	CSA	6.00	Around 2.00	3
HORIZON-CL6-2021-ZEROPOLLUTION-01-02	RIA	7.00	Around 7.00	1
HORIZON-CL6-2021-ZEROPOLLUTION-01-03	RIA	10.00	2.00 to 4.00	3
HORIZON-CL6-2021-ZEROPOLLUTION-01-04	CSA	3.00	Around 3.00	1
HORIZON-CL6-2021-ZEROPOLLUTION-01-05	IA	6.00	Around 6.00	1
HORIZON-CL6-2021-ZEROPOLLUTION-01-06	RIA	7.00	Around 3.50	2
HORIZON-CL6-2021-ZEROPOLLUTION-01-07	CSA	6.00	Around 2.00	3

³⁰² The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

³⁰³ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

HORIZON-CL6-2021-ZEROPOLLUTION-01-08	RIA	5.00	Around 5.00	1
HORIZON-CL6-2021-ZEROPOLLUTION-01-09	CSA	4.00	Around 2.00	2
HORIZON-CL6-2021-ZEROPOLLUTION-01-10	RIA	11.00	Around 5.50	2
Overall indicative budget		65.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Halting emissions of pollutants to soils and waters

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-ZEROPOLLUTION-01-01: Regional nitrogen and phosphorus load reduction approach within safe ecological boundaries

Specific conditions

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
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<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Successful proposals will support local administrations and policy makers to apply a systemic approach preventing pollution from nitrogen and phosphorus, in line with the Zero Pollution Ambition. Project outcomes will contribute to maintaining nitrogen and phosphorus flows well within safe ecological boundaries at EU, regional and local scale and to restoring ecosystems. Project results are expected to contribute to all of the following expected outcomes:

- Harmonised environmental protection policies and implementation actions delivered by local administrations and policy makers to achieve nitrogen and phosphorus load reduction targets at regional/river basin level.
- Best practices shared in EU and Associated Countries to prevent pollution from nitrogen and phosphorus emissions to air/soil/water including the design of inter-sectorial governance models and policy implementation tools to deploy the concept of nitrogen and phosphorus load reduction targets.
- Improved knowledge on the physical science of climate change.

Scope: The quantification of nitrogen and phosphorus emissions reduction necessary to respect ecosystems' health in order to achieve the objectives of EU legislation and the 2030 targets of the Biodiversity and Farm to Fork Strategies may be assessed through a nitrogen (N) and phosphorus (P) load reduction targets approach. The scope of the topic is to develop a regional/river basin approach. The topic is targeted to stakeholders from regions/river basins or clusters of regions/river basins: local agencies of environmental protection, local administrators, scientists and experts in environmental impacts models. A cluster may be formed by two or more regions/river basins, in the EU and Associated Countries, with very similar characteristics in terms of territorial conditions or being neighbouring regions/river basins.

Proposals will:

- a. Develop a robust and transparent methodology to identify safe ecological limit values (e.g. concentration in media) of N/P applicable at regional scale to ensure good status for ecosystems in air/water/soil, inside and outside the local scale and apply the methodology to regions/river basins of the consortium. The local territorial specificity will be taken into account, in terms of territorial extension, land use, orography, distribution of basins and fresh water bodies, coastline, lagoons, etc. A coherent set of environmental indicators and their limit values at local scale will be selected for each region/river basin, based on legislation, existing and announced objectives and on scientific evidence, including datasets from the long-term environmental monitoring

campaign and tools³⁰⁴. Indicators of N/P limit values should align to the monitoring capacity of N/P patterns in the environment.

- b. Review scientific knowledge of the contribution of N/P flows to climate change, including their impacts on carbon sink capacity of soils, of any other impact of N/P life cycle in the environment, of short-term and long-term dynamics of P in the soil matrix and its regional variation across the EU;
- c. Develop and/or improve an existing methodology to assess N/P emissions (flows) from all economic activities that may exist in the region/river basin (i.e. agriculture, aquaculture, forestry, industrial sectors, including food/drink sector, water supply, water/waste management, bioenergy, fossil-based energy production, mining activities, transport, etc.) including unintentional losses (e.g. losses and run-off of agricultural nutrients into the soil) and their impacts on air/water/soil environmental quality. Apply the methodology to regions/river basins of the consortium. Data from existing initiatives, consolidated reporting from national authorities, elaboration from EEA, Eionet, ESTAT, etc. and existing modelling capacity, either locally available or based on a twinning process across regions/clusters shall be considered in order to facilitate harmonisation of the approaches;
- d. Develop and/or improve an existing methodology to identify the N/P load reduction targets for all regions/river basins of the consortium to stay within local N/P limit values;
- e. Apply existing³⁰⁵ /develop new methodologies to model pathways to reduce N/P emissions to meet load reduction targets and at the same time prevent pollution in air, water and soil, contribute to climate change mitigation, protect biodiversity and avoid pollution swapping. Pathways may include but are not limited to: i) integrated land/marine and bioeconomy; ii) limiting livestock stocking density; iii) integrated agricultural practices, including agro-ecology, aiming at limiting N/P flows and any other environmental impacts; iv) nature-based solutions (e.g. in waste water treatments, soil remediation); v) integrated industrial innovation towards circularity, industrial symbiosis and innovative resources use to improve efficiency and reduce N/P emissions from industrial sectors and any other environmental impact;
- f. Identify inter-sectorial governance models and design policy implementation tools at regional level, also to integrate policy requirements for environmental legislation and emission sources from many sectors, including measures to foster a systemic shift in societal aspects (e.g. approaches to address meat consumption, food waste prevention, greener mobility, consumers' awareness of environmental footprint of goods etc.).

If projects use satellite-based earth observation, positioning, navigation and/or related timing, they must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

304 For the atmospheric compartment the JRC has developed the global emissions database EDGAR (<https://edgar.jrc.ec.europa.eu>) and the FASST (<https://tm5-fasst.jrc.ec.europa.eu>) modelling tool.

305 For example Blue 2: https://ec.europa.eu/environment/blue2_en.htm

HORIZON-CL6-2021-ZEROPOLLUTION-01-02: Optimization of nutrient budget in primary production

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 7.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the Zero Pollution action plan and the Farm to Fork Strategy, the successful proposal will support to limit and reduce pollution due to the excess of nutrients and nutrient losses (especially nitrogen and phosphorus) in the environment, stemming from excess use in agriculture. It will contribute with new and enhance knowledge to the development of integrated nutrient management plan.

Projects results are expected to contribute to all following expected outcomes:

- Improve nutrient budget and flows by identification of optimal combinations of nutrients in different farming systems (conventional, agro-ecological and organic systems) following, when possible, a holistic approach of the plant and animal productions system.
- New approaches and methods supported with sound indicators to monitor and measure nutrients flows and practices with the greatest climate change mitigation potential and water and nutrient leakages, and biodiversity preservation while ensuring economic farm viability.
- Identification of individual or combined region-specific agricultural practices that help balance nutrient cycles and Natural Based Solutions for plant and animal nutrition and health optimizing the use of external inputs and implementation of regulated deficit strategies.
- Quantification of the potential to save particularly N and P emissions from the implementation of relevant individual or combined agriculture practices, e.g. organic agriculture, agro-ecology, conservation agriculture, improve organic and mineral fertilization management, etc, that enhance soils health and combat eutrophication and water pollution.
- Improved nutrient budget at different scales, by sound quantification of the inputs and outputs of water and nutrients in different agricultural systems including quantitative environmental and economic indicators for farms, regions and/or products.

- Enhanced models to identify contamination and pollution hotspots locally, to extrapolate to regional, national and global solutions.
- Strengthened transdisciplinary and interdisciplinary research and integrated scientific support for relevant EU policies and priorities (Common Agricultural Policy, Green Deal, the Zero Pollution action plan, the Farm to Fork, etc.).

Scope: Sustainable agricultural production systems not only deliver nutritious food and other raw materials, they are also key drivers of economic growth in rural areas. Roughly 25% of the annually produced terrestrial agricultural biomass is used by humans, about 70%³⁰⁶ (mostly from grassland, by-products, and inedible crop residues) converted through animals into food and manure, and the remainder goes into biofuel. Unsustainable agricultural systems can cause a variety of adverse environmental effects, such as climate change, loss of biodiversity, and air and water pollution due to poor management of nutrients.

When possible, the holistic consideration of plant and animal nutrition within the agricultural production systems could contribute to more sustainability of the food chain by promoting the minimization of nutrients leakage and improved nutritional values of fertilisers, feed and food. This approach could cover the basic nutritional elements (carbon, hydrogen, nitrogen, oxygen), the macro elements (phosphorous, potassium, magnesium, calcium, sulphur) but also the trace elements (zinc, copper, iron, iodine, selenium, manganese). In line with the European Green Deal, the development of a nutrient budgeting approach could focus on the fluxes of carbon (C).

However, there are substantial knowledge gaps regarding the measurement and understanding of the impacts of nutrients flow in different farming practices (conventional, agro-ecological and organic systems, specialised and mix farming systems) at various scales, from local to global, and the capacity to model those impacts.

Proposals will build on existing and new knowledge, data, models (including in situ calibration measurement), AI and tools to:

- Optimise and harmonise nutrient and water flow models, indicators and data for quantification and assessment to prevent or reduce environmental pollution caused by nutrients, across sectors, for different types of agricultural practices (conventional, organic and agro-ecological agriculture), and scales – farm, local, regional and river basin.
- Explore and assess alternative nutrient sources and pathways (e.g. organic vs inorganic), enhance management and recycling of organic wastes and explore nutrient recovery opportunities (e.g. by using treated wastewater) as well as nutrient mobilisation through microorganisms;

³⁰⁶ A nutrient budget quantifies the inputs and outputs of nutrients in a system and can be used to understand better how the system soil-water-plant-nutrients works, and provide quantitative environmental and economic indicators for farms, regions and products.

- Build upon available results from previous EU projects funded under the Horizon 2020 topic CE-RUR-08-2018-2019-2020: Closing nutrient cycles.
- Enhance nutrient use efficiency at different levels.
- Analyse climate change effects of certain nutrient flows, including interactions between nutrient, water and carbon cycles.
- Develop biological models for nutrients flows remote sensing tools, in agricultural systems: for physical, chemical and biological parameters, using smart sensors and AI technologies,
- Develop digital platforms to allow precision nutrient management at farm scale and landscape scale.

Proposals should fall under the concept of the 'multi-actor approach'³⁰⁷ and ensure adequate involvement of the farming sector and, as relevant, bio-based industry active in rural areas.

Protecting drinking water and managing urban water pollution

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-ZEROPOLLUTION-01-03: Preventing and managing diffuse pollution in urban water runoff

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal’s zero pollution ambition, successful proposals will contribute to halt and prevent pollution of freshwater and soils, and consequently also protecting biodiversity, as addressed by several impacts under Destination 4, in particular “Advanced understanding of diffuse and point sources of water pollution in a global and climate changing context, enabling novel solutions to protect water bodies, aquatic ecosystems and soil functionality, and further enhancing water quality and its management for

³⁰⁷ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

safe human and ecological use, while fostering the EU's position and role in the global water scene.”

Project results are expected to contribute to some of the following expected outcomes:

- Wider use of an enhanced knowledge base required to assess and monitor pollution sources, transport pathways and impacts of diffuse pollution conveyed to receiving water bodies by urban water runoff and storm water overflows, including forward looking approaches aimed to anticipate and prepare for future or emerging challenges.
- Implement advanced preventive and mitigating strategies to reduce diffuse pollution of urban waters based on source control measures and storm water management that also consider climate change impacts.
- Apply effective risk assessment and risk management strategies enabling early warning systems and delivering ready-made outputs for decision-making and governance in urban areas.
- Deploy innovative concepts, cost effective technologies and advanced sensors and monitoring approaches for sustainable waste water collection and urban drainage systems preventing pollution due to urban run-off.
- Comprehensive urban runoff and storm water management plans implementing holistic approaches at city/catchment level to ensure resilient urban water quality and climate adaptation.
- Broad uptake of advanced knowledge, breakthrough solutions and innovative technologies to enhance competitiveness of the EU water sector and fostering the EU's position and role in the global water scene.
- Increasing the EU scientific and technological base and guidance on measures to manage storm water quality and evidence for policy-making and implementation.
- Science and evidence-based implementation of the European Green Deal and the Sustainable Development Goals, notably the SDG 6 “Ensure availability and sustainable management of water and sanitation for all”.

Scope: Good quality of fresh water is essential for human wellbeing and health, for supporting healthy aquatic ecosystems and biodiversity, and crucial for agriculture and food production, three major components of the European Green Deal. Despite significant progress in reducing conventional water pollutants and improving freshwater quality, pollution loads from urban point and non-point sources remain an important challenge, particularly exacerbated in water scarce areas. Urban storm water runoff is a large contributor to diffuse pollution that impairs the quality of receiving waters and ecosystems and public health. Impacts of climate change, affecting e.g. the variability and intensity of precipitation, the concentration of pollutants and the temperature of runoff water, may further aggravate the problem.

Additional knowledge is needed on sources and transport pathways of diffuse pollution conveyed by urban runoff and storm water overflows, including emerging threats and challenges posed by climate change. This accurate knowledge is essential for developing preventive and mitigation strategies focussing on source control and storm water management measures.

Proposals in this field should aim to develop holistic approaches at city/catchment level ensuring resilient urban water runoff quality by considering different spatial and temporal scales and contexts, and different technologies. Urban runoff water quality management plans should consider micro-pollutants, contaminants of emerging concern, behavioural changes and societal and technical developments, including in relation to urban planning, buildings and mobility, construction and manufacturing materials, as well as sound risk management approaches. The identification and selection of measures to manage storm water quality will require engaging with relevant stakeholders, water utilities, public authorities and industry to develop guidance for decision makers and policy makers on urban runoff and storm water control measures and deploy easy and ready-made options for end users' implementation.

Actions in this topic should also aim to develop innovative and integrated concepts and technologies, including digital advances, for urban drainage systems by combining advantages from blue-green-grey solutions and decentralised approaches to preventing and managing water pollution from urban runoff and storm water overflows.

In general, the participation of academia, research organisations, utilities, industry and regulators is strongly advised, as well as civil society engagement whenever necessary, also aiming to broaden the dissemination and exploitation routes and to better assess the innovation potential of developed solutions and strategies.

If appropriate, applicants are advised to seek complementarities and synergies, while avoiding duplication and overlap, with relevant actions funded under previous Horizon 2020 calls³⁰⁸, as well as targeted topics supported in the last Horizon 2020 and Horizon Europe calls, addressing micro/nano-plastics, persistent and mobile pollutants, such as per- and polyfluoroalkyl substances (PFAS), pharmaceuticals and contaminants of emerging concerns (CECs), pathogens and antimicrobial resistance.

In order to better address some or all of the expected outcomes, international cooperation is encouraged.

Addressing pollution on seas and oceans

Proposals are invited against the following topic(s):

³⁰⁸ Including access and use of data and information collected through long-term environmental monitoring activities supported by national and/or European research infrastructures.

HORIZON-CL6-2021-ZEROPOLLUTION-01-04: Achieving zero polluted seas and oceans

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 3.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In line with the European Green Deal’s zero pollution ambition and the Marine Strategy Framework Directive, successful proposals will support the development and implementation of a policy vision and the transition needed to reach clean European seas, cutting across behavioural, social-economic and governance spheres.

- Better understanding of major obstacles and showcasing of best practices on the implementation of sustainable and effective marine pollution reduction, prevention, mitigation measures and monitoring (e.g. administrative, legal, financial, technical, social);
- Improved support, with a set of guidelines, for the needed blue green transition to reach the policy vision of achieving clean European seas by 2030.

Scope: To reach the policy vision of achieving clean European seas, a profound transition is needed on how we address and manage marine pollution – a blue green transition. Many national laws, European and international agreements, forbid dumping of harmful materials into the environment, although enforcing these regulations remains a challenge. Moving towards this transition includes: i) actions encouraging the enforcement of existing or new pollution management related legislation; ii) the incorporation of new circular economy principles (designing materials and processes to enhance the recyclability and reuse of products and wastes e.g. plastics); iii) encouraging responsible chemical-use through consumer and political actions; iv) the uptake of effective sustainability policies etc. In summary, this transition will require measures at all levels e.g. legal, social, economic, industrial³⁰⁹, environmental and with all stakeholders e.g. decision makers, scientists³¹⁰, citizens, industry, overall all players behind man-made pollution. It will also require improved cooperation within and across regions and countries (the ocean and seas do not have borders), improved sharing and integration of information, development of joint measures to achieve zero polluted ocean and seas.

309 The need for new ways of working for Europe to strengthen its industry for the transitions, whether it be on skills or circularity (Industry Strategy)

310 A new generation of sustainability scientists needs to be trained to focus on a holistic vision of the marine ecosystem. Centred on solving societal challenges. Improving management of marine ecosystem/resources.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

Increasing environmental performances and sustainability of processes and products

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-ZEROPOLLUTION-01-05: Environmental sustainability criteria for biological feedstock production and trade in bio-based systems: impacts and trade-offs

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 7-8 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal will support tracing environmental impacts of biological feedstock production and trade by primary producers, traders and certification companies to enable responsible production in the bio-based systems, in line with the 2030 Climate Target Plan and the Zero Pollution ambition. Project outcomes will contribute to establish circular bio-based systems reversing climate change, restoring biodiversity and protecting air, soil and water quality along supply chain of biological feedstock and industrial value chains, within the EU and across borders. Project results are expected to contribute to the expected following outcome:

- Certification schemes for international trade at EU and global scale of biological feedstock for bio-based systems include the environmental impacts and trade-offs along the bio-base supply chains.

Scope: Assessment of environmental sustainability of biological feedstock production and trades in the bio-based systems is still a challenge. Indicators of such sustainability should build on dynamic perspectives at scales ranging, in space, from planetary to local ecosystems and, in time, from next decade to the end of century and beyond.

Proposals will:

- a. Identify the range of biological feedstock intended for industrial bio-based systems at EU and local (regional/rural/urban/coastal) scale, including primary biomass resources production and biological feedstock from secondary raw materials from

rural/urban/industrial activities. Industrial bio-based systems do not include food/feed, biofuels, bioenergy and cultural/recreation sectors. Aspects of trade of biological feedstock within the EU and at global level shall be part of the analysis.

- b. Collect data and figures on volumes of biological feedstock identified under a) in global trade flows and imports into the EU and their geographic distribution. The data collection shall base on existing and consolidated statistics and market databases;
- c. Improve existing and/or develop new methodology for the assessment of the environmental impacts and trade-offs of biological feedstock in the scope addressing, but not limiting to, the following environmental categories: i) GHG emissions/savings and carbon footprint; ii) emissions from nitrogen and phosphorous based fertilisers; iii) land use and land use change and its related impact on land carbon sink capacity; iv) marine space use and marine space use change; v) water use; vi) biodiversity and ecosystem services; vii) energy consumption, viii) any other aspects of air/water/soil environmental quality. Assessment shall consider the life cycle perspective and relevant regulatory requirements in terms of trade (across and within the EU), to the extent possible. Trade-offs and synergies with food production, biodiversity protection or other resources use and ecosystem services (e.g. recreation, urban creep) shall be included in the assessment;
- d. Align methodology in c) with indicators (e.g. environmental, demographic, geophysics indicators), provided by consolidated and available database, including networks of environmental observations, efficiently;
- e. Adapt methodology in c) to be suitable to definition/identification of environmental sustainability criteria compliant with the format of certification schemes in terms of either adopting existing certification schemes or developing of ad hoc ones. Criteria should be aligned to the Commission's Taxonomy Regulation³¹¹. Traceability of biological feedstock at European and global scale shall be essential part of certification;
- f. Demonstrate the developed methodologies for the assessment of environmental impacts and trade-offs, sustainability criteria and certification schemes to a range of biological feedstock intended for industrial bio-based systems in an operational environment and deliver guidelines.

Proposals' consortia may involve primary producers of biological feedstock, trade bodies, bio-based industries, agencies/companies developing certification, consumers' organisations and any stakeholder along the supply chain of biological feedstock for bio-based industries.

HORIZON-CL6-2021-ZEROPOLLUTION-01-06: Increasing the environmental performance of industrial processes in bio-based sectors: construction, woodworking, textiles, pulp and paper and bio-chemicals

Specific conditions

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 7.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal will support circular bio-based systems in industrial sectors in line with the European Green Deal and its Zero Pollution ambition and 2030 Climate Target Plan by increasing the environmental performance and sustainability of processes, and their ability to reverse climate change, restore biodiversity and protect air, water and soil quality along industrial value chains, within EU and across borders.

Project results are expected to contribute to the following expected outcome:

- Improvement of the environmental performance of industrial processes in the following bio-based sectors: construction, woodworking, textiles, pulp and paper, and bio-chemicals.

Scope: Proposals under this topic should focus on all of the following industrial bio-based sectors: construction, woodworking, textiles, pulp and paper, and bio-chemicals.

Proposals will:

- a. Identify and analyse case studies for each aforementioned industrial bio-based sector at the local (regional, rural, urban or coastal) or international scale within the EU and Associated Countries, and collect data and figures on the environmental performance of industrial processes in these sectors.
- b. Improve existing and/or develop new methodologies to assess the environmental impacts of these processes. The assessment should use, when possible, the Life Cycle Assessment methodology (in line with the existing international standards, the European Commission’s Product Environmental Footprint method³¹² and other relevant sources of information), and include, but not limited to, the following environmental impacts: GHG emissions and carbon footprint, emissions to air/water/soil, water and primary energy use, biodiversity and ecosystem services. The assessment methodology will also look at social and economic aspects. Relevant data may be fed into the European Platform on Life Cycle Assessment³¹³.

³¹² https://ec.europa.eu/environment/eussd/smgp/dev_methods.htm

³¹³ <https://eplca.jrc.ec.europa.eu/>

- c. Assess and analyse the environmental impacts and trade-offs of bio-based processes identified in a) based on the methodology developed in b).
- d. Identify and evaluate possible solutions to improve the environmental performance of bio-based processes based on c). The aspects to be evaluated include, but are not limited to the following: GHG emissions reduction, resource and energy efficiency, shift to renewable energy sources, enhanced circularity of materials (including upcycling and cascading use of biomass), non-toxic substances used in the processes, replacement of toxic substances with non-toxic ones, minimisation of residual waste at all phases of the processes, efficient recovery of any waste and residual flows.
- e. Demonstrate, where possible, the best solutions identified under point d) in order to evaluate their effectiveness and assess monitoring procedures.
- f. Develop recommendations and guidelines to improve the environmental performance of processes in each of the aforementioned industrial bio-based sector. These shall include a prioritisation of solutions and recommendations for modifications in specific processes and preliminary indications for monitoring procedures.
- g. Build synergies with research and innovation projects funded under Horizon Europe³¹⁴, and where relevant, seek complementarities and capitalise on the results of other past and ongoing research projects (especially under the Bio-based Industries Joint Undertaking).

HORIZON-CL6-2021-ZEROPOLLUTION-01-07: International and EU sustainability certification schemes for bio-based systems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The successful proposals will support tracing environmental impacts along value chains and trades in the bio-based systems for business-to-business communication to enable responsible production and consumption, in line with the 2030 Climate Target Plan and the Zero Pollution ambition. Project outcomes will contribute to establish circular bio-based systems reversing climate change, restoring biodiversity and

³¹⁴ HORIZON-CL6-2021-ZEROPOLLUTION-01-04: Environmental sustainability criteria for biological feedstock production and trade in bio-based systems: impacts and trade-offs

protecting air, soil and water quality along supply chain of biological feedstock and industrial value chains, within the EU and across borders.

Project results are expected to contribute to all of the following expected outcomes:

- Bio-based value chains transparency in international and EU trade is enhanced through business-to-business labels of biological feedstock and bio-based materials and products.
- Harmonization of existing international and EU certification scheme and the monitoring system and indicators of their effectiveness and robustness.

Scope: Climate neutral circular bio-based systems have the potential to establish a zero-pollution economy provided that they are developed sustainably. Environmental, social and economic impacts and trade-offs should be traced along value chains and trades to enable responsible production and consumption. Activities under this topic will assess scope, potential and requirements of international and EU sustainability certification schemes and business-to-business labels applicable to biological feedstock including bio-waste and residues intended for bio-based industrial value-chains and to bio-based materials and products, also in complementarity with actions on bio-based innovation and market measures³¹⁵. Traceability of biological feedstock and bio-based materials and products on a business-to-business level, at the EU and the global scale, should be part of certification, including aspects on primary and secondary biomass and bio-based intermediates in global trade flows and imports into the EU.

Proposals will:

- a. Review and analyse existing international and EU sustainability certification schemes and business-to-business labels for biological feedstock. The analysis will encompass schemes applied/applicable to biological feedstock intended for industrial bio-based value chains. Certified environmental, social and economic impacts and trade-offs will be analysed. Bio-waste and any biological feedstock from secondary raw materials from rural/urban/industrial activities are included in the definition of biological feedstock;
- b. Collect data and figures on volumes of biological feedstock and bio-based materials and products in global trade flows and imports into (exports from) the EU and their geographic distribution, distinguishing between certified and uncertified feedstock and materials/products. The data collection shall base on existing and consolidated market databases;
- c. Review and analyse existing international and EU sustainability certification schemes and business-to-business labels for bio-based materials and products with the same level of detail apply to the analysis of feedstock (point a).
- d. Assess existing/develop new monitoring system and indicators of effectiveness and robustness of existing certification schemes and labels reviewed in point a) and c). The

315

For example topic «“HORIZON-CL6-GOV-2022-00-00 Consumer-focused labelling options for bio-based products”»

task shall consider the life cycle analysis perspective and identify minimum requirements of a certification scheme to ensure its completeness covering environmental, social and economic aspects;

- e. Demonstrate/test effectiveness of existing (voluntary) certification schemes and labels and monitor robustness; this action includes testing the monitoring system and indicators assessed/developed within the project, point d, on the reviewed schemes, point a) and c). The results shall consolidate the optimal monitoring system and indicators and provide a preliminary selection of (parts of) the certification schemes covering the minimum requirements identified in point d). The same for labels;
- f. Assess costs from the adoption of certification schemes and labels in selected industrial bio-based value-chains. The assessment includes selecting a range of value-chains in the EU and Associated Countries and the corresponding biological feedstock and flows of materials and products among those certified and reviewed in point a and c and collecting data and figures on the known costs: actual economic and internalised environmental and social ones. The evaluation of the externalised environmental and social costs will be part of the overall assessment, based either on primary data or/and on models taken from peer-reviewed literature in the related fields of economy, social and environmental sciences;
- g. Evaluate the feasibility of business-to-business labels that award best performances either of feedstock or material or products from either environmental or social aspects. The feasibility will include modelled economic costs and benefits;
- h. Analyse and develop recommendations on how to promote the best practices in the adoption of effective a robust certification schemes and business-to-business labels. Promoting actions may include deployment and take-up by industrial sectors of certification schemes, building trust between business stakeholders, deploying corporate responsibility, engagement with and awareness of bio-based sectors.
- i. Engage in cooperation with international partners and organisations, to increase impact and outreach, while ensuring sufficient focus on the EU’s situation.

Proposals will include a task dedicated to sharing methodologies and findings with projects funded within this topic. Proposals’ consortia may include, but not be limited to, experts in certification schemes and stakeholders of the international and EU trade of biomass feedstock and bio-based materials and products.

HORIZON-CL6-2021-ZEROPOLLUTION-01-08: New genomic techniques (NGT): understanding benefits and risks – focus on bio-based innovation

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless,

<i>project</i>	this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: The successful proposal will contribute to Destination 4 impacts, and European policies it supports, in particular the European Green Deal, the Circular Economy Action Plan and the Bioeconomy Strategy, and specifically in respect to circular bio-based systems in industrial sectors along value chains and supply chains of biological feedstock, within Europe and globally, as well as to delivering the innovative “zero-pollution” bio-based biotechnology solutions.

Project results are expected to contribute to all of the following expected outcomes:

- Improved understanding of the benefits and risks of new genomic techniques applied for plants³¹⁶ and/or animals³¹⁷ and microorganisms, as well as their potentials (including via social innovation) and consequences for human health and the environment (e.g. environmental balance, biodiversity impacts), aiming at a holistic approach.
- Development of long-term environmental and population models concerning the spreading into the environment of organisms obtained by NGTs, taking into account the climate change issues³¹⁸.
- Contribution to an improved and more inclusive understanding and awareness, through transparent communication of the risks and benefits of the new genomic techniques and resultant innovation, while supporting societal dialogue and engagement with all stakeholders (academia, industry, including SMEs, NGOs, regulatory institutions, international partners and consumers or civil society to ensure public knowledge and awareness).

Scope: There is a need to enable major advances in the life sciences and biotechnology, in new genomic techniques, such as gene/genome editing³¹⁹, to ensure they can contribute safely and sustainably addressing the grand societal challenges of our age, such as climate change mitigation and adaptation, improved resource efficiency by industry and throughout various sectors of the economy. This covers their applicability for bio-based sectors (e.g. development of improved and more resilient feedstocks, plants and livestock to achieve a more efficient use of resources, longer shelf life of the agricultural products, products or agricultural by-products rendered more reusable). These advances must be aligned with the relevant EU legal

³¹⁶ Such as ensuring molecular containment of genetically modified crops

³¹⁷ Such as related to gene-drive eradication of vectors of human and animal pathogens, e.g. malaria

³¹⁸ Jones, et al.. (2016). Invasive mammal eradication on islands results in substantial conservation gains. *Proceedings of the National Academy of Sciences of the United States of America*, 113(15), 4033–4038.
 Grunwald, et al. (2019). Super-Mendelian inheritance mediated by CRISPR-Cas9 in the female mouse germline. *Nature*, 566(7742), 105–109.

³¹⁹ Including, if relevant, epigenomic control mechanisms

framework³²⁰, while aiming to support the climate ambition of zero net emissions by 2050, as well as biodiversity protection and resource efficiency goals. A key aspect will be the combination of safety, environmental sustainability and functionality of the developed products, while recognizing the need for a holistic approach at the ecosystem level, for both conventional and alternative production systems. R&I activities shall result in solutions to develop safe and more environmentally friendly products, allowing for innovation, transparency and inclusiveness for all actors.

International cooperation is encouraged, to exchange best practice, while contributing to the European competitiveness.

Proposals will:

- a. Advance new genomic techniques in bio-based innovation (purely medical applications such as the therapeutical/clinical applications are excluded), to understand and increase their impact, as related, for instance, to the origin of feedstocks and its other features and its applicable conversion pathways (e.g. via biorefinery processing), storage, logistics, enhanced functionalities and environmental sustainability, safety/non-toxic nature and improved end-of-life behaviour (e.g. reuse/reprocessing), etc. for specific applications.
- b. Develop future scenarios taking into account in different environmental, social and economic drivers, to assess potential critical impacts and bottlenecks with respect to the EU and international governance frameworks. This should take into account the expected demand of primary resources needed to satisfy the growing bio-based economy (especially sustainable biomass), the need to protect and restore biodiversity, as well as the increasing environmental pressures under climate change conditions.
- c. Develop and optimize innovative aspects of the production process, screening procedures, molecular tools and digital applications.
- d. Outline the necessary scale-up production processes for novel bio-based innovations in order to reach a critical mass for a given application, to achieve economies of scale, address different market segments and applications, etc.
- e. Ensure transparent and inclusive engagement of all actors, including industry and SMEs, scientific community, regulatory institutions, and broader civil society, to ensure necessary impact.
- f. Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing research projects.

³²⁰ Including the EU Court of Justice judgment in Case C-528/16, <http://curia.europa.eu/juris/documents.jsf?num=C-528/16>

HORIZON-CL6-2021-ZEROPOLLUTION-01-09: Environmental impacts and trade-offs of alternative fertilising products at global/local scale.

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The successful proposals will support awareness of environmental performances of alternative fertilising products and their uptake by stakeholders and local administrators, in line with the Zero Pollution Ambition. Projects outcomes will contribute to maintaining nitrogen and phosphorus flows well within safe ecological boundaries at the EU, regional and local scale and to restoring ecosystems.

Project results are expected to contribute to all of the following expected outcomes:

- Orienting the production and the application of alternative fertilising products according with the best environmental performances and practices.
- Local administrations formulate policies to support the development of sustainable local value chains deploying alternative fertilising products.

Scope: The scope of this topic is the assessment of environmental impacts and trade-offs of the production and application of a range of fertilising products derived from secondary raw materials which could replace nitrogen- and phosphorus-based fertilisers produced from conventional processes (including mining and fossil-based processes) in a life cycle perspective. Examples of alternative fertilising products within the scope include products made from secondary raw materials such as, for example: recycled nutrients from urban and industrial waste water and sewage sludge, organic fertilising products from bio-waste, from any biological residue or by-products, from digestate and from treated manure.

Proposals will:

- a. Collect all relevant data and figures on a range of fertilising products derived from secondary raw materials. Information should include all phases of their life cycle: production, distribution/trade, storage, application on lands and consequent transformation/diffusion into the different environments. The range of alternative fertilising products should be selected in order to cover at least one product from each main waste/residue raw material, i.e. at least one from each of: urban waste water, industrial waste water, sewage sludge, bio-waste, biological by-products, digestate and treated manure.

- b. Apply and/or improve existing methodologies to assess the environmental impacts and trade-offs of the alternative fertilising products selected at point a) on a life cycle base, building on and complementing existing assessment results published by European Commission (project SAFEMANURE³²¹). In particular, methodology and assessment will include the territorial and practical factors in terms of local vs global production and trade, local management procedures (storage, spreading on soils) also depending on specific agricultural applications and practices (e.g. agro-ecological vs traditional approach, current legislation at national level, within the consortium). Impacts and trade-offs will include categories on: climate change mitigation, including in terms of restoring the carbon sink capacity of soils, biodiversity and ecosystems protection, including soil biodiversity and below-ground ecosystems, land use and land use change, water consumption, energy use, nitrogen and phosphorus flows into the environment and any other pollutants' emission that affect air/water/soil, including microplastics. Methodology and assessment will rely on existing procedures, e.g. Product Environmental Footprint method³²² and other validated/certified modelling and objective techniques, experimental tests, consultation of peer-reviewed scientific literature;
- c. Relevant data may be fed into the European Platform on Life Cycle Assessment³²³ if feasible;
- d. Analyse technical aspects of the environmental impacts prevention and control operations during all phases of life cycle of the selected alternative fertilising products and their effectiveness. Include preliminary assessment of costs of installation/maintenance and social benefits of such operations. Alternative fertilising products under this proposal seeking market regulatory approval, shall consider relevant regulatory requirements.

Activities should include a thorough analysis of past research projects and studies developed under the EU funding programmes. Proposals will include a task dedicated to sharing methodologies and findings with projects funded within this topic. Proposals' consortia may include stakeholders from the whole value chain such as producers of fertilisers and farmers, as well as scientists and experts in the analysis of environmental impacts of agricultural products.

HORIZON-CL6-2021-ZEROPOLLUTION-01-10: Environmental services: improved bioremediation and revitalization strategies for soil, sediments and water

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of around EUR 5.50 million would allow these outcomes to be addressed appropriately. Nonetheless,

321 <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/technical-proposals-safe-use-processed-manure-above-threshold-established-nitrate-vulnerable>

322 https://ec.europa.eu/environment/eussd/smgp/dev_methods.htm

323 <https://eplca.jrc.ec.europa.eu/>

<i>project</i>	this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal and its Zero Pollution ambition and Climate Pact, the successful proposal will support circular bio-based systems reversing climate change, restoring biodiversity and protecting soil and water quality along supply chain of biological feedstock and industrial value chains, within Europe and globally, as well as to delivering innovative “zero-pollution” bio-based biotechnology solutions and advanced bioremediation methods for environmental protection.

Projects results are expected to contribute to all of the following expected outcomes:

- Improved bioremediation and revitalization strategies for contaminated environments, including soil, sediment, surface water and groundwater using recent advances in biotechnology;
- Disseminate expanded tool sets for efficient bioremediation and resource recycling;
- Provide science-based evidence and bio-based solutions enabling a better assessment of pollution threats to soil, sediment, surface water and groundwater;
- Reduce the main negative impacts of pollution in terms of loss of biodiversity and ecosystem services;
- Wide deployment of newly developed and effective bioremediation methods in different environmental conditions, also based on microbiome exploitation potential;
- Improved overall environmental performance (soil and sediment health, water quality, reduction of emissions, etc.);
- Improved environmental footprint and lower toxicity of processes, products and services by means of biotechnologies;
- Demonstrate effective methods of bioremediation with improved environmental, economic and social sustainability.

Scope: Environmental pollution has been a major concern over the past few decades influencing the quality of life. Contamination of soils, sediments and water remains a major ecological problem. This pollution contains dangerous and persistent toxic substances that have adverse effects on human health and the environment. Pollutants resulting from human

activity are detrimental to ecosystems at different functional levels, representing an important economic burden for society.

Remediation strategies, such as chemical and physical approaches, are not enough to mitigate pollution problems. Bioremediation using microbes is a sustainable, eco-friendly and socially acceptable alternative to conventional remediation approaches and help improve the environment. It plays a significant role in monitoring “Zero-pollution”. Many microbes with bioremediation potential have been isolated and characterized but, in many cases, cannot completely degrade the targeted environmental pollutant or are ineffective in situations with complex contamination such as mixed waste.

The topic aims at improving bioremediation and revitalization strategies for soils, sediments, surface water and groundwater while respecting the EU legislation and regulations applicable in this area, including the use of natural organisms.

Proposals will:

- a. Develop sustainable and cost-effective technologies for bioremediation of water resources used for water production and effective in situations with mixed waste (e.g. nature-based solutions)^{324, 325};
- b. Identify, analyse and introduce optimised proteins, microorganisms, microbiomes, plants, and animals (specifically fish and molluscs/bivalves including mussels) for sediment, watershed and wastewater remediation and revitalization (e.g. design of novel enzymes to degrade xenobiotic small molecules such as toxins, antibiotics and microplastics, selective uptake of non-degradable metal toxins bioadsorption);
- c. Identify and characterize plant platforms, microorganisms and microbiomes that can be optimised for efficient remediation of a range of contaminated environments (e.g. enzymes optimised for efficient bioconversion and/or biosequestration of environmental contaminants, biological tools/systems for land-based bioremediation, phytoremediation for contaminated industrial sites);
- d. Identify and characterize plants transformed with pathways and metabolisms that enable the uptake of targeted contaminants and that have clearly visible ‘markers’ for public surveillance (for example, colours that clearly mark the plant as being genetically modified, so as to prevent people from eating these plants);
- e. Develop strategies for efficient metabolic pathways of naturally-occurring species to be re-introduced into the environment;
- f. Enable new interdisciplinary microbial approaches, such as combinations of synthetic auxotrophies, that increase the safety and reduce the risk of deploying optimised microbes in the field;

³²⁴ The EU and nature-based solutions ([link](#))
³²⁵ What Nature-Based Solutions can do for us ([link](#))

- g. Develop and analyse the ability of defined consortia of bacteria, fungi and/or algae to most productively revitalize sediment and water sources (for example, by researching functioning of ecosystems in the hyporhexic zone, which plays a crucial role in the purification of bank filtered water and thus in ensuring a safe supply of drinking water in several countries);
- h. Demonstrate (with quantification) the key environmental, economic, social and safety benefits of bioremediation and revitalization strategies for soils, sediments, surface water and groundwater compared to standard physicochemical remediation approaches;
- i. Where relevant, proposals will seek synergies and capitalise on the results of past and ongoing research projects.^{326, 327}

Call - Clean environment and zero pollution

HORIZON-CL6-2022-ZEROPOLLUTION-01

Conditions for the Call

Indicative budget(s)³²⁸

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ³²⁹	Number of projects expected to be funded
		2022		
Opening: 28 Oct 2021 Deadline(s): 15 Feb 2022				
HORIZON-CL6-2022-ZEROPOLLUTION-01-01	RIA	12.00	2.00 to 4.00	3
HORIZON-CL6-2022-ZEROPOLLUTION-01-02	IA	12.00	Around 6.00	2
HORIZON-CL6-2022-ZEROPOLLUTION-01-	IA	12.00	Around	2

³²⁶ Horizon 2020 call [CE-BIOTEC-04-2018](#): New biotechnologies for environmental remediation (RIA)

³²⁷ Horizon 2020 call [CE-BIOTEC-08-2020](#) : New biotechnologies to remediate harmful contaminants (RIA)

³²⁸ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

All deadlines are at 17.00.00 Brussels local time.

The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

³²⁹ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

03			6.00	
HORIZON-CL6-2022-ZEROPOLLUTION-01-04	RIA	15.00	2.00 to 4.00	4
Overall indicative budget		51.00		

General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Halting emissions of pollutants to soils and waters

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-ZEROPOLLUTION-01-01: Preventing groundwater contamination and protecting its quality against harmful impacts of global and climate change

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.

<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal’s zero pollution ambition, successful proposals will contribute to halting and preventing pollution of freshwater and soils, and consequently also protecting biodiversity, as addressed by several impacts under Destination 4, in particular “Advanced understanding of diffuse and point sources of water pollution in a global and climate change context, enabling novel solutions to protect water bodies, aquatic ecosystems and soil functionality, and further enhancing water quality and its management for safe human and ecological use, while fostering the European position and role in the global water scene.”

Project results are expected to contribute to some of the following expected outcomes:

- Wider use of an enhanced knowledge base and better understanding of pollution sources, pathways and impacts, including surface hydrology, aquifers and receiving water bodies, as well as the synergistic effects of multiple stressors on groundwater quality.
- Implement advanced prevention and mitigation strategies to protect groundwater against pollution induced by global and climate change, including anticipative approaches preparing for future or emerging challenges.
- Apply effective risk assessment and risk management strategies enabling early warning systems and delivering ready-made outcomes for decision-making and governance.
- Deploy innovative monitoring strategies, including advanced sensors, tracers and analytical methods, and integration of IT tools/platforms and advanced modelling.
- Broad uptake of advanced knowledge, breakthrough solutions and innovative technologies to enhance the competitiveness of the EU water sector and foster the EU’s position and role in the global water scene.
- Increasing the EU scientific and technological base on measures to manage groundwater quality and providing evidence and guidance for policy-making and implementation.
- Science and evidence-based implementation of the European Green Deal and the Sustainable Development Goals, notably the SDG 6 “Ensure availability and sustainable management of water and sanitation for all”.

Scope: The European Union has made noticeable progress in terms of reducing concentrations of nutrients in groundwater and in rivers through the implementation of dedicated policy measures. However, Member States identified that diffuse pollution is still a significant

pressure that affects 35% of the area of groundwater bodies³³⁰, while quality standards (pesticides, herbicides, etc.) were exceeded in 15% of the groundwater bodies studied. Climate change and increasing water demand will exert significant pressures on groundwater quality, notably where the combined effect of reduced hydrological flows, water table depletion and sea level rise endanger the integrity of coastal aquifers and groundwater quality due to saline water intrusion. Extreme events like higher tides, storm surges and inland flooding events, and consequent pollutant and pathogen runoff, will put at risk wetlands and reservoirs, estuaries and ecosystems, jeopardising an efficient and qualitatively good groundwater recharge. Rising water tables in urban and rural areas, caused by e.g. higher sea level, changing water use or variable precipitation patterns, could potentially affect pollution sources (sewage, runoff infiltration, dilution of soil pollutants, salinization, etc.) and deteriorate the quality of groundwater.

Additional knowledge is needed to understand the synergistic effects and risks of multiple stressors and pollutants on groundwater quality to better evaluate the impacts of global and climate change, particularly in highly vulnerable areas affected by diffuse pollution, anthropogenic activities and/or water table fluctuations. Actions in this field should aim to identify and assess sources and pathways of groundwater pollution to inform risk management plans at basin/regional scales, with particular consideration of aquifer recharge with reclaimed water and persistent pollutants.

Further developments are expected in terms of cost-efficient monitoring strategies, which could include new tracers and sensors, increased sampling and analytical capacity, as well as integrating IT advances and geophysical modelling.

Proposals in this area should assess possible options and anticipate novel strategies to protect groundwater quality by considering the harmful effects of and threats from climate change. Actions in this field should focus on preventive measures and consider technological and non-technological solutions, and should engage with policy and decision-making bodies.

In general, the participation of academia, research organisations, utilities, industry and regulators is strongly advised, as well as civil society engagement whenever necessary, also aiming to broaden the dissemination and exploitation routes and to better assess the innovation potential of developed solutions and strategies.

If appropriate, applicants are advised to seek complementarities and synergies, while avoiding duplication and overlap, with relevant actions funded under previous Horizon 2020 calls³³¹, as well as targeted topics supported in the last Horizon 2020 and Horizon Europe calls, addressing micro/nano-plastics, persistent and mobile pollutants, such as per- and polyfluoroalkyl substances (PFAS), pharmaceuticals and contaminants of emerging concerns (CECs), pathogens and antimicrobial resistance.

³³⁰ European Environment Agency The European environment — state and outlook 2020 <https://www.eea.europa.eu/soer-2020/intro>

³³¹ Including access and use of data and information collected through long-term environmental monitoring activities supported by national and/or European research infrastructures.

In order to better address some or all of the expected outcomes, international cooperation is strongly encouraged.

HORIZON-CL6-2022-ZEROPOLLUTION-01-02: Piloting innovative governance solutions to limit nitrogen and phosphorus emissions at the interface of rural/coastal and urban/industrial environments

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 7-8 by the end of the project – see General Annex B.

Expected Outcome: In the context of eliminating pollution to guarantee a clean and healthy environment and in line with the Zero Pollution Ambition, successful proposals will deliver governance solutions that halt nitrogen (N) and phosphorus (P) pollution and limit N/P emissions to remain within safe ecological boundaries at European, regional and local scale while restoring water, air and soil ecosystems.

Project results are expected to contribute to all of the following expected outcomes:

- Dynamic interfaces between rural/coastal and urban/industrial environments that allow for the exploitation of hitherto untapped synergies in eliminating and preventing N/P pollution
- Mainstreamed circular and sustainable use of N and P recovered from urban/industrial contexts and returned to agricultural/primary production in rural/coastal environments throughout Europe, with a view to closing N/P cycles and stimulating a market for recovered N and P
- Best practice on how to implement innovative governance models shared among relevant stakeholders across the EU
- Better informed and less fragmented policies and regulatory instruments at regional, national and European scale to promote re-balancing N/P flows and restoring ecosystem services to stay within safe ecological and planetary boundaries

Scope: In line with the overarching objective to bring N/P flows back within safe ecological and planetary boundaries and to achieve the deliverables of the European Green Deal and other relevant EU legislation, at regional level, this Innovation Action (Pilot) explores

innovative governance solutions to support transferring resources and services between rural/coastal and urban/industrial environments while limiting N/P emissions and other emissions exacerbating pollution, biodiversity loss and climate change. N/P relevant materials and residues discarded in one environment may be a valuable resource in another context but are not always exploited due to systemic or structural barriers. Actions may include piloting incentives (regulatory, structural, financial, behavioural etc.), innovative supply and value chains and novel infrastructures or other governance solutions.

Proposals will

- Develop novel or adapt existing governance models and test in an operational environment how these innovative tools and instruments will drive systemic change to promote circularity, environmental protection and closed N/P circles at the urban/rural interface.
- Demonstrate these innovative governance models in geographically representative regional clusters throughout the EU and associated countries. A cluster may be formed by two or more regions/river basins, in EU and associated countries, with very similar characteristics in terms of territorial conditions or being neighbouring regions/river basins. which feature similar degrees of N/P emission pressures as well as physical, social and economic specificities and governance structures. All relevant stakeholders (local authorities, farmers and other rural stakeholders, urban/industrial actors, environmental protection organisations, academia etc.) should be involved.
- Showcase how innovative governance models at relevant levels can contribute to achieving EU objectives, such as the targets of the Farm to Fork and Biodiversity Strategies on reducing fertiliser use by 20% and nutrient losses by 50% until 2050³³², by fostering ecologically responsible and sustainable use, recovery and exchange of N/P relevant resources, services and infrastructures between urban/industrial and rural/coastal environments while taking into account local specificities.
- Identify opportunities to exchange N/P flows between both environments and demonstrate novel governance/structural approaches to fully exploit synergies that help bring these flows back within safe ecological boundaries by building on past and ongoing Horizon 2020 and Horizon Europe projects that develop a regional N/P load target approach while keeping within safe ecological boundaries.
- Implement innovative practices and technologies at different governance and stakeholder levels in order to promote increased dialogue and collaboration, to encourage behavioural change and public acceptance of recovered products as well as more effective problem-solving mechanisms.
- Assess these novel governance approaches, develop guidelines and recommendations for all concerned stakeholders on how to best implement these novel governance

³³² cf. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/farm-fork_en

approaches, disseminate results and best practice, and envisage regional twinning and mentoring schemes.

- Review existing EU policies and contribute to designing harmonised, coherent and efficient policies and regulatory instruments that facilitate eliminating and preventing N/P pollution and conduct a comprehensive evaluation of the ecological and economic cost of non-action.

Applicants are encouraged to select different regional clusters per project and to diversify their proposed consortia by involving a wide range of relevant stakeholders, such as primary producers, representatives of administrations at different levels, actors from related industries, value chains, environment organisations, academia, citizens, etc. This topic will be part of the demonstration projects for the implementation of the European Commission’s Circular Cities and Regions Initiative (CCRI) and must be carried out in close cooperation with it.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

If projects use satellite-based earth observation, positioning, navigation and/or related timing, they must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

HORIZON-CL6-2022-ZEROPOLLUTION-01-03: EU-China international cooperation on nature-based solutions for nutrient management

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Innovation Actions

Expected Outcome: In line with the Zero Pollution Ambition, the Farm to Fork Strategy, in particular promoting the global transition to sustainable food systems, successful proposals will support the development of Green Alliances on sustainable agro-food systems in relation to nutrient management that halt nitrogen (N) and phosphorus (P) pollution and limit N/P emissions to remain within safe ecological boundaries at European, regional and local scale. Moreover, selected proposals are expected to reinforce the transdisciplinary research and integrated scientific support for relevant EU policies and priorities (Common Agricultural Policy, Green Deal objectives, etc.).

Project results are expected to contribute to all following expected outcomes:

- Strengthened international cooperation with actors from China in the areas of nutrient management to halt pollution and limit N/P emissions to remain within safe ecological boundaries at different scales while restoring water, air and soil ecosystems.
- Develop and test Natural based Solutions (NBS)³³³ to plant nutrition and health, with innovative technologies that optimize the use of external inputs and helps European farmers in the implementation of regulated deficit strategies.
- Support for the implementation of the nutrient budget methodologies with new or improved technologies for different agricultural systems considering environmental, social and economic factors at different scales farms, regions and/or products.
- Identification and management of potential new sources and pathways of nutrients through distribution/sharing of organic wastes at local level to reduce nutrient loads to soil and water bodies.
- Uptake of knowledge and innovations in implementing a sustainable management of natural resources.

Scope: The success implementation of a sustainable nutrient management plan requires the availability of the technologies to support farmers in their decision-making and applications of the nutrients plans, based on the type of production system, environmental conditions, soil type, water availability and socio-economic aspects of both crops and nutrients. NBSs and innovative agricultural and environmental tools can improve nutrient management and strategies for, among other things, meeting the objectives of the European Green Deal, including the ‘From farm to fork’ strategy, and the ‘Biodiversity’ strategy, the Circular Economy Action Plan and the Zero Pollution Action Plan for air, water and soil.

Proposals will build on existing and new knowledge, data, models (including in situ calibration measurements) and available tools to:

- Develop smart nutrient management plans and methods to prevent, mitigate and when possible eliminate pollution in soils, water and air caused by nutrients and water management practices, across sectors, for different types of agricultural practices (conventional, organic and agro-ecological agriculture), and scales – farm, local, regional and river basin.
- Explore and assess the potential of alternative nutrient sources (organic vs inorganic), enhance management and recycling of organic wastes and explore nutrient recovery opportunities, for different agricultural systems.
- Analyse the effect of NBS on climate change and crop productivity including nutrient availability, and interactions between nutrients and carbon cycles.

³³³ As defined by the European Commission: Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services. In <https://ec.europa.eu/research/environment/index.cfm?pg=nbs>

- Develop models and tools to monitor nutrients flow based on remote sensing technologies and data, in agriculture and forestry systems: for physical, chemical and biological parameters;
- Engage with technology development actors, farmers and investors organising large scale online hackathon activities to support tech services for farmers at farm and local level in their nutrient management plans e.g. by allowing targeted field application of fertilisers (organic/inorganic), and addressing geographical imbalances in nutrient flows, e.g.
- Develop Decision Support Systems to assess and understand the performance and relative merits of NBS for nutrient management.

Proposals should fall under the concept of the 'multi-actor approach'³³⁴ and ensure adequate involvement of the farming sector and, as relevant, bio-based industries active in rural areas.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

If projects use satellite-based earth observation, positioning, navigation and/or related timing, they must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Actions will contribute to implementing the EU-China Food, Agriculture and Biotechnology (FAB) flagship initiative, which aims to ensure sustainability of agri-food systems, catering for the needs of a growing population, the reduction of food and agricultural losses and waste, and the provision of safe and healthy foodstuffs.

Due to the scope of this topic, international cooperation is strongly encouraged, in particular with China.³³⁵

Proposals are requested to collaborate with other relevant projects selected under other relevant topics/calls. In addition, proposals follow FAIR data principles, ensuring that resulting knowledge will be accessible through the Oppla portal.

Protecting drinking water and managing urban water pollution

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-ZEROPOLLUTION-01-04: Securing drinking water quality by protecting water sources against pollution, providing innovative monitoring and treatment solutions and ensuring safe distribution

Specific conditions

³³⁴ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

³³⁵ TBC co-funding (ONLY IF AGREED WITH CHINA) China based participants in projects selected under this topic are invited to apply for co-funding from the ministry of Science and Technology - MOST.

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal’s zero pollution ambition, successful proposals will contribute to halt and prevent pollution of freshwater and soils, and consequently also protecting biodiversity, as addressed by several impacts under Destination 4, in particular “Advanced understanding of diffuse and point sources of water pollution in a global and climate changing context, enabling novel solutions to protect water bodies, aquatic ecosystems and soil functionality, and further enhancing water quality and its management for safe human and ecological use, while fostering the European position and role in the global water scene.”

Project results are expected to contribute to some of the following expected outcomes:

- A wider use of a better understanding and an enhanced knowledge base required to assess pollution sources, pathways and combined effects on drinking water systems, including forward looking approaches aimed to anticipate and prepare for future or emerging challenges.
- Implement advanced preventive and mitigating strategies and measures to protect drinking water sources, treatment and supply against harmful effects of global and climate change.
- Apply effective risk assessment and risk management strategies enabling early warning systems and delivering ready-made outputs for decision-making and governance.
- Exploit advanced, integrated and cost-effective water quality sensors and analytical methods.
- Deploy innovative and robust monitoring systems and real-time information on drinking water quality, from sources to supply.
- Disseminate and use a robust knowledge on the occurrence, persistence and degradability of disinfection by-products (DBPs) in drinking water with due consideration to operational parameters, chemicals, materials and biofilms interactions, including the pathways related to human exposure.

- Spread the use of advanced and cost-effective drinking water treatment and disinfection processes and technologies, including transformative approaches.
- Broad uptake of advanced knowledge, breakthrough solutions and innovative technologies to enhance competitiveness of the EU water sector and fostering the EU's position and role in the global water scene.
- Increasing the EU scientific and technological base and guidance on measures to manage drinking water quality and evidence for policy-making, safety planning and implementation.
- Science and evidence-based implementation of the European Green Deal and the Sustainable Development Goals, notably the SDG 6 “Ensure availability and sustainable management of water and sanitation for all”.

Scope: The European Union policy framework has secured public safety and health objectives by the Drinking Water, Bathing Water and Floods Directives (EU, 1998, 2006, 2007), and the ongoing development and implementation of minimum requirements for water reuse. Despite the valuable output of implemented measures, some persistent problems are still a major, and sometimes unknown, risk factor for human and ecosystem health. Past contaminated sites and industrial activities managing hazardous chemicals, such as highly persistent compounds, together with agriculture and food production (pesticides, herbicides, antibiotics etc.), and household activities release a number of substances that individually or combined represent a concern for the safety of drinking water supplies. Detrimental effects of natural/human-made disasters and increasing water temperatures due to climate change could deteriorate the quality of drinking water sources by favouring the conditions for enhanced eutrophication leading to algal and cyanobacterial outbreaks as well as pathogen development or the spread of invasive species. Emerging concerns are also rising at the level of drinking water treatment and distribution, notably in relation to disinfection operations, materials and products, aging infrastructure, biofilm growth and possible harmful effects of unintentionally formed by-products and metabolites.

Actions in this field should aim to expand the knowledge base required to identify, assess and prevent pollution threats (micro-pollutants, pathogens, toxins, algal blooms, etc.) and the combined effects of multiple stressors on water sources, including risk assessment and management, to protect drinking water preparation and distribution. Particular attention to extreme weather events and possible synergistic effects affecting hydraulic flows, temperatures and pollutants' loads should be considered, whenever appropriate.

Advanced water quality assessment will need further development of sensors sensitivity, automated routine monitoring and fast analytical responses that fully integrate IT advances. Proposals in this topic should aim to extend the current analytical capacity to enable among other issues the detection of suspect and non-targeted pollutants, resulting in robust and reliable monitoring systems for consideration in future legislation. They should also consider the requirements of the revised Drinking Water Directive as regards catchment management.

Unintended disinfection by-products (DBP) and interactions with chemical reagents used for drinking water treatment (DWT), engineering and contact materials as well as the combined effects of biofilms formation are emerging as hazardous chemical risks that could affect human health. Proposals in this field should further extend the knowledge base of mechanisms and reactions leading to DBP formation by analysing raw water quality and precursors, as well as assessing DWT operational parameters, including disinfection needs, methods and doses. Advanced DWT solutions should explore integrated systems coupling different treatment technologies and strategies enabling the optimization of the operational DWT effectiveness while removing DBP risks.

In general, the participation of academia, research organisations, utilities, industry and regulators is strongly advised, as well as civil society engagement whenever necessary, also aiming to broaden the dissemination and exploitation routes and to better assess the innovation potential of developed solutions and strategies.

If appropriate, applicants are advised to seek complementarities and synergies, while avoiding duplication and overlap, with relevant actions funded under previous Horizon 2020 calls³³⁶, as well as targeted topics supported in the last Horizon 2020 and Horizon Europe calls, addressing micro/nano-plastics, persistent and mobile pollutants, such as per- and polyfluoroalkyl substances (PFAS), pharmaceuticals and contaminants of emerging concerns (CECs), pathogens and antimicrobial resistance. Whenever possible, proposals should consider already developed digital solutions for real-time water monitoring systems. Activities related to water reclamation and reuse, indirect potable use or alternative water sources are beyond the scope of this topic.

In order to better address some or all of the expected outcomes, international cooperation is encouraged.

³³⁶ Including access and use of data and information collected through long-term environmental monitoring activities supported by national and/or European research infrastructures.

Destination 5 – Land, oceans and water for climate action

Assessing the impacts of climate change on our land and marine environments, natural resources, agriculture and food systems, and identifying mitigation options and adaptation pathways, requires interdisciplinary and multidisciplinary research and investments across a broad range of activities. Research is needed to better understand who or what is exposed and sensitive to these changes, their underlying vulnerability, the associated costs and adaptive capacity. Research is also required to provide mitigation options that reduce the risk of long-term climate change

The conservation and enhancement of Earth's natural carbon sinks such as soils and plants, forests, farmed lands, wetlands and the oceans is crucial. The European Green Deal green oath to “do no harm”, requires a careful examination of the trade-offs and synergies among the sustainability goals, including health protection, food and nutrition security, ecosystem services and biodiversity preservation both on land and at sea. R&I has a significant role to play to support the design and implementation of policies that will ensure the achievement of EU climate objectives.

Agriculture has a significant role to play to reduce and mitigate GHG emissions and to enhance carbon sinks. It also needs to strengthen its capacity to adapt to climate change and its resilience. The forestry sector faces similar challenges.

Freshwater resources are increasingly under stress as a consequence of overuse and climate change with wide-ranging consequences for human societies and ecosystems. It is therefore necessary to define the safe operating space in terms of water quantity and availability, reduce the vulnerability to change and enhance our adaptive capacity.

Strengthening the ocean and climate nexus is another priority for the EU. There is growing political awareness of the importance of ocean and polar regions as an integral part of the Earth's climate system and of the need to ensure the integrity and resilience of these ecosystems.

While new knowledge leading to a better understanding of the impacts of climate change is necessary, a strong priority needs to be granted to the large-scale deployment and uptake of solutions for climate adaptation and mitigation. Environmental observations and related solutions will be necessary throughout, from understanding to deployment.

Understanding the impacts of climate change on primary production and natural systems is a pre-requisite for policy and societal action on climate change adaptation and mitigation. At present, our understanding of the interactions between climate change and ecosystem management, protection and restoration is limited, yet it is crucial to enabling sound decision making for mitigation and adaptation measures. Monitoring and evaluation of the impacts of climate change, land use change and associated biodiversity loss on a range of key issues related to agriculture and forestry are crucial with respect to the transition to net-zero emissions in the EU. R&I are also needed to close knowledge gaps in support of decision-

making aimed at preserving the integrity of ocean and aquatic ecosystems through a better understanding of the drivers of change and of emerging threats. Moreover, since water availability is vulnerable to climate change, it is necessary to improve the projections of changes to the water cycle at different relevant scales and projections of the frequency and intensity of extreme events. We also require improved long-term observations and assessment of the effects of climate change on diverse water uses and on the state of ecosystems and their services.

Reducing GHG emissions and enhancing carbon sinks in primary production and natural systems are key elements of the European Green Deal. Achieving sustainable land management and efficient use of natural resources that foster climate change mitigation implies finding the right balance between productivity, climate, biodiversity and environmental goals in the agriculture and forestry sectors, with a long-term perspective. R&I activities will support solutions for climate- and environmentally-friendly practices, to reduce emissions of major greenhouse gases and the environmental footprint of land use changes and agricultural activities. R&I, new technologies and business models are expected to unlock the full potential of LULUCF³³⁷ activities in the mitigation of climate change. Results of funded activities will benefit land and forest management and the delivery of multiple services provided by land and forests, such as the provision of goods as long-term carbon stocks in harvested wood products, peatlands and wetlands, the protection of soils, water and biodiversity and finally climate change adaptation and mitigation. Ocean is also a large storage system for the global reservoirs of climate-regulating factors. R&I will advance knowledge innovations to foster ocean-based solutions/mitigation options, helping to close the emissions gap.

Climate action calls also for fostering adaptation to climate change of ecosystems, primary production, food systems and the bioeconomy. Climate change is exacerbating existing risks to livelihoods, biodiversity, human and ecosystem health, infrastructure and food systems. There are growing concerns regarding the role of climate change in the spreading of new plant and terrestrial and aquatic animal diseases, which can jeopardise food safety and security. Human activities relying on the availability and use of water are particularly impacted by variable and extreme weather events, which may at the same time lead to desertification. Agriculture and forestry in the EU are vulnerable to climate change. There is in particular growing evidence about the effects of climate change, and of extreme weather events, on agricultural production and crop yields, which need to be mitigated, and also on the forest sector. Coastal areas are also threatened by sea level rise, saline water intrusion, biodiversity loss, ocean acidification, extreme events and a shrinking cryosphere. R&I will, therefore, be critical to foster adaptation and build resilience in agriculture, forestry and coastal areas. They will aim to deliver on the urgent need to foster the adaptation of primary production, notably by providing farmers and other actors in bioeconomy value chains with better-adapted crop varieties and animal breeds with lower impacts on the related ecosystems. R&I efforts are critical to avoiding, reducing and reversing desertification. Water adaptation strategies and approaches will be developed and tested. Appropriate solutions including water allocation

³³⁷ LULUCF stands for land use, land use change and forestry.

schemes will be developed for businesses, farmers and ecosystems. Potential trade-offs, and measures to mitigate and avoid them, will be assessed to ensure environmental sustainability and to keep the objectives of enhancing soil fertility, increasing carbon storage in soils and biomass, benefitting agricultural productivity and food security and reducing biodiversity loss. R&I will also aim at better understanding how institutions and behaviour shape vulnerability and offer opportunities for adaptation³³⁸.

Expected impact

Proposals for topics under this Destination should set out a credible pathway to contributing to climate action on land, oceans and water and more specifically to one or several of the following impacts:

- Better understanding and enhancing the mitigation potential of ecosystems and sectors based on the sustainable management of natural resources;
- Advanced understanding and science to support adaptation and resilience of natural and managed ecosystems, water and soil systems and economic sectors in the context of the changing climate;
- Efficient monitoring, assessment and projections related to climate change impacts, mitigation and adaptation potential in order to bring out solutions for tackling emerging threats and support decision-making in climate change mitigation and adaptation policies at European and global levels;
- Fostered climate change mitigation in the primary sector, including by the reduction of GHG emissions, maintenance of natural carbon sinks and enhancement of sequestration and storage of carbon in ecosystems;
- Improved adaptive capacity of water and soil systems and sectors including by unlocking the potential of nature-based solutions;
- Better managed scarce resources, in particular soils and water, thus mitigating climate related risks, in particular desertification and erosion, thanks to informed decision-makers and stakeholders and integration of adaptation measures in relevant EU policies.

Topics under this destination will have impacts in the following impact areas of the Horizon Europe Strategic Plan for 2021-2024³³⁹: “Enhancing ecosystems and biodiversity on land and in water”; “Clean and healthy air, water and soil”; “Sustainable food systems and nutrition security”; “A resilient EU prepared for emerging threats”; “A secure and open EU society”; “Inclusive growth and new job opportunities”

The following call(s) in this work programme contribute to this destination:

³³⁸ While Cluster 5 focuses on climate action with notably a destination dedicated to climate science and responses, Cluster 6 will address specific issues related to land, forests, soils, cropland, rangeland, natural areas, oceans and water in synergy with activities of Cluster 5.

³³⁹ Footnote indicating link to the document.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

Call	Budgets (EUR million)		Deadline(s)
	2021	2022	
HORIZON-CL6-2021-CLIMATE-01	108.00	10.00	01 Sep 2021
HORIZON-CL6-2022-CLIMATE-01		75.00	15 Feb 2022
Overall indicative budget	108.00	85.00	

DRAFT

Call - Land, oceans and water for climate action

HORIZON-CL6-2021-CLIMATE-01

Conditions for the Call

Indicative budget(s)³⁴⁰

Topics	Type of Action	Budgets (EUR million)		Expected EU contribution per project (EUR million) ³⁴¹	Number of projects expected to be funded
		2021	2022		
Opening: 15 Apr 2021 Deadline(s): 01 Sep 2021					
HORIZON-CL6-2021-CLIMATE-01-01	RIA	10.00		3.00 to 5.00	2
HORIZON-CL6-2021-CLIMATE-01-02	COFUND	10.00	10.00	Around 20.00	1
HORIZON-CL6-2021-CLIMATE-01-03	RIA	15.00		7.00 to 8.00	2
HORIZON-CL6-2021-CLIMATE-01-04	CSA	23.00		Around 23.00	1
HORIZON-CL6-2021-CLIMATE-01-05	RIA	7.00		Around 7.00	1
HORIZON-CL6-2021-CLIMATE-01-06	RIA	12.00		Around 12.00	1
HORIZON-CL6-2021-CLIMATE-01-07	CSA	3.00		Around 3.00	1

³⁴⁰ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

³⁴¹ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

HORIZON-CL6-2021-CLIMATE-01-08	RIA	8.00		Around 4.00	2
HORIZON-CL6-2021-CLIMATE-01-09	RIA	10.00		Around 5.00	2
HORIZON-CL6-2021-CLIMATE-01-10	RIA	10.00		Around 10.00	1
Overall indicative budget		108.00	10.00		

General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-CLIMATE-01-01: Improved understanding, observation and monitoring of water resources availability.

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 3.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.

<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In support of the European Green Deal and EU water-related policies, successful proposals will contribute to foster the adaptation of water resources to climate change, in particular Destination 5 impacts “Advance the understanding and science, and support adaptation and resilience of natural and managed ecosystems, water and soil systems and economic sectors in the context of the changing climate” and “Improve tools and technologies for efficient monitoring, assessment and projections related to climate change impact”

Projects results are expected to contribute to several of the following expected outcomes

- Enhanced knowledge base regarding water related climate change impacts, vulnerability, risk and adaptation assessments in Europe and abroad.
- Provide a more complete picture of future water vulnerabilities, including both water quantity and quality aspects, by better considering the interactions among climate change and variability, land surface and groundwater hydrology, water engineering, and human systems, including societal adaptations to water scarcity
- Support decision makers defining the safe operating space in terms of water quantity and availability, i.e., defining sustainable water management and climate change adaptation measures, meeting growing water supply, food, and energy needs, and controlling the high inter-annual variability in water availability
- Improve Member States’ preparedness for climate change impacts with respect to floods and droughts and support more accurate decision making for flood and drought risk reduction and response.
- Improve knowledge of ecological flows in the context of the Water Framework Directive and especially of the impacts of management, infrastructure and climate on ecological flows; improve prediction of drought events and water scarcity and enhance the assessment of the impacts of drought on water quality and biodiversity.
- Minimise the disparities associated with data collection and reporting between researchers and data agencies, enhance the interoperability, in particular through the mainstreaming of community-accepted standards, metadata schemas and data management best practices in line with the FAIR principles, between data providers and data users and strengthen coordination among various monitoring services
- Foster commitments between climate change and water scientists, monitoring services, industry, water utilities and other socioeconomic communities to collect, standardize, and widely disseminate information on water use in different sectors.

Scope: Freshwater resources are under increasing stress as a consequence of overuse and climate change with wide-ranging consequences for human societies and ecosystems. To reduce the vulnerability of ecosystems, society and water consuming economic sectors (agriculture, energy, industry) to climate change, it is necessary to enhance the knowledge on water resource availability and use, on future changes to climate and hydrological systems and on risks of extreme weather events.

Actions should address one or more of the following issues:

- A comparative assessment of the state-of-the-art integrated river basin models that are currently used for assessing water availability and vulnerability in the context of climate change. Models should be capable of simulating both surface and groundwater quantity and quality issues, as well as water supply and use and land use changes. They should be also able to take into account the socio-economic impacts of future climate change scenarios, as well as the costs and benefits associated with the adaptation strategies defined in response to those. In assessing water availability, an estimation should be made of the environmental flows necessary to sustain the health of both terrestrial and aquatic ecosystems. The impacts of various management and hydraulic infrastructure systems on the ecological flows of water and sediments should also be considered in this estimation. Assessments should be carried out in several river basins within and outside Europe, which are particularly vulnerable to climate change impacts and are facing significant water related problems, with a view to providing policy recommendations for long term infrastructure investments and management strategies beyond the river basins addressed.
- Improve accuracy and spatiotemporal resolution of regional scale projections of changes in precipitation, soil moisture, runoff and groundwater availability for management purposes, and quantification of the related uncertainties. Projections of changes in the frequency and intensity of extreme events such as severe storms, heat waves, floods, including flash floods and droughts should be also made. The potential of recent global observation studies and data collections, in cooperation with relevant EU earth observation initiatives, such as ESA, should be considered.
- Development of techniques, monitoring tools and innovative sensors for advance measurement and calculation of current available water balances and future needs and monitoring, leveraging on advanced computation technologies (e.g. high performance computing, edge analytics, cloud computing, and grid computing), artificial intelligence and Internet of Things
- Development of a long-term observation framework and capacity, in collaboration with the Copernicus Programme and GEOSS and any other relevant global observation initiatives, to support integrated analysis of water resource availability in Europe, including the development of community-driven, open access, end-to-end data infrastructures. This framework should be linked the European Open Science Cloud, as a pan-European cross-sectoral data space for Research and Innovation, and should include

all relevant in situ and earth observations needed to monitor and assess the impacts of climate change on water resource availability and to support integrated model developments and adaptation planning responses. Both surface and groundwater resources as well as water quantity and water quality issues should be considered. Particular attention should be given to ensuring availability of data to measure and/or assess relevant water use. In developing this framework, a thorough review of existing observational systems and initiatives at both EU and global level developed over recent years should be undertaken, and experiences and lessons learnt from previous long term water related research studies across a wide range of river basins within and outside Europe should be considered. Cooperation with relevant European water observation institutions and initiatives, such as ESA, EEA and JRC, is essential.

Actions should bring together a multidisciplinary and multi-institutional team of researchers to pursue a combination of field data collection, innovative data analysis methods, artificial intelligence and the development of data-driven reduced-complexity models for scientific understanding and to guide management decisions, and to support relevant stakeholders and policy makers.

All in-situ data collected through actions funded from this call should follow INSPIRE principles

In general, the participation of academia, research organisations, utilities, industry and regulators is strongly advised, as well as civil society engagement whenever necessary, also aiming to broaden the dissemination and exploitation routes and to better assess the innovation potential of developed solutions and strategies.

HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet (Water4All)

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 20.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 20.00 million.
<i>Type of Action</i>	Cofund Actions
<i>Total indicative budget</i>	The total indicative budget for the topic is EUR 126 million committed in annual instalments over the 7 years, 2021-2027 (EUR 10 million from the 2021 budget and EUR 10 million from the 202 budget).

Expected Outcome: In support of the European Green Deal and EU water-related policies, the successful proposal will contribute to foster the adaptation of water resources to climate change, contributing therefore to the Destination 5 impact “Advance the understanding and

science, and support adaptation and resilience of natural and managed ecosystems, water and soil systems and economic sectors in the context of the changing climate”, as well as preserve and restore ecosystems and biodiversity, prevent pollution in land and seas, enhance food security, foster sustainable and circular management of water resources and innovative governance.

Projects results are expected to contribute to all of the following expected outcomes:

- Increased protection of water resources and ecosystems and strengthening of biodiversity, by developing a more systemic and integrative policy which considers cross-sectoral interactions (water, biodiversity, agriculture, fisheries and aquaculture, energy, health).
- Enhanced resilience, mitigation and adaptation of water systems to climate change and multiple interacting stressors.
- Pooled resources (EU, Member States, Associated Countries, European platforms and economic sectors) and alignment within a shared and co-developed strategic research and innovation agenda (SRIA) and related implementation plans and better embedding of national and regional knowledge and innovation ecosystems within that of the EU.
- Leverage impacts of policies on the water security crisis, by upscaling projects (from research to demonstration) and supporting policy implementation based on cooperation, across stakeholders and sectors.
- Strengthened alignment between funders’ programmes and timelines and knowledge transfer, and addressing the lack of continuity of funding from research to implementation and difficulties in securing long-term investments.
- Greater cooperation across sectors, with multi-stakeholder engagement and empowerment, to co-develop and co-implement solutions and to drive the necessary societal transformations required for securing water for all.
- Reinforced role of the EU in the international water agenda (implementation of UN SDGs) and in strengthening water diplomacy.
- Science and evidence-based implementation of the European Green Deal and EU water-related policies.

Scope: Water resources are vital for all human activities and the environment. Ensuring that enough water of high quality is available for all purposes remains a key challenge globally and within Europe.

Global trends project world-wide growth in water use by 55% by 2050, due to growing demands from manufacturing, thermal electricity generation, agriculture and domestic use, all increasing the pressure of human activities on our freshwater resources. Furthermore, water quality is declining due to agricultural, industrial, mining and urban pollution, impacting the

availability of water of sufficient quality for users. According to the recently released Global Assessment by the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES), freshwater biodiversity is declining rapidly. Hydrological extreme events, such as floods and droughts, are going to increase, according to the latest IPCC conclusions, exacerbating the water crisis and impacts across all economic sectors.

Achieving good status of Europe's surface waters and providing enough water for all, is not only important for the implementation of EU water related policies, it is also an essential element for achieving other EU related policies, such biodiversity, agriculture, climate and energy related policies. Water is also central to all components of the European Green Deal. There is, therefore, a need to produce science-based knowledge to support the European Green Deal and other EU policies by monitoring problems related to water and developing feasible technical and managerial solutions.

Water is a dedicated UN Sustainable Development Goal (namely SDG6) but it will not be achieved by 2030 at current rates, considering trends in financing, capacity and political commitments. This will also undermine progress towards most of the other SDGs, particularly the goals related to poverty, hunger, health, clean energy, cities, climate, life below water and life on land, but also gender equality and peace, which are all related to water.

The diversity of challenges we are now facing to secure water for all, requires a new co-funded partnership that brings together all public and private research funders and supports a more efficient collaboration and integration of EU, Member States and Associated Countries R&I activities related to water. This will ensure a transition to a healthy planet, respectful of planetary boundaries, a resilient Energy Union, and implementation of an EU policy of climate neutrality, in line with Horizon Europe priorities.

It also requires the alignment and/or integration of different research and innovation agendas and of EU and national programmes, coordination of funding agencies and commitments to implement a long-term strategy that would deliver major changes and impacts. Based on a shared and co-constructed SRIA, such a partnership should combine bottom-up and top-down approaches to reconcile needs whilst pooling resources from different sources. It should foster consortium building and help leverage between existing initiatives under common broader or specific objectives. This will give direction and shape to a common water implementation strategy.

A European Partnership will also be necessary to deliver an objective and impact-driven approach and build critical mass in resources (human and financial), expertise and capacities in the longer-term, in line with the challenge faced. This would allow for the mobilisation of additional national resources with access to other instruments / financing / investments along the same strategic research agenda (e.g. real-life testing sites, research infrastructures, and innovation hubs or competitiveness clusters), contributing from collaboration that benefits existing European, national and local ecosystems.

Tackling the global challenges also requires different forms of cooperation (to maximise the types and number of partners involved). This would allow implementation of a larger range of

types of actions, such as development of academic and applied research, innovative solutions, including collaboration with enterprises in projects, transfer of innovation to enterprises, addressing the science/policy interface, while having better access to research infrastructures and connections to implementation tools (financial, regulatory), demonstration and training.

The co-funded European Partnership Water Security for the Planet (Water4All) should address the following vision: “Boosting the systemic transformations and changes across the entire research – water innovation pipeline, fostering matchmaking between problem owners and solution providers to ensure water security for all in the long term”.

Water4All should propose a portfolio of multi-national, multi-faceted and cross-sectoral approaches, encompassing policy, environmental, economic, technological and societal considerations to enable water security for all in the long term. It should therefore be implemented through a joint programme of activities ranging from research and innovation programme coordination to new knowledge and innovation development, transfer to policy-making, operational implementation and demonstration of the efficiency of solutions. It should be structured according to the following pillars:

- Identify research and innovation priorities to strengthen alignment of EU and national RDI programmes and increase the impact and policy relevance.
- Develop new knowledge and innovative solutions for a systemic and inclusive approach to water challenges at operational scale (e.g. river basin, water catchment).
- Transfer knowledge and innovation to i) policy-makers and ii) operators / managers so that they are able to implement the proposed solutions.
- Demonstrate the efficiency and the sustainability of the proposed solutions at local level, in close cooperation with the relevant actors (including policy-makers and decision-makers).
- Increase and strengthen international cooperation to develop a critical mass in relation to the global challenges faced.

This will create a continuum from the identification of the challenges to the demonstration of proposed solutions, ensuring a more rapid translation of research and innovation into concrete applications and uptake by relevant managers and citizens.

Water4All should rely on a core group composed of R&I programme owners and funders from ministries in charge of R&I policy and agencies, policy makers from ministries in charge of environmental policy and environmental / water protection agencies, from the EU, neighbouring countries and beyond the EU, as core members, in close cooperation with a wide range of other research and economic actors (multinational corporations, suppliers & SMEs, research & technology developers, water utilities, civil society organisations). Partners are expected to provide financial and/or in-kind contributions for the governance structure, the joint calls, and other additional activities. To achieve the international cooperation objectives, collaboration with non-European countries is encouraged.

The Partnership should be open to all EU Member States, as well as to countries associated to Horizon Europe and will remain open to such countries wanting to join.

To ensure the coherence and complementarity of activities, and to leverage knowledge investment possibilities, the partnership is expected to foster close cooperation and synergies with other ongoing EU and nationally funded R&I activities, the Horizon Missions on Healthy Soils; on Ocean, seas and waters; on Climate Adaptation and on Cities, relevant Horizon Europe Partnerships (Chemical Risk Assessment, Driving Urban Transition, Waterborne, Biodiversity, Blue Economy, Safe and Sustainable Food System, Agro-ecology living labs) and other programmes/initiatives (such as Cohesion Policy funds, LIFE programme, COST actions, Development and International Cooperation funds, ESA/Copernicus, KIC Climate, PRIMA, follow-up of BONUS). Proposers are expected to describe in details the way to implement such collaborations.

Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joints call for transnational proposals resulting in grants to third parties. Financial support provided by the participants to third parties is one of the primary activities of this action in order to be able to achieve its objectives. Therefore, the 60 000 EUR threshold provided for in Article 204 (a) of the Financial Regulation No 2018/1046 does not apply.]

Up to one proposal will be funded. The Commission considers that proposals requesting a contribution from the EU of EUR 126 million would allow these challenges to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. The EU contribution for this action will be implemented in annual instalments of around EUR 10-22 million.

HORIZON-CL6-2021-CLIMATE-01-03: Key polar processes driving regional & global climate change

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 7.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may

	additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to range between TRL 3 and 5 by the end of the project – see General Annex B.

Expected Outcome: In support to the European Green Deal and climate initiatives, and the EU Arctic Policy, successful proposals will contribute to strengthening the ocean - climate nexus and our understanding of the ocean and polar regions, as an integral part of the Earth’s climate system. Successful proposals will further the science for understanding key processes that link oceans to climate and people. They will allow for a better understanding of the nature and magnitude of these processes, and the impact of human activity on them. Given their specific vulnerability to climate change, this knowledge may help formulate the appropriate policy action to better protect the ocean and the polar regions and help ensure their health, integrity and resilience.

Project results are expected to contribute to all of the following expected outcomes:

- Increased predictability and reduced uncertainty associated with key polar processes and advanced understanding and science of the climate-ocean nexus.
- Contribution to the next generation observation and modelling of key climate-ocean processes and indicators.
- Contribution to the implementation of the EU Arctic Policy, the European Commission-European Space Agency Flagship Action on Polar Changes & Global Impacts, European climate policies and a substantial contribution to key international assessments, such as the Intergovernmental Panel on Climate Change (IPCC), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), World Ocean Assessment (WOA) and other major regional and global initiatives.

Scope: The current climate in polar regions is influenced by interactions between the ice sheets, the ocean, sea ice and atmosphere, and their response to anthropogenic climate forcing. Both the Arctic and Antarctic are connected to global climate through several feedback mechanisms, such as the Atlantic meridional overturning circulation (AMOC), snow albedo effect, sea level rise from melting glaciers and ice sheets, changing terrestrial ecosystems that lead to changes in fluxes of carbon dioxide, and methane nutrients. Several of these processes exhibit tipping points (e.g. methane hydrate release in a warming Arctic Ocean, thawing permafrost and release of carbon). Potential tipping points in the polar regions include a significant slowdown of the AMOC and a destabilization of Greenland and Antarctica ice sheets. There is deep uncertainty regarding the contribution the melting of the Antarctic ice sheet will make to mean global sea level rise towards the end of this century. The potential consequences vary greatly from region to region making the information needed at local and regional level highly relevant for supporting local and regional adaptation decisions. The Southern Ocean controls the natural release of CO₂ from the ocean, helps to absorb anthropogenic CO₂ and modulates transport of heat towards the Antarctic ice cap. The largest anthropogenic storage of CO₂ is in the North Atlantic. The observational record is not

long enough to determine if changes observed in the circulation of the Atlantic and Southern Oceans are due to internal variability, solar and volcanic forcing or a response to anthropogenic forcing.

Actions should aim at developing innovative approaches to address only one of the following options:

- a. Regional & global components of the Atlantic meridional overturning circulation (AMOC)

Actions will further the research on how and why the AMOC has changed over time, and how it will evolve in the future. Actions will endeavour to understand the entire system of the AMOC, as well as its links with the world ocean circulation system, in particular with the Polar Oceans. Actions will enable the sustained and sustainable observation of the AMOC by improving, developing and/or deploying existing and novel methods and technologies to observe the AMOC and its functions in the Earth system, and may include the development of advanced methods and digital technologies such as machine learning algorithms and multiple observational constraints. Observations should address climate change indicators, including indicators of past climate change, measurements of ocean heat content and currents, carbon dioxide solubility and fluxes, modifications of ocean circulation and climate feedbacks.

Action should address observational gaps of existing AMOC observing systems, focusing for example on formation regions, ocean boundaries and topographic constriction points, which are not or only poorly observed by large-scale observation systems such as the Argo array of profiling floats, or current generation satellite altimeters. Emerging technologies such as ocean gliders, remote mooring telemetry and autonomous vehicles offer opportunities to streamline traditional transport mooring arrays. This will lead to a more precise assessment (key for e.g. IPCC reports) of the risk of rapid changes using the newly released CMIP6 database and high-resolution models developed, inter alia, within the EU Horizon 2020 framework programme. Actions should add new observations of biogeochemical parameters (including carbon) and ecosystem-relevant quantities to observing arrays, thus providing synergy and optimisation of the long-term research infrastructure. Actions should also include reconstructions of deep boundary current intensities at different time scales to better discriminate/characterize anthropogenic impact from “natural” variability during the observational period. Actions should focus on improving models to better understand short-term variability and impacts on European and global climate. Moreover, action should interpret the recent changes in this context, to understand how close we may be to a climate tipping point.

- a. Improving understanding and observation of Antarctic key processes and the Southern Ocean circulation

Actions will endeavour to reduce the deep uncertainty regarding the Antarctic contribution to global mean sea level rise towards the end of this century. Action will further the science and understanding of the dynamics of the Antarctic ice sheet and its climatic triggers, which constitute the major source of uncertainty about sea level rise. Actions will endeavour to

understand the sensitivity of the low-latitudinal oceans to freshwater fluxes in order to advance the comprehension of the dynamics and functioning of the southern sources of deep waters, the Antarctic bottom water (AABW) circulation and thus counteract the deficit of scientific knowledge limiting the complete understanding of decadal to millennial time-scale climate change. Actions will focus on the potential importance of feedbacks between the northern and southern sources of deep waters. Actions will endeavour to close the gap towards producing an integrated view of the planet's climate system and the role of Antarctica in it. Actions will focus on understanding the Antarctica climate variability, Antarctic surface mass balance and the forces that control future change and responses to change, including tipping points. Actions will research the Antarctic ice sheet dynamics and integrate this knowledge into coupled ice sheet-climate models adapted to the Antarctic and Southern Ocean region, in order constrain and improve the accuracy and precision of predictions of future changes in global and regional temperatures, ocean acidification and sea level rise. Actions will reduce the gap in ocean observations in the Antarctica allowing for improved sea ice and weather forecasting and other environmental predictions that could improve the quality of various applications including search and rescue, coupling with numerical weather and seasonal predictions, historical reconstructions (reanalysis), aquaculture and environmental management including environmental emergency response. Actions will endeavour to understand how ice-shelf loss in Antarctica link with and impact on the ocean's circulations system, in particular the AMOC, and the relationship between the relative strength of the Antarctic circumpolar current (ACC) and AMOC.

For both options, in line with the Strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, with a strong linkage with the ongoing activities under the All Atlantic Ocean Research Alliance, with participation from bordering countries and countries – beyond the EU Member States and countries associated to Horizon Europe – that took part in the Arctic Science Ministerial. Actions under this topic should plan on a close collaboration among each other and with the EU Polar Cluster. Actions should build upon and link with past Horizon 2020 projects, EU PolarNET2, Copernicus, Sustaining Arctic Observing Networks (SAON), Scientific Committee on Antarctic Research (SCAR) and Southern Ocean Observing System (SOOS), and other international Ocean Observing Initiatives. The R&I needs to be conducted in a multidisciplinary and ecosystem-based approach. All in-situ data collected through actions funded from this call should follow INSPIRE principles and be made available through open access repositories supported by the European Commission (Copernicus, GEOSS, and EMODnet). The JRC may participate as member of the consortium but is not eligible for funding.

This topic links with research conducted under Cluster 5 ('Climate, Energy and Mobility') Destination 1 – Climate sciences and responses and Cluster 6 ('Food, Bioeconomy, Natural Resources, Agriculture and Environment') Destination 5 – Oceans for climate action and Destination 7 – Innovative governance, environmental observations and digital solutions in support of the European Green Deal, Deploying and adding value to Environmental Observations.

At least one proposal for each option should be funded under the call.

HORIZON-CL6-2021-CLIMATE-01-04: Demonstration network on climate-smart farming – linking pilot farms

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 23.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 23.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The conservation and enhancement of Earth’s natural terrestrial carbon sinks such as soils and plants, forests, farmed lands and wetlands is crucial. The European Green Deal gives R&I a significant role to play in supporting the design and implementation of policies that will ensure the achievement of the EU’s climate objectives. Project implementation is expected to contribute to mitigation and adaptation to climate change and help achieve climate neutrality by 2050.

Project results are expected to contribute to all the following expected outcomes:

- Expand the knowledge base of climate related practices, resulting in increased application of climate neutral farming approaches, assessing and evaluating different methods with all relevant actors involved;
- Speed up involvement and adoption by farmers of innovative / smart farming practices that mitigate emissions of GHGs and that foster adaptation of the sector to climate change. In the long term, this will support a more substantial contribution of the farming sector to mitigation of GHG emissions and to carbon storage;
- Increased involvement of Member States’ and Associated Countries AKIS in climate-related farming issues, including through linking to the EIP-AGRI national/regional/local projects and to advisors, with a view to wider dissemination and interaction within the Member States.

Scope: A wide adoption of practices contributing to mitigation of climate change and carbon storage by farmers is a priority to ensure that the EU reaches GHG mitigation objectives by 2030 and climate neutrality by 2050. Farming is also vulnerable to impacts of climate change; hence adaptation is of utmost importance. Mainstreaming the use of climate-smart practices has been recognised as a priority at the global level, including at the G-20. In particular, the engagement of farmers in this effort needs to be increased. Therefore, a strong involvement of Member States’ agricultural knowledge and innovation system (AKIS) is needed, as well as the development of targeted advice to farmers on climate issues.

The aim is to establish a three level network in a phased manner over Cluster 6 work programmes 2021/2022 and 2023/2024. The first level is a network which will engage front-runner farmers introducing on-farm trials and demonstration of innovations, using existing knowledge both in the EU and Associated Countries. The second level is a network to connect to all advisors on the subject in the Member States, building on achievements of Horizon 2020 projects and EIP-AGRI operational groups and the development of Member States' AKIS, to ensure the provision of targeted advice. The third level of the network will engage and strengthen the capacity of experimental research stations on climate issues.

The present topic deals with the level of commercial farms. This level will engage commercial farms led by sustainability-oriented farmers who are eager to pilot existing or new ready-for-practice techniques and demonstrate them to other farmers. The second level will aim at sharing broadly climate neutral ready-for-practice solutions through a collaborative innovation ecosystem, involving all advisors and the main AKIS actors and AKIS coordination bodies in Member States. The second level will be implemented through Topic HORIZON-CL6-CLI-2022-00-00 "Demonstration network on climate-smart farming – boosting the role of advisory services".

Proposals will:

- Network existing nationally or regionally funded trial farms, including those linked to universities and research institutes, and other farms not yet part of networks;
- Exploit existing and develop new solutions through practice oriented on-farm testing and demonstration in a co-creative approach with the pilot farmers and his/her advisor;
- Collect and compare tool-kits for assessing GHG balances at farm level, performance monitoring, decision tools, climate services, etc. for possible use on average farms;
- Support the implementation of the EU carbon farming manual as foreseen in the Farm to Fork Strategy and the implementation of the third party certification of carbon removals, as foreseen in the Circular Economy Action Plan;
- Foster knowledge exchange within and among Member States and regions and establish links with the EIP-AGRI and Member States' AKIS networks and coordination bodies;
- Link the demonstration farms into an EU demonstration farm network including all Member States to stimulate effective cross-fertilisation among Member States. Include a sufficient number of farmers and their advisors per country, taking into account the size of the Member State and ensuring a broad EU coverage;
- Proposals should include a task to collaborate with project of topic HORIZON-CL6-CLI-2022-00-00 "Demonstration network on climate-smart farming – boosting the role of advisory services" and a topic to be published in Cluster 6 work programme 2023/2024;

- The project should operate for at least seven years and build on the outcomes of the climate-related projects from various funding sources. The project will implement the multi-actor approach³⁴² and may involve social innovation.

HORIZON-CL6-2021-CLIMATE-01-05: Agroecological approaches for climate change mitigation, resilient agricultural production and enhanced biodiversity

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 7.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: A successful proposal will contribute to the European Green Deal and international objectives to foster climate change mitigation and adaptation in agriculture. It will in particular support the Farm to Fork Strategy objective for a transition to a fair, healthy and resilient European agriculture, notably its objective to promote agroecology. It will do so by unfolding the potential of agroecology as a farming system based on the sustainable management of natural resources. Activities will improve the knowledge base to inform decision-makers and other relevant stakeholders on how agroecology can contribute to these objectives, while remaining a profitable activity for farmers.

Project results are expected to contribute to all of the following expected outcomes:

- Increased and robust evidence of the potential of agroecology for climate change (mitigation and adaptation), its climate neutrality potential, impact on biodiversity, and the potential for improving farm socio-economic resilience. This will be achieved through quantitative and qualitative assessments allowing to identify and monitor the implementation and performance of optimal combinations of agroecological practices and strategies, as well as trade-offs or gains, barriers and drivers, for different crops and farming systems representative of the diversity of European farming, and at the farm and landscape level

³⁴² See definition of the multi-actor approach in the introduction to this Work Programme part.

- Qualitative and quantitative data availability of the social, economic and environmental sustainability and performance of agroecological strategies, contributing to a dependable and transparent knowledge base for EU policy design and implementation (Common Agricultural Policy, European Green Deal, objectives of the Farm to Fork and Biodiversity strategies, etc.)
- Increased understanding, adoption and implementation of agroecological practices by farmers
- Improved understanding of the definition of agroecology with regard to the European context and of its application to European farming.

Scope: Achieving sustainable agricultural production that fosters both climate change mitigation and adaptation of agriculture to climate change is a policy objective that implies finding a balance with productivity and wider sustainability goals, such as preserving and enhancing biodiversity. Agroecology³⁴³ can provide an important contribution to achieving these objectives, while at the same time enhancing food and nutrition security, thus contributing to achieving the objectives of the Farm to Fork and Biodiversity strategies and the Sustainable Development Goals. Agroecology is a holistic approach that relies on and maximizes the use of ecological processes to support agricultural production. By working more with nature and ecosystem services, agroecology has the potential to increase the circularity, diversification and autonomy of farms, and drive a full transformation of farming systems, from input substitution and beyond. The effectiveness of agroecology is context-specific and practices need to be implemented on a significant proportion of farms to deliver tangible impacts on sustainability. Specific methods and indicators are needed to monitor and quantify the positive effects of these practices on climate change mitigation and adaptation at the farm and landscape levels, along with its impacts on yield stability, farm viability and biodiversity, for different farming systems and pedo-climatic conditions. Moreover, improving farmers' uptake of agroecological practices calls for specific support measures and for the design of specific business cases at the farm and landscape levels.

Activities will improve knowledge of the contribution of agroecological practices to climate change mitigation, increased adaptation of farming to climate change, and preservation and enhancement of biodiversity, while ensuring farm profitability, thus providing an important contribution to policy design. Proposals should cover the wide range of crops and farming systems present in European agriculture. Projects should fall under the concept of the 'multi-actor approach'³⁴⁴, and should ensure adequate involvement of the farming sector. Projects funded under this topic will build on the results of relevant projects funded under Horizon 2020 and will ensure collaboration with projects funded under calls *HORIZON-CL6-SAG-2022-00-00: Agroecological approaches for sustainable weed management* and *HORIZON-CL6-SAG-2021-00-00: Digitalisation as an enabler of agroecological farming systems* in this Work Programme. . Projects will identify, evaluate and deliver a method that allows identification of the optimal combinations of agroecological practices and the most suitable

³⁴³ <http://www.fao.org/3/i9037en/i9037en.pdf>

³⁴⁴ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

agroecological strategies that efficiently contribute to climate change mitigation and adaptation while ensuring biodiversity preservation or enhancement and overall farm profitability. Projects will improve existing indicators and develop new ones where relevant, to monitor and measure the qualitative and quantitative impacts of these strategies, including their climate neutrality potential and trade-offs or gains in biodiversity, and the associated improvement in farm socio-economic resilience. Projects will develop tools to identify and monitor both the implementation of agroecological practices in farm management and the full-farm agroecological approaches, analysing the scale-dependent effects from farm to landscape level, as well as the opportunities and challenges derived from regulation and market aspects. Projects will develop and test innovative mechanisms to accompany farmers in implementing and/or switching to agroecological practices that contribute to mitigating climate change and other negative environmental impacts. Projects will undertake a socio-economic analysis of the social, environmental and economic sustainability performance of such strategies and analyse the potential to integrate such practices in business cases at farm level, including exploring the potential of labelling of products linked to agroecological practices to promote and scale-up their uptake.

HORIZON-CL6-2021-CLIMATE-01-06: Resilient livestock farming systems under climate change

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 12.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: A successful proposal will contribute to the European Green Deal and international objectives to foster climate change mitigation and adaptation in agriculture. It will in particular support the Farm to Fork Strategy objective for a transition to a fair, healthy and resilient European agriculture. It will contribute to climate action on land and more specifically towards climate neutrality by reducing GHG emissions and enhancing natural carbon sinks: better understanding and mobilising the mitigation and adaptation potential of livestock farming and related sectors based on the sustainable management of natural resources.

The following outcomes are expected:

- Enhanced adoption by farmers and other relevant actors of innovations that increase the mitigation and adaptation capacity of livestock farming systems to climate change, at animal, population and farm level, therefore improving the resilience of production systems as well as animal health and welfare.

- Improved capacity to assess the environmental and socio-economic impact of mitigation and adaptation practices and options at different scales, alone and in combination.
- Consolidated transition towards a resilient livestock production with novel integrated approaches (in terms of management, breeding, feeding, local resources use, etc.) defined for different climate change scenarios

Scope: Terrestrial livestock production is considered a large contributor to anthropogenic GHG emissions worldwide. Although emission intensity in Europe is lower in comparison to many other regions of the world, options to better assess and improve the emissions balance of terrestrial livestock production, weather intensive or extensive/low input, including organic, are necessary, including the evaluation of appropriate indicators of GHG emissions in different breeds, environments and production systems, in order not to rely solely on a reduction of the demand in food of animal origin to improve the emission balance of the sector. A variety of options have been identified, but are not yet common practice, and the potential of breeding to contribute to an improved GHG balance was not much investigated so far. In addition, the likelihood of further climate change occurring, and the increasing scale of potential climate impacts require addressing agricultural adaptation of the livestock sector as well.

The proposals should investigate at different levels (animal, herd, farm and sector, region) and with a coherent approach, practices and innovations that enable a reduction of the net GHG emissions by terrestrial livestock, while striving to ensure farm viability and resilience of productions systems, including adaption to climate change, and taking into account the impact on the environment and biodiversity. Trade-offs within and between the different levels should be addressed. At animal level, the research should use systems biology to study interactions between host and environment (e.g. feed and microbes) and how this interplay affects the efficiency of feed utilisation (energy and proteins) and GHG emissions, not least methane. Proposals will define and investigate traits/phenotypes, and the potential of breeding, to reduce GHG animal emissions or/and adapt to climate change. At farm level, different husbandry practices should be addressed. At sector/regional level, a system approach should investigate how different actors can cooperate to improve the GHG balance of livestock production, optimising the use of resources, including feed (e.g. production and origin), improving circularity. In addition to biophysical research, the proposals should address the potential socio-economic impact of the proposed practices and innovations, and look at options to facilitate their uptake. Proposals should develop or refine related tools for a proper assessment of practices and proposed innovations. Proposals should take into account novel farming systems and future scenarios, different breeds, particularly local breeds, various management approaches, climatic conditions and regional specificities. Proposals should address at least cattle and pigs and may address any other relevant species.

Proposals should fall under the concept of the 'multi-actor approach'³⁴⁵ and ensure adequate involvement of the farming sector, terrestrial livestock breeders, advisers and other relevant actors.

The proposals should take into account other EU-funded projects, including those funded under the ERA-NETs SusAn³⁴⁶ and ERA-GAS³⁴⁷.

HORIZON-CL6-2021-CLIMATE-01-07: International Research Consortium on (agricultural) soil carbon

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 3.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Activities should contribute to all of the following expected outcomes:

- establishment of an International Research Consortium on soil carbon and related issues.
- creation of a knowledge platform for sharing information on relevant research activities and results concerning methodologies for soil carbon balance monitoring, and practices for increasing soil carbon (e.g. carbon farming),
- better coordination of research activities *and of methods for monitoring soil carbon stock changes* at global level, thereby maximizing complementarities and avoiding duplication of efforts;
- validated methods to support national GHG inventories;
- *increased transparency with regard to progress towards commitments on soil carbon under the Paris Agreement on Climate Change.*

On the long(er) term, activities will contribute to meeting international commitments concerning carbon sinks (Paris agreement), as well as to the European Green Deal overall objective to become the world's first climate neutral continent by 2050.

Scope: Soil health is threatened both in Europe and globally by the effects of human activities and climate change. It is estimated that between one fourth and one third of global soils suffer from degradation. Soil degradation negatively impacts on food production, biodiversity or

³⁴⁵ See definition of the multi-actor approach in the introduction to this Work Programme part.

³⁴⁶ <https://era-susan.eu/>

³⁴⁷ <https://www.eragas.eu/en/>

soil's capacity to retain water and store carbon , Urgent action is needed to stabilize and increase soil carbon in soils, thereby also drawing down atmospheric CO₂ and monitor its status in more reliable ways, *at a range of scales from field to region and at a low cost*. Yet, knowledge and methodological gaps exist in relation to measuring soil carbon stocks and changes in soil carbon as well as with regard to effective measures for increasing soil carbon. Furthermore, R&I efforts are dispersed and results not widely known or taken up.

International research cooperation is needed to pool resources and scale up efforts for *monitoring soil carbon stock changes, remote sensing and modelling*.. Activities will include

- formalizing research cooperation between EU and international partners on soil carbon. While initially focusing on carbon in agricultural soils, the partnership shall progressively expand during the lifetime of the project to address also other land uses (e.g. forests, pastures, public areas for recreation);
- an analysis of results of on-going R&I and knowledge sharing through a single online knowledge platform with access to information and data from different existing repositories;
- building a roadmap for R&I priorities at international level based on identified knowledge gaps as well as identifying and developing joint flagship initiatives;
- establishing the methodological basis for a harmonized monitoring and verification of soil organic carbon balance.

For activities involving satellite-based earth observation, positioning, navigation and/or related timing, the selected project should use as much as possible Copernicus and/or Galileo/EGNOS (taking into account possible limitations on their use by international partners). Other data and services may be used additionally.

Data produced during the project should comply with FAIR principles and proposals will promote open access and open data approaches.

Activities should be implemented in synergy with major soil related European initiatives including the European Joint Programme EJP Soil and a planned mission in the area of Soil Health and Food.

HORIZON-CL6-2021-CLIMATE-01-08: Agroforestry to meet climate, biodiversity and farming sustainability goals

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	<p>The conditions are described in General Annex B. The following exceptions apply:</p> <p>If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).</p>

Expected Outcome: A successful proposal will contribute to the European Green Deal and international objectives to foster climate change mitigation and adaptation in agriculture. It will in particular support the Farm to Fork Strategy objective for a transition to a fair, healthy and resilient European agriculture, notably its objective to promote agroforestry as a sustainable farming practice that can foster climate change mitigation and carbon sinks in the primary sector. It will do so by optimising and deploying agroforestry for climate neutrality and mobilising its mitigation potential as a farming system based on the sustainable management of natural resources. Activities will improve the knowledge base to inform decision-makers and other relevant stakeholders on how agroforestry can contribute to better manage scarce resources such as soil and water in a changing climate.

Project results are expected to contribute to some of the following expected outcomes (depending on the activities covered):

- Improved qualitative and quantitative data availability of the contribution of agroforestry to climate change (mitigation and adaptation), soil conservation and (agro-)biodiversity (including genetic diversity within species) and to greater economic, environmental and social sustainability of farming
- Improved configuration and management of agroforestry systems, including systems involving animal production, through models and tools
- Enhanced capacities of various actors to measure the economic, environmental and social performance of agroforestry, in particular at farm level and in relation with the support scheme designed under the Common Agricultural Policy as regards environment and climate objectives, through appropriate methods and indicators
- A strengthened and more robust European agroforestry innovation ecosystem and increased end user acceptance and implementation of agroforestry in Europe
- Dependable and transparent knowledge base for EU policy design and implementation (Common Agricultural Policy, European Green Deal objectives, Farm to Fork and Biodiversity strategies, etc.).

Scope: Achieving sustainable agricultural production that fosters both climate change mitigation and adaptation and biodiversity preservation and enhancement is a policy objective that implies finding a balance with farm productivity, socio-economic viability and wider sustainability goals. Agroforestry systems include both traditional and modern land-use systems where trees are managed together with crops and/or animal production systems in agricultural settings. These systems have the potential to increase ecosystem services - including soil carbon sequestration, water retention, erosion control, soil nutrients, pollination, pest- and disease-control - and biodiversity, while improving farming productivity, profitability and sustainability of farmers' incomes. Implementation of agroforestry in Europe needs to be boosted in order to maximise this potential. The management of agroforestry systems is critical for their positive impact on climate and the environment as well as to ensure a balance with productivity and profitability for farmers. This is essential to promote the uptake and long-term sustainability of agroforestry. Projects will increase knowledge of the contribution of agroforestry to ecosystem services underpinning climate change mitigation and adaptation, increased biodiversity and farming resilience and will boost the implementation of this type of farming systems in different pedo-climatic zones across Europe. Projects should fall under the concept of the 'multi-actor approach'³⁴⁸ and ensure involvement of farmers and all other relevant actors in the value chain. Proposals will cover the conventional, agroecological and organic sectors. Projects funded will build on and expand existing knowledge, tools and initiatives developed by Horizon 2020 projects, and where relevant ensure coordination with those projects/initiatives. Projects should include a clear plan to collaborate with other projects selected under the topic. In order to achieve the expected outcomes, international cooperation is advised. Proposals will address at least five of the following activities:

- Design agroforestry systems for climate change (mitigation and adaptation) and increased (agro-)biodiversity that also ensure farming resilience to fluctuating climate, environmental and socio-economic conditions, farm income stability and enhanced ecosystem services, in different regions and pedo-climatic conditions;
- Develop methods and indicators that allow the identification of newly established agroforestry systems and monitor their performance over time. Analysis of trade-offs and synergies (e.g. between ecosystem services and between the environmental and socio-economic benefits) should be included;
- Develop models and tools adapted to real farm conditions and considering the full amount of food, feed (for systems including livestock), timber or biomass and ecosystem services produced, to allow the configuration and efficient management of agroforestry systems that take into account aspects such as tree renewal, adaptation to biotic and abiotic stresses, selection and improvement of agricultural varieties and animals most suited for agroforestry, recovery and improvement of biodiversity, soil water related aspects, and erosion control, in different regions and pedo-climatic zones;

³⁴⁸ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

- Building on existing tools and methods where available, enhance quantification of the contribution of agroforestry to ecosystem services underpinning climate change (mitigation and adaptation) in relation to aspects such as carbon sequestration potential, stability of organic carbon in the soil (top- and sub-soil), reduction of GHG emissions, soil erosion control, pest and disease control, increased organic matter in (top- and sub-) soil, and nutrient recycling, and develop indicators. When animals are present, animal production, health and welfare aspects should be considered;
- Enhance quantification of the contribution of agroforestry to increased (agro-)biodiversity, including on pollinators, and the linkages with soil quality and water quality and quantity, and develop indicators;
- Improve knowledge of the economic, environmental and social performance of agroforestry systems and their contribution to sustainable food and feed / non-food biomass production, analysing their productivity and profitability for farmers and factors influencing farmers' decision-making, and considering aspects such as crop / tree and livestock / tree combinations, factors explaining yield response variability, tree size, animal production, a mix of traditional and new systems and applications, etc. Identify needs for new equipment, machinery and management tools;
- Building on existing tools where relevant, develop a model to measure the impact of policies on agroforestry, both in terms of barriers or incentives to maintain existing agroforestry systems and to establish new ones. Sharing of experience among stakeholders as regards relevant Common Agricultural Policy support to agroforestry will be promoted. The potential of labelling of products linked to agroforestry will be investigated;
- Design and implement a plan to boost networking and R&I support to agroforestry at regional level, building on and expanding existing networks and initiatives where available and relevant, and involving policy makers, regional authorities, institutions, researchers, consumers and other key stakeholders;
- Develop a training package and guidelines to support farmers in designing business plans linked to value chain development to put in place and manage agroforestry systems in different regions.

HORIZON-CL6-2021-CLIMATE-01-09: Enhancing science-based knowledge on EU forests', including old-growth forests, capacities to mitigate climate change

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the EU Green Deal objectives and the EU Forest Strategy, successful proposals will support the preservation and enhancement of carbon stocks and sinks while supporting biodiversity and providing renewable resources for a circular and sustainable bioeconomy contributing to fostering climate change mitigation in the primary sector and carbon sinks and optimising and deploying nature-based solutions for climate neutrality. Project results are expected to contribute to all of the following expected outcomes:

- Forest managers adapting to sustainable management practices in view of climate change, bioeconomy and biodiversity objectives
- Improved knowledge on scenarios and sustainable pathways for forestry and the forest-based sector including measures and management strategies taking into account regional differences in Europe and changes in species composition.
- Increased forest-based carbon removals through forest management practices and uses of long-lived wood products
- Better understanding on how forest management impacts carbon sequestration in comparison to non-managed forests
- Pathways to achieve the ambition of the Paris Agreement ambition to limit climate warming
- Transfer of knowledge from science to practice (good practice)

Scope: Carbon sequestration by forest ecosystems has attracted much interest as a mitigation approach, as it can be considered as a relatively inexpensive option to address climate change in the short- medium- and long term. Forest lands, covered by the regulation on land use, land-use changes and forestry, are expected to contribute to the achievement of Europe's climate ambition for 2030. As shown in the in-depth analysis in support of the “Clean Planet for all” communication, this contribution needs to be increasing to achieve climate neutrality by 2050.

This topic aims to increase the science-based knowledge for an efficient implementation of good management practices that ensure the multiple functions of various forest types in Europe and to increase forest carbon stocks in the short-, medium-, and long-term.

Proposals will:

- Contribute to a better understanding of favourable management practices for both soil and vegetation, species selection and rotations to enhance and climate-proof forest carbon stocks (considering both in situ carbon sequestration and carbon storage in long-

lived wood products) and sinks, while considering the broad range of other forest values and ecosystem services.

- Consider the dynamics of the carbon stored in the different pools (above-ground biomass, below-ground biomass, deadwood, litter, soil organic carbon fractions, harvested wood products) under different forest management regimes and at different scales (EU-wide, national, local) to identify possible adaptations to current European models of sustainable forest management, so that the forest-based sector can optimise climate action, and to facilitate the monitoring and reporting of GHG emissions.
- Improve the integration of European forests, including forest practices, in global and regional climate modelling.
- Contribute to progress in the certification and authenticity verification of carbon removals that are nature-based (i.e. through forest protection, afforestation and sustainable forest management) or through the forest biomass used for longer-lived and higher-substitution products.
- Design and monitor the efficacy of forest-based mitigation plans, combining the growing potential of satellite-based remote sensing with surface monitoring.
- Develop recommendations for up-take in practice, including specifying which silvicultural measures to apply to which types of forest in order to maximize their mitigation potential while ensuring the provision of other ecosystem services, under the current and future climate, while fully respecting ecological principles favourable to biodiversity and soil conservation.
- Analyse socio-economic aspects of forest-based mitigation strategies, including forest managers' and users' perception and factors influencing their decision making such as consumer choices, sectorial integration and international/domestic competition.
- Improve knowledge on the environmental integrity, the social acceptability and the economic feasibility of forest-based mitigation actions such as afforestation, reforestation, forest restoration, forest protection, sustainable forest management and enhanced wood harvest and use, especially for long-lived products.

Proposals should include a task to collaborate with other projects financed under the topic *HORIZON-CL6-2022-CLIMATE-01-05: Forestry - European observatory of climate change impacts and demonstration network of climate smart restoration pilots*.

The JRC may participate as member of the consortium but is not eligible for funding.

HORIZON-CL6-2021-CLIMATE-01-10: EU-China international cooperation on increasing the resilience of forests

Specific conditions

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: In line with the European Green Deal objectives and the EU Forest Strategy, successful proposals will support the resilience and adaptation of forests and the forest-based sector contributing to advance the understanding and science, and support adaptation and resilience of natural and managed ecosystems, water and soil systems and economic sectors in the context of the changing climate.

Project results are expected to contribute to all following expected outcomes:

- Strengthened international cooperation with actors from China in the areas of forest adaptation to climate change
- Comprehensive knowledge base on the impact of climate change on forests and their capacity to adapt
- Increased adaptation efforts in climate change hotspots in the EU/associated countries (mountains, Mediterranean, Northern Scandinavian Peninsula, Central and Eastern Europe, outermost regions) and China
- Informed decision-making by forest managers adopting sustainable forest management practices.
- Knowledge transfer and capacity building at science-policy-practice interface.

Scope: Adaptation and increased resilience of forests is essential for the forests to maintain their function as carbon sinks, to protect existing stocks and to ensure that forests will continue to provide important ecosystem services and to support the forest-based bioeconomy. Due to the high variation of European and Chinese forests, diversity of landscapes as well as governance and ownership structures, adaptation strategies need to be adapted to regional conditions and circumstances, with focus on the most vulnerable forests in climate change hotspots.

Proposals will:

- Develop and refine projections at regional scale, improve the modelling of effects on natural vegetation, both at individual and ecosystem level and support science-based decisions with a view to the sustainable management of forests, including activities related to afforestation, reforestation and regeneration.
- Design adaptation plans to increase the resilience of forests by active management of the species composition (including through assisted species migration, and forest regeneration and afforestation with species already adapted and / or further improved to tolerate or even benefit from future climate conditions) while supporting forest production and ecosystem services under climate change in the various regions and forest types of Europe.
- Analyse socio-economic aspects of forest adaptation, including forest managers' and users' perception and factors influencing their decision making such as consumer choices, sectorial integration and international/domestic competition and analyse the potential of incentives and tools to reach forest managers and to encourage changes towards preventive strategies/measures by taking into account the different forms of forest governance and ownership.

The project will implement the multi-actor approach and ensure an adequate involvement of the primary production sector and the wider forest-based value chain³⁴⁹.

Proposals should include a task to collaborate with projects financed under the topic *HORIZON-CL6-2022-CLIMATE-01-05: Forestry: European observatory of climate change impacts and demonstration network of climate smart restoration pilots*. Actions will contribute to implementing the EU-China Food, Agriculture and Biotechnology (FAB) flagship initiative, which aims to ensure sustainability of agri-food systems, catering for the needs of a growing population, the reduction of food and agricultural losses and waste, and the provision of safe and healthy foodstuffs.

Due to the scope of this topic, international cooperation is strongly encouraged, in particular with China.³⁵⁰

Call - Land, oceans and water for climate action

HORIZON-CL6-2022-CLIMATE-01

Conditions for the Call

Indicative budget(s)³⁵¹

³⁴⁹ See definition of the multi-actor approach in the introduction to this Work Programme part.

³⁵⁰ TBC co-funding (ONLY IF AGREED WITH CHINA) China based participants in projects selected under this topic are invited to apply for co-funding from the ministry of Science and Technology - MOST.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ³⁵²	Number of projects expected to be funded
		2022		
Opening: 28 Oct 2021 Deadline(s): 15 Feb 2022				
HORIZON-CL6-2022-CLIMATE-01-01	IA	10.00	4.00 to 5.00	2
HORIZON-CL6-2022-CLIMATE-01-02	RIA	15.00	Around 15.00	1
HORIZON-CL6-2022-CLIMATE-01-03	CSA	20.00	Around 20.00	1
HORIZON-CL6-2022-CLIMATE-01-04	RIA	15.00	Around 15.00	1
HORIZON-CL6-2022-CLIMATE-01-05	RIA	15.00	Around 15.00	1
Overall indicative budget		75.00		

General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.

³⁵¹ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

³⁵² Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

<i>Procedure</i>	The procedure is described in General Annex F.
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Proposals are invited against the following topic(s):

HORIZON-CL6-2022-CLIMATE-01-01: Climate sensitive water allocation systems and economic instruments.

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 4.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: In support of the European Green Deal and EU water-related policies, successful proposals will contribute to foster the adaptation of water resources to climate change, in particular the Destination 5 impact “Advance the understanding and science, and support adaptation and resilience of natural and managed ecosystems, water and soil systems and economic sectors in the context of the changing climate”.

Projects results are expected to contribute to several of the following expected outcomes

- Achieve transparent water sharing and adjust water allocation across environmental and human uses towards long-term water replenishment capacity and availability,
- Adopt inclusive, forward-looking and climate risk-informed water allocation planning and management processes, foster adoption of digital technologies in water management
- Guide decision makers in transboundary rivers to share transboundary waters equitably, reaping the benefits of appropriate water allocation regimes.
- Identify water efficiency deficiencies and achieve improvement by at least 50% by 2030, in regions under water stress, now or in the future, and for water bodies at risk of failing to achieve good ecological or quantitative status.
- Reduce the water footprint of water-using sectors, especially agriculture, energy and industry.
- Promote financing mechanisms to smoothen the transition to more appropriate water pricing policies in water supply and sanitation and in the different economic sectors,

such as agriculture, energy and industry, taking into consideration the opportunities available in various EU (e.g. CAP, Cohesion Policy funds, etc.) and national funding mechanisms and policies.

- Help structure an appropriate policy dialogue to support water allocation reforms and increase stakeholders engagement.
- Support the implementation of the European Green Deal and the Sustainable Development Goals, notably the SDG 6 “Ensure availability and sustainable management of water and sanitation for all”.

Scope: Current water allocation regimes are largely shaped by historical preferences and usage patterns. They are therefore usually not well equipped to deal with the growing water needs and intensifying competition of the different water use sectors, the impacts of climate changes, especially water scarcity and/or shifts in societal preferences, such as increasing value placed on water related ecological services. It is therefore important to assess current water allocation systems in different regions and sectors and to develop pertinent water allocation models that are able to perform well under both average and extreme conditions and could demonstrate adaptive efficiency in order to adjust to climate conditions.

Actions under this topic should address ways to value water appropriately, taking into account the multiple and diverse values of water to different groups and sectors, and ways to develop appropriate tariffs and prices to ensure access to water which should be available and affordable to all, while also securing adequate pricing policies allowing for systematic renewal of water service infrastructure. Actions should develop and demonstrate in relevant river basins and sectors, innovative tools / instruments on intelligent water allocation schemes relevant for decision-making recommendations (e.g. on permits). The opportunities for developing water allocation schemes based on digital technologies should be explored.

The challenges for water allocation regimes, especially in developing countries, are also aggravated by weak water policies which contributes to structural water scarcity, increasing the risk of shortages for users and the environment. The interaction of policies, regulation and implementation mechanisms should be especially assessed, as well as, the interplay between conventional and non-conventional water resources (e.g. wastewater reuse, desalination, etc.).

Water allocation scheme in transboundary river basins should also be addressed with a view to developing an internationally accepted and standardized mechanism for allocation of water in cross-border river basins, by taking into account the various socio-economic and environmental disparities among these countries and making transboundary waters an area of cooperation rather than conflict.

Climate change impacts on freshwater resources can have significant impacts on agricultural production resulting in destabilising effects on agricultural markets, food security and other non-agricultural uses. Current water allocation regimes in agriculture should be reviewed in this context, with a view to developing the necessary combination of various adaptation measures, such as, water pricing, water use restrictions, improvement of water use efficiency,

economic incentives, water reuse, shifting to less water-requiring crops and fallowing, etc., to cope with the reduction of water availability anticipated in climate change scenarios.

International cooperation with non-associated third countries with transboundary rivers is encouraged.

In general, the participation of academia, research organisations, utilities, industry and regulators is strongly advised, as well as civil society engagement whenever necessary, also aiming to broaden the dissemination and exploitation routes and to better assess the innovation potential of developed solutions and strategies.

HORIZON-CL6-2022-CLIMATE-01-02: Understanding the oceanic carbon cycle

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 15.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to range between TRL 3 and 5 by the end of the project – see General Annex B.

Expected Outcome: In support to the European Green Deal and its biodiversity and climate initiatives, successful proposals will contribute to strengthening the ocean - climate nexus by reinforcing the scientific capacity to further our understanding of the natural ocean carbon sinks and their potential role in mitigating and adapting to climate change, help identify lasting solutions to climate change by paying greater attention to nature-based solutions for healthy and resilient seas and oceans. The ocean is a large storage system for the global reservoirs of climate-regulating factors. Successful proposals will also close knowledge gaps in support of decision-making aimed at preserving the integrity of ocean and aquatic ecosystems through a better understanding of the drivers of change in the ocean and emerging threats.

Project results are expected to contribute to all of the following expected outcomes:

- Furthered ocean exploration and increased understanding, predictability and reduced uncertainty associated with the oceanic carbon cycle and the role, capacity, spatial and temporal changes and trends over time in the ocean and its ecosystems in absorbing and storing CO₂ from the atmosphere.
- Improved understanding of the potential of the ocean and its ecosystems for contributing to the next generation of carbon cycling models, such as those used by the Intergovernmental Panel on Climate Change, to set global climate policy.
- Significant contribution to closing the knowledge gaps in the ocean carbon cycle and substantial contributions made to key international assessments, such as the Intergovernmental Panel on Climate Change (IPCC), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), World Ocean Assessment (WOA) and other major regional and global initiatives.

Scope: The ocean has a key role in regulating atmospheric CO₂ concentrations and currently take up about 25% of annual anthropogenic carbon emissions. The oceanic carbon cycle is composed of processes that exchange carbon between various pools within the ocean, as well as between the atmosphere, Earth interior, and the seafloor. The oceanic carbon cycle is a result of many interacting forces across multiple time and space scales. The oceanic carbon cycle is a central element of the global carbon cycle and contains three main processes (or pumps): the solubility pump, the carbonate pump, and the biological pump. In order to better understand, quantify and predict the ocean's potential for carbon uptake, actions will further research the oceanic carbon cycle. The deep sea and its water column may be the largest carbon sink on Earth but its large-scale carbon uptake potential and future is still unknown. Ocean carbon sequestration options include the management of natural ocean processes, i.e. actions to maintain the integrity of natural carbon stores and actions that enhance the long-term (century-scale) removal and sequestration of greenhouse gases from the atmosphere by marine systems, primarily by biological means. Actions should aim at developing innovative approaches to understand the complex processes underlying the oceanic carbon cycle, its efficiency, climate sensitivity, and emerging feedbacks. Actions should further the understanding of the resilience to climate change and temporal and regional variability of the natural carbon inventory in the ocean. Actions will further the understanding of how the biological pump and the deep ocean carbon sink will respond to the rapid and ongoing anthropogenic changes to our planet—including warming, acidification, and deoxygenation of ocean waters. Actions will advance the scientific understanding of marine pelagic and benthic invertebrate and vertebrate carbon, the carbon services they provide (i.e. trophic cascade carbon, biomixing carbon, carbon mineralisation, bony fish carbonate, whale pump, twilight zone carbon, biomass carbon, deadfall carbon and marine vertebrate mediated carbon), and the intricate biological pathways involved in carbon cycling and the associated implications for climate regulation. Actions will assess and model the marine vertebrate carbon services and shall link them to population dynamics, with a view to gathering enough evidence to enable their inclusion in the models of carbon cycling. Actions will assess and model the as yet poorly quantified carbonate-forming invertebrate species in the deep sea, such as reef-building scleractinians, as well as their resilience to cumulative impacts of global changes.

Actions shall contribute to ocean observations and the Digital twin of the oceans by providing an ocean carbon-modelling environment. Actions will improve the sampling of regions and metrics for marine organisms and will gather evidence and data to estimate and quantify the global CO₂ sequestration potential of protecting and restoring populations of invertebrates and vertebrates to previous levels. Actions will explore the efficiency and global magnitude of the biological pump and how this will be affected by climate change. Actions will deliver quantification and predictability of the ocean carbon sink and in so doing, will contribute to resolving the uncertainty in the magnitude and sign of projections of future global ocean primary production. The regional variability in the amplification or reduction of the efficiency of the ocean carbon sink is an important element that actions will take into consideration, as the climate effects on the carbon sink (both on the physical and biological drivers) will have a strong regional correlation. The importance of polar regions in the carbon cycle needs to be kept in mind. Actions will further the regional predictive skill beyond five years.

Actions will further investigate tipping points and irreversibility in the ocean carbon cycle (both for the upper ocean and the intermediary & deep ocean), the biogeochemical feedbacks, the changes that will occur in the 21st century, both globally and regionally, and how the multiple stressors will affect the primary production (monitoring strategies to have access to all the compartments - upper, intermediary and deep ocean). Among the stressors, the effects of trawling, drilling, overfishing, deep-sea mining and dredging on carbon cycling and sediment dynamics will be included and investigated using marine monitoring techniques. Actions will look into the policy implications of the findings of this research.

For this action, the multifaceted nature of the ocean carbon cycle requires collaboration across disciplines, taking an ecosystem approach. At a minimum, actions will link science on the changing ocean physics and chemistry, and more generally on climate, with the study of the marine biota and their evolution. In line with the Strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged. Actions under this topic should plan on a close collaboration among each other and should build upon and link with Horizon 2020 projects and other European and international ocean observing initiatives, including the Integrated Ocean Carbon Research, IOC-R. All in-situ data collected through actions funded from this call should follow INSPIRE principles and be available through open access repositories supported by the European Commission (Copernicus, GEOSS, and EMODnet). Where relevant, creating links to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) is expected.

This topic links with research conducted under Cluster 5 ('Climate, Energy and Mobility') Destination 1 – Climate sciences and responses; Cluster 6 ('Food, Bioeconomy, Natural Resources, Agriculture and Environment') Horizon Europe Mission Ocean, seas and waters, Destination 1 – Biodiversity and ecosystem services, Destination 4 – Clean environment and zero pollution, Destination 5 – Oceans for climate action, Destination 6 – Resilient, inclusive, healthy and green rural, coastal and urban communities and Destination 7 – Innovative governance, environmental observations and digital solutions in support of the European Green Deal; Horizon Europe Mission Ocean, seas and waters.

HORIZON-CL6-2022-CLIMATE-01-03: Demonstration network on climate-smart farming – boosting the role of advisory services

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 20.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 20.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The conservation and enhancement of Earth’s natural terrestrial carbon sinks such as soils and plants, forests, farmed lands and wetlands is crucial. The European Green Deal gives R&I a significant role to play in supporting the design and implementation of policies that will ensure the achievement of the EU’s climate objectives. Project implementation is expected to contribute to mitigation and adaptation to climate change and help achieve climate neutrality by 2050.

Project results are expected to contribute to all the following expected outcomes:

- Expand the knowledge base of climate related practices, resulting in increased application of climate neutral farm approaches, assessing and evaluating different methods with all relevant actors involved in Member States and Associated Countries;
- Speed up involvement and adoption by farmers of innovative / smart farming practices that mitigate emissions of GHGs and that foster the adaptation of the sector to climate change. In the long term, this will support a more substantial contribution of the farming sector to mitigation of GHG emissions and to carbon storage;
- Increased involvement of Member States’ and Associated Countries agricultural knowledge and innovation system (AKIS) in climate-related farming issues, including through linking to the EIP-AGRI national/regional/local projects and the advisors, with a view to wider dissemination and interaction within the Member States.

Scope: A wide adoption of practices contributing to mitigation of climate change and carbon storage by farmers is a priority to ensure that the EU reaches GHG mitigation objectives by 2030 and climate neutrality by 2050. Farming is also vulnerable to impacts of climate change; hence adaptation is of utmost importance. Mainstreaming the use of climate-smart practices has been recognised as a priority at the global level, including at the G-20. In particular, the engagement of farmers in this effort needs to be increased. Therefore, a strong involvement of Member States’ AKIS is needed, as well as the development of targeted advice to farmers on climate issues.

The aim is to establish a three level network in a phased manner over Cluster 6 work programmes 2021/2022 and 2023/2024. The first level is a network which will engage front-runner farmers introducing on-farm trials and demonstration of innovations, using existing knowledge. The second level is a network to connect all advisors on the subject in the Member States, building on achievements of Horizon 2020 projects and EIP-AGRI operational groups and the development of Member States' AKIS, to ensure the provision of targeted advice. The third level of the network will engage and strengthen the capacity of experimental research stations on climate issues.

The present topic deals with the advisory level. Learning from experiences on “real” farms led by sustainability-oriented farmers eager to pilot existing or new practice-ready techniques, this level will aim at enhancing up advisors' competences by sharing widely climate neutral ready-for-practice solutions across the EU. This requires interaction between collaborative innovation ecosystems and will involve the main AKIS actors and AKIS coordination bodies in each Member State.

Proposals will:

- Use advisors to spread solutions from practice oriented on-farm testing and demonstration in project work programme HORIZON-CL6-CLI-2021-00 “Demonstration network on climate-smart farming – linking pilot farms” and help develop new solutions through taking part in practice-oriented innovation projects such as EIP Operational Groups;
- Collect and provide tool-kits for GHG balances at farm level, performance monitoring, decision tools, climate services, etc. for possible use by a wide range of farms;
- Support the implementation of the EU carbon farming manual as foreseen in the Farm to Fork Strategy and the implementation of the third party certification of carbon removals, as foreseen in the Circular Economy Action Plan;
- Foster knowledge exchange within Member States and regions and establish links with the EIP-AGRI and AKIS networks and AKIS coordination bodies of Member States and Associated Countries;
- Link advisors in an EU climate-smart farming network including advisors in all Member States to stimulate effective cross-fertilisation among Member State advisors. Include a sufficient number of various types of advisor per country, taking into account the size of the Member State and ensuring a broad EU coverage;
- Proposals should include a task to collaborate with other projects involved in the network HORIZON-CL6-CLI-20212-00-00 “Demonstration network on climate-smart farming – linking pilot farms” and a topic to be published in Cluster 6 work programme 2023/2024);

- The project should operate for at least seven years and build on climate-related projects from various funding sources. The project will implement the multi-actor approach³⁵³ and may involve social innovation.

HORIZON-CL6-2022-CLIMATE-01-04: Fostering the resilience of food security: from observation of changes to the development of resilience strategies

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 15.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the European Green Deal climate ambition, project implementation is expected to contribute to mitigation and adaptation to climate change and help achieve climate neutrality by 2050.

Project results are expected to contribute to all the following expected outcomes:

- Establishment of a comprehensive capacity to observe the short-term to long-term drivers of change and their impacts on agriculture in key areas;
- Better informed policies and strategies regarding mitigation and adaptation to climate change;
- Better resilience of European food security to shocks such as those arising from various drivers of change, including climate change, including through the development of strategies and policies.

Scope: Resilience of the farming sector to exogenous shocks needs to be boosted. Impacts of climate change in the short- to medium-term are gaining more importance and there is an urgent need to develop resilience strategies. It is also necessary to set up a capacity to observe the short-term to long-term impacts of climate change and reinforce strategies to deal with those impacts.

- An observatory of the impacts of drivers of change on food security will be set up. The observatory will cover at least the following issues related to the impact of climate change: 1) biodiversity and genetic resources, with a focus on agro-biodiversity and invasive species and genetic resources under pressure as a consequence of climate change and 2) sustainable productivity (including impact on photosynthesis), animal and plant diseases and nutritional composition

353 See definition of the multi-actor approach in the introduction to this Work Programme part.

- The observatory will make use of various types of data, at various geographical scales and will include, as appropriate, citizen observations. It will cover the main biogeographical regions of Europe;
- The observatory will contribute to establish / reinforce strategies to deal with those impacts.
- The impact of shocks will be modelled as relevant for use in policy-relevant areas in order to improve resilience of the agro-food sector.
- Project will contribute to the development of a contingency plan for ensuring food supply and food security that is to be put in place in times of crisis as foreseen in the Farm-to-Fork Strategy.
- Case study strategies will be developed in a participatory manner to foster the resilience in the short- to long term at various geographic scales. These resilience strategies should also take into account the mitigation and adaptation objectives of the EU. Preparation of the strategies may be supported through grants to third parties. In this case, the proposal must define the process of selecting entities for which financial support will be granted, typically in the order of 60.000 – 200.000 EUR per party. It is expected that up to 30% of requested EU contribution will be devoted to grants to third parties.
- Proposals should ensure that the approach proposed is compatible with and improves the tools used at the European Commission. The JRC may participate as member of the consortium but is not eligible for funding.

HORIZON-CL6-2022-CLIMATE-01-05: Forestry - European observatory of climate change impacts and demonstration network of climate smart restoration pilots

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 15.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: In line with the European Green Deal objectives and the EU Forest Strategy, successful proposals will increase the knowledge on climate change impacts and enhance the practical knowledge on adaptive management practices contributing to efficient monitoring, assessment and projections related to climate change impacts, mitigation and adaptation potential in order to bring out solutions for tackling emerging threats and support decision-making in climate change mitigation and adaptation policies at European and global levels. Project results are expected to contribute to all of the following expected outcomes:

- Better knowledge on impacts and effects of drivers and pressures on Europe's forests in the context of climate change
- Combination of modern monitoring tools (remote sensing) and traditional approaches (demo sites) in European forests.
- Enhanced practical knowledge on restoration, afforestation, reforestation and forest protection addressing forest composition and forest management practices that support mitigation, adaptation, and (biodiversity), maximising the synergies and minimising trade-offs.
- Better knowledge on best practices for effective adaptation and mitigation strategies, including synergies with biodiversity management goals and soil carbon impacts.
- Increased capacity and exchange of scientific knowledge, proven experience and know-how, tools and practices.
- Engagement of the society in forest restoration through information, participation and merging of societal engagement with scientific evidence and professional expertise.

Scope: A holistic approach is needed to ensure that climate, biodiversity and bioeconomy goals can be integrated at different scales in practice and with the engagement of local communities, forest owners and industries. Intensive monitoring of impacts and sharing of experiences in the context of climate change is an important decision support at the science-practice interface to implement adapted forest management practices successfully.

Proposals will:

- Establish a European network to gather information on current developments in demo and long-term observation sites;
- Reinitiate EU participation in the International Co-operative Programme on the Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests) for long-term observations of forest ecosystems;
- Develop an evidence-based overview on current and planned forest restoration activities across Europe and their socio-economic and environmental impacts;

- Quantify possible synergies and trade-offs between contrasting forest management objectives at different spatial, temporal scales in different social environmental contexts in Europe;
- Analyse typical restoration cases to systematise knowledge on implementation successes and failures in specific regional settings, and distil best practices cases and business models for upscaling;
- Engage with key stakeholders and citizens to develop regionalized restoration trajectories through assessment of regional restoration pathways,
- Consider forward-looking forest conversion through adaptive forest management to mitigate/prevent future adverse effects
- Improve communication and network/capacity building and exchange of experience, engagement with key stakeholders including national and regional policymakers and enable knowledge exchange beyond the forest community.
- Pilot climate-smart forestry measures in view of the diverse forest conditions, value chains and societal needs found across Europe.

Proposals may involve financial support to third parties, particularly for setting up of the observatory and for supporting the implementation and scaling-up of climate-smart restoration pilots. All European climate/biogeographical regions should be covered. Consortia must define the selection process of organisations, for which financial support will be granted. It is expected that up to 40% of the project budget will be devoted to grants to third parties.

In order to achieve the expected outcomes, international cooperation is advised.

The involvement of citizens and civil society in co-creating solutions (e.g. as part of user-led innovation or citizen science), alongside other actors, is encouraged as part of the project's methodology/approach.

Proposals should include a task to collaborate with other projects financed under the topics HORIZON-CL6-2021-CLIMATE-01-09: Enhancing science-based knowledge on EU forests', including old-growth forests, capacities to mitigate climate change and associated risks and HORIZON-CL6-2021-CLIMATE-01-10: EU-China international cooperation on increasing the resilience of forests.

Projects should consider to collaborate with the EU Observatory on Deforestation and Forest Degradation, managed by the Joint Research Centre (JRC) of the European Commission. The JRC may participate as member of the consortium but is not eligible for funding.

Destination 6 – Resilient, inclusive, healthy and green rural, coastal and urban communities

Places and people matter to the achievement of a more sustainable Europe. The Sustainable Development Goals and the ecological and digital transitions brought forward by the European green deal³⁵⁴ and digital strategy³⁵⁵, alongside the recent pandemic, bring challenges and opportunities that differ for different places and people. Rural (including mountains and sparsely populated areas) and coastal areas, play a key role in managing, protecting and using natural resources. The provision of both private and public goods from these areas depends on the resilience and attractiveness of rural and coastal communities and the capacity of people who live and work there to access a sufficient level of well-being. The COVID-19 pandemic has highlighted deficiencies in digital infrastructures and economic opportunities that hamper resilience. Urban communities generally offer better access to many services but are also more vulnerable to supply-chain disruptions, as shown during the COVID-19 pandemic. Furthermore, they have a key role to play in fostering sustainable production and consumption as major demand drivers. In all communities, social and behavioural drivers play an important role in enabling or slowing down transitions. Knowledge and innovative solutions need to be developed to enhance every community's resilience and capacity to contribute to and benefit from the upcoming transitions in an economy that works for all territories and ensures a fair and just transition leaving no one behind.

Under this destination, transdisciplinary R&I with a strong social and behavioural sciences dimension, and attention to gender aspects, will foster a sustainable, balanced and inclusive development of rural³⁵⁶, coastal and urban areas in three different ways. Firstly, it will aim to increase our understanding of the differential impacts of climate, environmental, socio-economic and demographic changes on rural, coastal and urban areas in order to identify ways to turn these changes into equal opportunities for people wherever they live, enhancing territorial cohesion and enabling a just transition. Secondly, it will explore innovative ways to tailor policy responses to the place-based challenges identified at various levels of governance. Thirdly, it will support bottom-up community-led innovation to empower communities to develop, test and upscale solutions that answer global challenges in locally adapted ways. Achieving policy goals require providing people with more equitable access to the knowledge and skills required to make informed choices and be actively engaged in the sustainable and circular management of natural resources, from production or service provision to consumption. Rural, coastal and urban communities, in particular women, youth, the most vulnerable groups like indigenous people and those hit the hardest by the COVID-19 pandemic, need to see their labour conditions, quality of life and long-term socio-economic prospects improved in the context of major transitions and rising threats to climate, resources

³⁵⁴ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

³⁵⁵ https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/shaping-europe-digital-future_en

³⁵⁶ R&I will support the implementation of an [EU-level long-term vision for rural areas](#) to be published in the 2nd quarter of 2021.

and health. Their capacity to drive community-led innovations must be enhanced and their resilience increased across the diversity of European territories including remote places such as mountains and sparsely populated areas. Mobilising the forces of digital transformation, nature-based solutions, as well as social and policy innovation will facilitate necessary changes and support smart, environment and climate friendly and resilient lifestyles.

Activities under this destination are complementary to Cluster 2 activities with attention to spatial differences and specifics in relation with democracy (destination 1), socio-economic transformations (destination 3) and cultural heritage (destination 2). They are also complementary to Cluster 5's destination 2 on cities and communities that should explore place-based approaches to climate, energy and mobility specifically for all places.

To maximise the intended impacts and to ensure uptake by the communities, actions in the Cluster should aim for high standards of transparency and openness for the solutions developed, going beyond ex-post documentation of results and extending to aspects such as assumptions, processes, models and data during the life of projects.

Expected impacts

Proposals for topics under this destination should set out a credible pathway to contributing to resilient, inclusive, healthy and green rural, coastal and urban communities and more specifically one or several of the following expected impacts:

- Rural, coastal and urban areas are developed in a sustainable, balanced and inclusive manner thanks to a better understanding of the environmental, socio-economic, behavioural, cultural and demographic drivers of change as well as deployment of digital, nature-based, social and community-led innovations.
- Rural, coastal and urban communities are empowered to act for change, better prepared to achieve climate neutrality, adapt to climate change, and turn digital and ecological transitions into increased resilience to various types of shocks, good health and positive long-term prospects, including jobs, for all including women, young people and vulnerable groups.
- Rural communities are equipped with innovative and smarter solutions that increase access to services, opportunities and adequate innovation ecosystems, including for women, youth and the most vulnerable groups, improve attractiveness and reduce the feeling of being left behind, even in the most remote locations like mountains.
- The sustainable development of coastal areas including coastal protection and resilience reaps the benefits of social, digital and community-led innovations, to deliver nature-based and scientifically validated solutions to existing coastal socio-economic and environmental threats. In this way, applications of new social, economic and governance frameworks are enabled.
- Tourism, recreational and leisure activity development in natural and coastal areas respects long-term environmental carrying capacity, and social goals.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

- Urban and peri-urban communities – including the most vulnerable individuals and families – can access, afford and choose healthier, nutritious and environmental-friendly food.

Topics under this destination will have impacts in the following impact areas of the Horizon Europe Strategic Plan for 2021-2024³⁵⁷: “climate change mitigation and adaptation”; “enhancing ecosystems and biodiversity on land and in water”; “a resilient EU prepared for emerging threats”; “a competitive and secure data-economy” and “inclusive growth and new job opportunities”.

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2021	2022	
HORIZON-CL6-2021-COMMUNITIES-01	52.00		01 Sep 2021
HORIZON-CL6-2022-COMMUNITIES-01		42.00	15 Feb 2022
HORIZON-CL6-2022-COMMUNITIES-02-two-stage		33.00	
Overall indicative budget	52.00	75.00	

³⁵⁷ [Link to the Strategic plan](#)

Call - Resilient, inclusive, healthy and green rural, coastal and urban communities

HORIZON-CL6-2021-COMMUNITIES-01

Conditions for the Call

Indicative budget(s)³⁵⁸

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ³⁵⁹	Number of projects expected to be funded
		2021		
Opening: 15 Apr 2021 Deadline(s): 01 Sep 2021				
HORIZON-CL6-2021-COMMUNITIES-01-01	RIA	15.00	7.00 to 7.50	2
HORIZON-CL6-2021-COMMUNITIES-01-02	CSA	5.00	Around 5.00	1
HORIZON-CL6-2021-COMMUNITIES-01-03	RIA	10.00	Around 5.00	2
HORIZON-CL6-2021-COMMUNITIES-01-04	RIA	6.00	Around 6.00	1
HORIZON-CL6-2021-COMMUNITIES-01-05	IA	11.00	Around 11.00	1
HORIZON-CL6-2021-COMMUNITIES-01-06	CSA	5.00	Around 5.00	1
Overall indicative budget		52.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General

³⁵⁸ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

³⁵⁹ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

	Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-COMMUNITIES-01-01: Grasping rural diversity and strengthening evidence for tailored policies enhancing the contribution of rural communities to ecological, digital and social transitions

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 7.00 and 7.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal will contribute to fostering a sustainable, balanced and inclusive development of rural areas, supporting the implementation of the European green deal³⁶⁰, in particular its fair and just transition component, the European digital strategy³⁶¹, the European pillar of social rights³⁶² and the EU long-term vision for rural

³⁶⁰ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

³⁶¹ https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/shaping-europe-digital-future_en

³⁶² https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

areas³⁶³. It will do so by improving the understanding of the environmental, socio-economic, behavioural, cultural and demographic drivers of change in rural areas. Stronger evidence on which to build their strategies and initiatives will empower rural people to act for change and get prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience, good health and positive long-term prospects, including jobs, for all including women, young people and vulnerable groups.

Projects results are expected to contribute to all of the following expected outcomes:

- more evidence-based, place-based, integrated and tailored policies, strategies and governance frameworks at local, regional, national and EU levels to drive the sustainable transition of rural areas and communities, building on the specific outcomes below;
- a refined understanding by policy-makers and rural actors of the diversity of rural situations, and of the challenges and opportunities associated with megatrends, potential major shocks and upcoming transitions, in particular climate, environmental and social challenges, to tailor policy interventions to local realities;
- a refined understanding by policy-makers and rural actors of functional characteristics of territories, functional relations between rural places and other rural and/or urban places within a territorial continuum and the importance of these relations for sustainable development, to design synergistic approaches favouring a networked and interlinked development; and
- a refined assessment by policy-makers of the impact of all current and upcoming policies on rural communities (rural proofing³⁶⁴), including sectoral or thematic policies (such as climate, energy, mobility, digitalisation, health and social inclusion), or policy frameworks designed to accompany sustainability transitions in general, to tailor interventions to maximise possibilities for rural communities to contribute to and benefit from these transitions.

Scope: The EU aims to lead just digital, economic and ecological transitions that will leave no one behind. One quarter of EU citizens live in rural areas, which represent 76% of the EU territory and supply the whole of society with essential goods and services. These broad figures hide a variety of situations, challenges and opportunities regarding the aforementioned transitions that the current evidence base insufficiently captures.

The design of positive governance frameworks and policy interventions for rural communities is hampered by i) the lack of conceptual frameworks that properly grasp the role of rural areas and communities in sustainable development and sustainability transitions; ii) a lack of data on several aspects at the right geographic scale, in particular on climate and environment performance and on social challenges, quality of life and well-being. The lack of data at the

³⁶³ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12525-Long-term-vision-for-rural-areas>

³⁶⁴ See Point 1 ‘Promoting rural prosperity’ of the [Cork 2.0 Declaration \(2016\)](#)

right geographical scale (local in many cases) is hampered by the technical and economic difficulties of finer data collection.

Proposals should explore innovative and out-of-the box ways to describe and characterise rural areas or various forms or degrees of rurality in multi-dimensional ways, screening a wide range of possible (including new) data sources going beyond conventional indicators such as population density and settlement configuration. They should analyse national and other definitions and approaches and engage with stakeholders to understand their perspectives on rurality. Proposals should define and describe functional linkages between various localities and territories and explore and develop ways to apply functional geography approaches to rural areas (e.g. developing the concept of functional rural area), learning from past work³⁶⁵ and failures on such approaches. Trade-offs in selected approaches should be analysed in regional and national contexts highlighting geographical differences.

Proposals should screen and benchmark the performance and cost efficiency (infrastructure needs, ease and frequency of updates etc.) of data collection methods and technologies including new ones (e.g. digital technologies, geolocation and geospatial techniques, crowd sourcing, citizen science) that could be used to collect the necessary rural data at the local level across a majority of EU Member States and Associated Countries in Europe, at affordable costs and select viable options for testing these options. They should strengthen rural evidence and rural data collection, documentation and access, in particular in the environmental, climate and social fields by generating data and designing, testing and implementing methods to:

- calculate climate and environmental indicators for rural communities, including rural dwellers and secondary-homers;
- upgrade socio-economic (including culture) assessment, analysis, monitoring and evaluation tools (stats, indicators, including the measurement of well-being, quality of life and attractiveness including gender and age differences);
- assess resilience to major threats, with particular emphasis on resilience and vulnerability factors under the COVID-19 pandemic.

This should result in enriched, upgraded and regularly updated platforms, data and indicators mapping, describing and monitoring economic (including sectors, jobs and income), social (including quality of life and well-being) and environmental (including climate mitigation and adaptation and energy) characteristics of rural areas and communities at sub-regional, local or functional levels. The analysis carried out should help to grasp the diversity and specificity of rural places in the EU and Associated Countries, their inter-relations, their preparedness for transitions, major shocks and megatrends, their capacity to take advantage of these trends in adaptive and resilient ways.

³⁶⁵ Such as ROBUST (<https://cordis.europa.eu/project/id/727988>) and COASTAL (<https://cordis.europa.eu/project/id/773782>) under Horizon 2020 and projects funded under the ESPON programme <https://www.espon.eu/>.

Proposals should benchmark climate and environmental policies and existing frameworks to describe and measure well-being, quality of life and attractiveness, assess their relevance for rural areas and communities and make recommendations for adapting these frameworks. They should in particular propose innovative schemes to reach climate neutrality by 2050 while taking advantage of the ecological transition and preserving ecosystems (nature-based solutions), landscapes etc. Finally, they should support rural proofing³⁶⁶ by developing tools completing those already existing on territorial impacts (e.g. under the EU Better Regulation)³⁶⁷, to assess the impact of EU policies and programmes on rural areas and communities.

Proposals should fall under the concept of the multi-actor approach³⁶⁸, bringing together from the start multiple types of scientific expertise in both hard sciences (e.g. climate, energy, and environment) and social sciences and humanities³⁶⁹ (e.g. geography, sociology, behavioural sciences, policy, foresight) together with a variety of rural community representatives. The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding. Projects outputs should be scalable at least to the EU as a whole, hence they should be developed using data from a representative diversity of rural contexts across the EU. Proposals must strengthen evidence on rural areas and communities in a multi-dimensional way (proposals focused on one particular sector -e.g. primary production- or dimension of sustainability are out of scope). Proposals should engage with both national authorities and rural communities on their understanding of rurality and on project developments. Proposals should foresee a task to work jointly with other projects funded under this topic and with the European Commission, its common agricultural policy³⁷⁰ networks³⁷¹ and other relevant networks (e.g.: future Farm Sustainability Data Network (FSDN)³⁷²) and projects (including research projects³⁷³ and projects funded under HORIZON-CL6-2021-GOVERNANCE-01-13) contributing to building rural evidence.

³⁶⁶ Rural proofing means to ‘systematically review other macro and sectoral policies through a rural lens, considering potential and actual impacts and implications on rural jobs and growth and development prospects, social well-being, and the environmental quality of rural areas and communities’, [Cork 2.0 Declaration, A better life in rural areas](#).

³⁶⁷ Better regulation tool #33 on territorial impacts: https://ec.europa.eu/info/files/better-regulation-toolbox-33_en

³⁶⁸ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

³⁶⁹ This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

³⁷⁰ https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy_en

³⁷¹ Currently ENRD and EIP-AGRI (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en#enrd) to be replaced by the networks to be funded under the future CAP: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

³⁷² Commission Communication ‘A farm to fork strategy’ (in particular section 3.2) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381>

³⁷³ https://ec.europa.eu/info/research-and-innovation/research-area/agriculture-and-forestry/rural-and-farming-dynamics-and-policies_en

HORIZON-CL6-2021-COMMUNITIES-01-02: Expertise and training centre on rural innovation

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The successful proposal will contribute to fostering a sustainable, balanced and inclusive development of rural areas, supporting the implementation of the European green deal³⁷⁴, in particular its fair and just transition component, the European digital strategy³⁷⁵, the European pillar of social rights³⁷⁶ and the EU long-term vision for rural areas³⁷⁷. It will do so by accelerating the deployment of digital, nature-based, social and community-led innovations in rural areas through capacity building and enhanced knowledge exchange, leading to rural communities that will be better equipped with innovative and smarter solutions that increase access to services, opportunities and adequate innovation ecosystems. Enhanced capacities and better knowledge flows and innovation support will empower rural people to act for change and get prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience, good health and positive long-term prospects, including jobs, for all including women, young people and vulnerable groups.

Project results are expected to contribute to all of the following expected outcomes:

- enhanced capacity of rural communities and rural people to innovate for change thanks to the specific outcomes below;
- improved skills and knowledge of rural citizens, entrepreneurs, organisations, local action groups³⁷⁸ and community leaders of existing tools to develop and implement rural innovation (including social innovation) strategies and innovative actions to implement these strategies in rural communities, in all domains of relevance to rural life and economy;

³⁷⁴ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

³⁷⁵ https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/shaping-europe-digital-future_en

³⁷⁶ https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

³⁷⁷ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12525-Long-term-vision-for-rural-areas>

³⁷⁸ https://enrd.ec.europa.eu/leader-clld/lag-database_en

- shortening of the innovation cycle in rural communities and businesses leading to quicker results and transitions in rural communities, strengthened human capital, including more lively networks and improved attractiveness of rural communities, in particular for women and young people;
- enhanced valorisation by rural communities of the results of rural innovation projects funded under various programmes; and
- enhanced dialogue and cooperation on rural innovation worldwide, with sharing of learning resources.

Scope: Proposals should provide capacity building on rural innovation towards rural communities and actors in the EU and beyond, seeking to valorise the outcomes of projects funded under various programmes. The latter may include Horizon 2020, Horizon Europe, the common agricultural policy (LEADER, EIP-AGRI operational groups), regional policy (community-led local development, INTERREG, smart specialisation strategies), preparatory actions such as the Smart rural project³⁷⁹ or SMARTA³⁸⁰ and other EU or non-EU relevant actions. Projects from these programmes should be considered as relevant if they produced practical tools to develop and/or implement strategies and roadmaps in various domains (energy, digital, climate adaptation and mitigation, mobility, environment, social, education and care, food etc.), innovation approaches such as living labs, activities related to smart villages; training packages, videos etc. innovation activities in general and innovative solutions. Proposals should pay special attention to social innovation³⁸¹, which has been demonstrated to have a high potential to meet rural challenges. Social innovation is recommended when the solution is at the interface between social and technical solutions and requires social change, new social practices, social ownership or market uptake. Capacity building should target in particular communities developing smart village strategies³⁸² as foreseen under the common agricultural policy for 2021-2027³⁸³ or similar initiatives, paying attention to the needs of various groups within these communities (e.g. women, youth etc.). They should map and promote funding opportunities and prepare the ground for rural communities to take part in innovation actions funded under Horizon Europe or other innovation support actions that can be used to support ecological, digital or social transitions in rural areas (whether or not they are targeted to these areas).

Proposals should organise the capitalisation and exchange of knowledge between projects funded under Horizon Europe working on innovation for rural communities. They should feed in and translate results from the research and innovation actions as these results become available. They should allow the portfolio of projects to reflect on rural innovation processes, lessons learnt and ways to improve innovation processes and innovation systems for rural

³⁷⁹ <https://www.smartrural21.eu/>

³⁸⁰ <https://ruralsharedmobility.eu/>

³⁸¹ Social innovation is defined for this topic as “*the reconfiguring of social practices, in response to societal challenges, which seeks to enhance outcomes on societal well-being and necessarily includes the engagement of civil society actors*”. (SIMRA)

³⁸² https://enrd.ec.europa.eu/enrd-thematic-work/smart-and-competitive-rural-areas/smart-villages_en

³⁸³ https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

communities in a multi-dimensional and multi-sectoral way. They should also ensure a lively interface between actions supporting rural community-led innovation funded under Horizon Europe (e.g. HORIZON-CL6-2022-COMMUNITIES-01-01 and HORIZON-CL6-2022-COMMUNITIES-01-02 in the work programme 2021-2022) and common agricultural policy networks³⁸⁴. The project duration should be adapted to ensure such capitalisation is possible (a duration of at least five years is recommended). They may engage in collaboration with projects funded under other relevant calls (e.g. HORIZON-CL6-2021-GOVERNANCE-24 'deepening the functioning of innovation support', HORIZON-CL6-2021-CircBio-01-07 'Mainstreaming inclusive small-scale bio-based solutions in European rural areas'; HORIZON-CL6-2021-GOVERNANCE-01-09 'Revitalisation of European local communities with innovative bio-based business models and social innovation' etc.).

Proposals should explore with rural communities and benchmark various options and business models to create viable, networked and long-term rural innovation expertise and training mechanisms, centre(s) or hub(s) in Europe, able to capitalise on new knowledge and tools created and process them into training packages and sessions for rural communities in Europe and beyond. They should engage with international partners, including relevant international organisations (e.g. FAO, OECD) and partners in priority regions of the world for EU international cooperation on rural development (e.g. Africa) or with outstanding expertise in rural development, on resources to support the sustainable development of rural communities. Proposals may support participation of beneficiaries from these countries to capacity building activities.

Proposals should fall under the concept of the multi-actor approach³⁸⁵, bringing together the required competencies in communication, dissemination, exploitation and training alongside genuine knowledge of rural communities' context. Training contents and packages should be provided in multiple languages and multimedia formats allowing their wide dissemination in the EU and beyond. They should be developed, tested and validated taking into account the specific needs of various types of rural actors (including women, young people, entrepreneurs, community-leaders, elderly etc.) in various types of rural areas (e.g. close to cities, remote etc.) and cover a wide variety of important aspects of rural life that rural communities may want to innovate on (e.g. energy, mobility, education, services, health, climate, environment etc.). Proposals focusing on one type of activity or sector (e.g. primary production) are out of scope. Synergies may be developed with other actions targeting community-based innovations in specific domains, innovation support or education and training.

³⁸⁴ Currently ENRD and EIP-AGRI (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en#enrd) to be replaced by the networks to be funded under the future CAP: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_enhttps://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en#enrd) to be replaced by the networks to be funded under the future CAP: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

³⁸⁵ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

HORIZON-CL6-2021-COMMUNITIES-01-03: Smart XG, last-mile and edge solutions for remote farming, forestry and rural areas

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the ambitions of the Green Deal, the Digital Age and an Economy that works for all, the Farm to Fork Strategy and the European Strategy for data in particular, successful proposals will strengthen the capacities of famers, foresters and rural community through connectivity gains. They will therefore contribute to i) fostering a sustainable, balanced and inclusive development of rural areas thanks to the deployment of digital, nature-based, social and community-led innovations; ii) empowering people to act for change and get prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience; and iii) equipping rural communities with innovative and smarter solutions that increase access to services, opportunities and adequate innovation ecosystems.

Project results are expected to contribute to all of the following expected outcomes:

- Reduce (the risk of) digital divides between different types of farms, sectors and regions.
- Contribute to increase the competitiveness and social and environmental sustainability of the agricultural and forestry sectors and rural areas through innovative 5G (and 6G), last-mile and edge solutions.
- Facilitate decision-making, in particular for municipalities, farmers, foresters and their associations, in the selection of internet connectivity solutions under consideration of technical, economic and environmental aspects.
- Increase energy efficiency through analysing and developing connectivity options and contributing to climate mitigation.

Scope: Missing access to fast broadband still presents a development challenge to many rural and remote areas. Frequently, the investments costs appear to be too high in comparison to the final number of end users in certain regions. Sometimes only investing in the “last-mile” presents a bottleneck to the connectivity. End-user needs vary not only between communities,

but also between individual businesses and households, making it more challenging to find a common solution.

5G connectivity is a prerequisite for the running of several real-time applications, including of applications in the agricultural and forestry sectors, and has thus theoretically the potential to increase the economic and environmental performance of the sectors.

Overall, a range of possibilities to establish different types of broadband access at e.g. community-, farm- or field level are available going along with different investment and running costs.

Edge technologies allow under certain conditions the processing and analysis of data in remote systems, independently from larger data centres, which are frequently far away from rural communities. Edge technologies have the potential to reduce energy consumption.³⁸⁶

Communities and businesses in rural areas considering upgrading their internet connectivity are confronted with decision-making challenges regarding the choice of technologies in which they should invest in to achieve best outcomes at system level under consideration of technical, economic, environmental and social aspects and the location-specific requirements and systemic resilience.

Proposals should cover all of the following aspects:

- Assessing the socio-economic and environmental effects of innovative and existing 5G/4G/3G provision options (at regional-, community-, and farm-level) and making them feasible for non-scientists).
- Developing innovative cost-effective and environmentally friendly solutions to 5G-and last-mile provision in remote areas tailored to the needs of communities, farms and forestry.
- Assessing the socio-economic and environmental effects of innovative and existing edge technology options (at regional-, community-, and farm- level and making them feasible for non-scientists).
- Developing innovative cost-effective and environmental friendly edge solutions tailored to the needs of communities, farms and forestry, including an energy balance at system level.
- Developing innovative business models (including at systemic level and cross-sectoral approaches).

Proposals are expected to undertake a comprehensive stocktaking exercise of solutions towards 5G, last-mile and edge solutions existing in the EU and globally (including satellite-

³⁸⁶ See e.g. “A European Strategy for Data” published by the European Commission in Q1 2020 (<https://ec.europa.eu/digital-single-market/en/policies/building-european-data-economy>).

based solutions³⁸⁷ and other solutions, such as drones-assisted broadband provision), and of related studies and assessments. This review may also cover connectivity solutions developed in other domains, such as expedition, emergency or military services.

The aspects of regional and/or systemic resilience and energy efficiency are to be elaborated, including the contribution to climate mitigation. Different regional contexts in the EU and Associated Countries as it regards environmental framing conditions, as well as the structure of the society and economy are to be reflected. To tailor solutions to practitioners' and citizens' needs, proposals should fall under the concept of the multi-actor approach³⁸⁸.

Project results are to be made feasible to rural communities, farmers and foresters associations, and policy-makers. A decision-making support tool, which includes assistance in business model development, is to be provided. – Practitioner-orientation has to form a key element of the project(s).

Proposals are not expected to develop innovative technology solutions for the general use of 5G, but should reflect and build – as far as possible – on the (interim)results of relevant projects funded under Horizon 2020, Horizon Europe Cluster 4, the Digital Europe Programme, the Connecting Europe Facility and other research and innovation projects, to develop innovative solutions tailored to the needs of remote farming, forestry and rural communities.

HORIZON-CL6-2021-COMMUNITIES-01-04: Socio-economic empowerment of the users of the sea

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: The successful proposal will contribute to fostering a sustainable, balanced and inclusive coastal development, supporting the implementation of the European Green Deal, incorporating a better understanding of the environmental, socio-economic, behavioural, cultural and demographic drivers of change. Conducted research activities and innovative results will empower people to act for change through education and upgraded skills, leading to positive long-term prospects, including jobs, for all including women, young people and vulnerable groups. Among several potential coastal sectors being addressed, the

³⁸⁷ See e.g. OECD (2017) “THE EVOLVING ROLE OF SATELLITE NETWORKS IN RURAL AND REMOTE BROADBAND ACCESS”, for reflections on the potential of satellite-based broadband provision for rural areas.

³⁸⁸ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

proposal will ensure inclusion of tourism, recreational and leisure activity development in coastal areas to respect long-term environmental carrying capacity, and social goals.

Project results are expected to contribute to all the following expected outcomes:

- Better understanding of the environmental, socio-economic, behavioural, cultural and demographic drivers of change for users of the sea in coastal areas is taken into account by the policy making community.
- Better understanding of the nature connectedness of coastal communities and preconditions, hurdles and success factors for social transition and nature-based social innovation inspired the policy making community to take measures.
- Socio-economic resilience and well-being of coastal communities (including gender related) are measured, understood and enhanced through a properly developed and established link with coastal ecosystem services and cultural heritage.
- Empowerment of coastal communities and sectors to innovate for the ecological transition and feel part of it, through a multi-actor approach.
- Design of transition mechanisms and identification of the means to make necessary changes socially acceptable, that among others may include curiosity-driven citizen science initiatives and outcomes connected to specific societal and blue bioeconomy-related socio-economic challenges on coastal climate adaptation and mitigation, coastal pollution, coastal biodiversity, circularity and sustainability or other aspects of coastal (eco)tourism and cultural events etc.
- Creation of a well-connected community, involving companies, local businesses, social innovators, private investors, researchers, citizens and policy makers, which will bring together on the one hand research actions and results and on the other implementation actions, new initiatives, and policy developments for their own companies or local communities.
- Improved skills in ocean literacy education and awareness raising, social sciences, green skills and digital transformation to process and integrate large network input of gradually more ‘Green and Blue Literate’ citizens that are more engaged to take direct and sustainable action.
- Contributions to Maritime Spatial Planning and Integrated Maritime Policy, including the Water Framework Directive and the Marine Strategy Framework Directive.
- Contribute to the UN SDG 1, SDG 2, SDG 3, SDG 5, SDG 10, SDG 11 and with a specific emphasis on UN SDG 14.

Scope: The multi- and trans-disciplinary proposals shall undertake a thorough analysis of gaps in ocean literacy, marine environment connectedness like monetary and non-monetary values of the marine environment, socio-economic vulnerability and resilience (including gender-

related) and preparedness for the social transition of coastal communities and stakeholders in order to advance understanding of the preconditions and success factors for social transition and nature-based social innovation. Proposals shall deal with environmental and socio-economic challenges related to coastal climate adaptation and mitigation, coastal pollution, coastal ecology, coastal habitability and entrepreneurship, blue spaces and well-being, coastal (eco)tourism and cultural events, coastal food and energy production and consumption among others. Proposals shall identify opportunities based on coastal ecosystem services and active engagement and participation of the users of the sea in designing, implementing and maintaining nature-based solutions (including monitoring activities on the performance and impacts of the solutions), taking into account cultural heritage aspects where relevant. SSH approaches should serve through a multi-actor approach to orient and contextualise coastal STEAM (science, technology, engineering, arts and mathematics) activities related to the above-mentioned challenges in terms of social and economic impact as well as in terms of the deep impact of human behaviour, culture (including indigenous knowledge and practices) and history (including religion literacy) on all societal innovation and integrated sustainable coastal zone development and management. Proposals shall engage or create appropriate multi-stakeholder platforms who should jointly evaluate cultural, societal and economic marine or coastal practices that are not compatible with sustainability principles, avoiding duplication with other projects, existing initiatives or platforms. They will jointly identify required cultural and societal changes for a sustainable use of the sea, design transition mechanisms and identify the means to achieve necessary changes. Attention needs to be given to different learning arrangements (e.g. multi-actor networks, producer-consumer association, hybrid innovative networks, territorial alliances, twinning approaches) as well as to innovative governance mechanisms at various levels, and their potential implications for social transition and nature-based social innovation. Activities should cover diverse types of coastal areas across the EU and Associated Countries and non-European [Black Sea and Mediterranean] countries. In line with the objectives of the EU strategy for international cooperation in research and innovation, proposals are encouraged to include third country participants, especially those established in Black Sea and Mediterranean countries.

Proposals should fall under the concept of the 'multi-actor approach'³⁸⁹ and involve sea-based businesses, and economic and local development bodies. Engaging with managing authorities of European Structural and Investment Funds during the project would help increase implementation of the project outcomes and support further uptake.

Projects should build on existing knowledge and integrate results from multiple origins, including other EU, international or national projects. Some cooperation activities with projects financed under Destination 1 and topics of the Green Deal Call could be included, as well as with relevant projects from other EU programmes or with relevant EU initiatives and thematic networks.

This topic should be linked to the Horizon Europe Missions Ocean, seas and waters and Adaptation to Climate Change including Societal Transformation, the Partnership for a

³⁸⁹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

climate neutral, sustainable and productive Blue Economy, the Biodiversity Partnership or other partnerships where relevant.

Social innovation³⁹⁰ is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2021-COMMUNITIES-01-05: Integrated urban food system policies – how cities and towns can transform food systems for co-benefits

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 11.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as of the EU's Climate ambition for 2030 and 2050, the successful proposal will support the development of policies, business models and market conditions contributing to the sustainable, balanced and inclusive development of urban and peri-urban areas and to the empowerment and resilience of their communities, who can access, afford and choose healthier, nutritious and environmental-friendly food.

Project results are expected to contribute to all of the following expected outcomes:

- City-region food systems and of the urban-rural linkages across Europe are better understood and taken into account in urban policies;
- The concept of local food environments is better understood and taken into account in local planning, with a view to driving people towards healthier food choices and transforming urban food systems to be healthier, circular and resilient;
- More cities and towns build on good practice initiatives (e.g.: signatory cities of the Milan Urban Food Policy Pact) to develop integrated urban food policies and planning frameworks linking health, environment and food systems, bridging the national and the local level and including risk prevention and reduction plans to anticipate and manage food systems shocks, as well as to develop resilience;

³⁹⁰ https://ec.europa.eu/growth/industry/policy/innovation/social_en

- Strengthened urban food systems governance through increased multi-stakeholder engagement in designing and implementing urban food policies in cities and towns across Europe, representing different cultural and geographical settings;
- More Higher Education Institutes engaging in structured and long-term collaborations with local/regional actors to help transform their urban food system through participatory R&I;
- Improved decision-making by government actors willing to commit to change their local food systems, based on ready-to-use knowledge on the typologies, evolution, outcomes and impacts of integrated local food policies, throughout and within Europe, and in comparison with other regions.

Scope: Urban areas face a serious challenge to ensure healthy, affordable, safe and sustainably produced food to their residents. Many cities and their inhabitants are disconnected from their food – e.g. where it comes from, how it is produced, the impact food production and consumption have on the environment, climate and health, and the complexity and fragility of food value chains –. The way in which cities deal with food is highly variable and often fragmented, but integrated urban food policies and social innovations providing co-benefits are progressively emerging throughout Europe.

A key issue to be addressed is that of poorly planned urban food environments that drive citizens, and children in particular, towards unhealthy packaged food that is high in calories, sugar, salt and saturated fat, which contributes to obesity and diet-related illnesses. Furthermore, different shocks disrupting urban food systems worldwide can exacerbate the already limited access to healthy food, in particular for the urban poor.

Cities have the potential to make healthy and sustainable food available, affordable and attractive to all, which will in turn reduce consumption-based GHG emissions, in a win-win situation for people and the planet.

Proposals under this topic should address the following four issues and be targeted to help at least 5 cities/towns lacking integrated food systems policies to take ambitious and decisive action:

- a. Understanding: map local food systems, policies and actions, with a special focus on assessing short supply chains and urban food environments (including harmful marketing and advertising and unequal access to healthy food for the urban poor), and on developing local indicators and monitoring frameworks. This shall be built on existing tools such as the “Food systems dashboard framework” and should include the development of food systems stakeholder maps, maps of the formal and informal food flows and retail channels and, especially relevant in case of food shock crisis, maps identifying the most vulnerable people and their access to nutritious food. This shall include analysing the local responses to emergencies and take into account the environmental, social and economic dimension.

- b. Governance: develop and evaluate innovative, multi-actor, urban food systems governance processes and capacities for science-backed integrated policy making and implementation actions that deliver on Farm to Fork Strategy objectives and Food 2030 co-benefits for health, environment, climate, circularity and inclusion, while minimizing trade-offs. Special attention will be given to improving food environments, providing increased food access to vulnerable groups and fostering short supply chains.
- c. Engaging: mobilize a wide diversity of food system actors from farm to fork (i.e. public and private, the financial sector, civil society and academia). Higher education institutions and research centres, in particular, shall be engaged to collaborate with local actors to support evidence-based food policy development and to help provide local solutions to integrated food system challenges.
- d. Mutual learning: reinforce or create new networks of cities and towns to share good practices and learn from and support each other. This implies involving cities with well-developed food policies to provide guidance and lessons learned, as well as new forms of collaboration/twinning.

Proposals shall address inequalities in urban food systems, whether they be due to gender, race and other social categories.

Proposals should implement the multi-actor approach by conducting inter and trans-disciplinary research and involving a wide diversity of food system actors. In particular, they should ensure a strong involvement of citizens and civil society, together with urban designers, design thinkers, social innovators, planners, social scientists and public authorities to strengthen relationships between urban planning and food choices and to develop new methods and approaches to innovation.

Proposals will set out a clear plan on how it will collaborate with other projects selected under this and any other relevant topic/call, e.g. by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals shall ensure that any data produced during the project will comply with the FAIR principles. In addition, they will adopt an open access and open data approach whereby research outcomes and data will be freely-shared.

Proposals are encouraged to link with relevant EIT Knowledge and Innovation Communities.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

Proposals are encouraged to link with relevant EIT Knowledge and Innovation Communities.

HORIZON-CL6-2021-COMMUNITIES-01-06: Inside and outside: educational innovation with nature-based solutions

Specific conditions

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: A successful proposal will contribute to the EU’s goal of leading just digital, economic and ecological transitions that will leave no one behind, supporting in particular European Green Deal priorities such as the Biodiversity Strategy for 2030. It will support the empowerment of rural, coastal and urban communities to act for change and to contribute to the Green Deal objectives through education and upgraded skills regarding the design, implementation and benefits of nature-based solutions (NBS)³⁹¹. By doing so, communities will be better prepared to adapt to climate change through the deployment of NBS, and turn digital and ecological transitions into increased resilience and positive long-term prospects, including jobs for all, notably for young people.

Project results are expected to contribute to all following expected outcomes:

- Increased awareness of the value of NBS to educate children and young people in an innovative and holistic way, developing 21st century competencies, values and attitudes through an active and engaging pedagogy.
- NBS teaching programmes and materials are more widely available across the EU.
- Local communities across the EU are stimulated to co-create NBS , thus contributing to greater upscaling and impact of these solutions.
- Increase awareness and long-term public engagement on NBS and their benefits, enhancing citizens' capacity to act as responsible and participative actors in a knowledge-based society.

³⁹¹ As defined by the European Commission: Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services. In <https://ec.europa.eu/research/environment/index.cfm?pg=nbs>.

Scope: Citizens and experts have identified better awareness of the opportunities, benefits, and limitations of nature-based solutions (NBS) as one of the main factors that could facilitate the transition to more sustainable cities and territories, and help build physical and mental resilience. Examples of NBS include green roofs and green walls that cool down cities in the summer; parks that mitigate air pollution and provide leisure and exercise opportunities to citizens; green corridors connecting natural areas; urban food gardens, etc.

NBS build on nature and ecosystems to deliver social, ecological, and economic benefits, increasing biodiversity and contributing to climate change adaptation and mitigation. Their large educational potential remains quite unexplored, whilst innovative programmes and resources around NBS for children and families have only recently started to appear in formal and informal education. Building on scientific evidence and experiences from NBS projects in cities and involving teachers in different countries, an educational pilot study in 2020 exploited research results to develop educational programmes and resources, raising awareness on NBS and their benefits in primary and secondary schools³⁹².

The scope of the present topic is to upscale that pilot, broaden its geographical and educational reach, and increase its impact. The successful proposal should set up a multidisciplinary, pan-European network of education professionals, researchers, public authorities, multipliers and civil society to integrate and help create awareness and mainstream NBS-related EU research and innovation into primary and secondary schools, vocational training and higher education centres (e.g. architecture and engineering), influencers, mass media and other multipliers.

The successful proposal should develop learning scenarios, formal and informal education activities and training programmes for teachers to mainstream biodiversity and NBS in education at all levels, in a broad range of disciplines (not exclusively STEM), adaptable, freely available in all European languages, to be used inside and outside (remote learning, classroom, in/with nature, outdoors).

Actions should build on the results of the pilot project and the growing corpus of EU-funded project results, networks and initiatives to develop innovative, open-access educational programmes and materials to raise awareness on NBS and their social, economic and environmental benefits among children, young people and their families in an interdisciplinary, problem-based learning approach. They should combine the use of ICT (e.g. games, apps, etc), remote learning, audio-visual productions and social media with real-life experiences in nature and local NBS, such as educational green roofs and urban gardens. All programmes and materials should be tested in a network of pilots and should convey a call for action for students to engage with local stakeholders (e.g. involving celebrities as NBS 'ambassadors', where appropriate) and reflect on the different ethical, economic, environmental and social aspects related to NBS, including gender aspects. Responsible research and innovation (RRI) guidelines and tools must be applied. The work that the JRC may have developed on a competence framework for sustainability during the lifetime of the project must also be taken into account.

³⁹² www.scientix.eu/pilots/nbs-project.

Proposals must ensure that all evidence, information and project outputs will be accessible through the Oppla (the EU repository for NBS) and Scientix (the community for science education) portals³⁹³. The project will set out a clear plan on how they will collaborate with other projects selected under this and any other relevant topic/call³⁹⁴, by participating in joint activities, workshops, as well as common communication and dissemination activities. In particular, the project should liaise with NetworkNature³⁹⁵ and the community of EU-funded NBS projects. In addition, the project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles³⁹⁶. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

Call - Resilient, inclusive, healthy and green rural, coastal and urban communities

HORIZON-CL6-2022-COMMUNITIES-01

Conditions for the Call

Indicative budget(s)³⁹⁷

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ³⁹⁸	Number of projects expected to be funded
		2022		
Opening: 28 Oct 2021 Deadline(s): 15 Feb 2022				

³⁹³ <https://oppla.eu/> and www.scientix.eu, respectively.

³⁹⁴ Notably the Horizon 2020 Green Deal call; HORIZON-CL6-2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding; HORIZON-CL6-2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions; HORIZON-CL6-2022-COMMUNITIES-01-07: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities; HORIZON-CL6-2022-COMMUNITIES-01-06: Developing nature-based therapy for health and well-being.

³⁹⁵ <https://cordis.europa.eu/project/id/887396/>.

³⁹⁶ https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_0.pdf.

³⁹⁷ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

All deadlines are at 17.00.00 Brussels local time.

The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

³⁹⁸ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

HORIZON-CL6-2022-COMMUNITIES-01-01	RIA	6.00	Around 3.00	2
HORIZON-CL6-2022-COMMUNITIES-01-02	RIA	5.00	Around 5.00	1
HORIZON-CL6-2022-COMMUNITIES-01-03	IA	9.00	Around 9.00	1
HORIZON-CL6-2022-COMMUNITIES-01-04	IA	10.00	Around 10.00	1
HORIZON-CL6-2022-COMMUNITIES-01-05	RIA	12.00	Around 6.00	2
Overall indicative budget		42.00		

General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-COMMUNITIES-01-01: Boosting women-led innovation in farming and rural areas

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: The successful proposal will contribute to fostering a sustainable, balanced and inclusive development of rural areas, supporting the implementation of the European green deal³⁹⁹, the EU farm to fork Strategy⁴⁰⁰, the European pillar of social rights⁴⁰¹, the European gender equality strategy⁴⁰² and the EU long-term vision for rural areas⁴⁰³. It will do so by increasing the understanding of the social and behavioural drivers of change, especially in relation with gender norms and relations and by favouring the deployment of women-led innovations in farming and rural communities. Improved knowledge of the specifics of women-led innovation, more supportive innovation ecosystems and smart solutions coming from women-led innovations will empower rural people to act for change and get farming and rural communities prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience, good health and positive long-term prospects, including jobs for all, in particular women.

Projects results are expected to contribute to all of the following expected outcomes:

- more effective policy and governance frameworks and knowledge and innovation systems to boost women’s roles in the sustainable development of rural areas and in innovation in farming, in the rural economy and in rural communities;
- improved understanding, awareness and recognition of women’s role in the future of the farming sector (in particular ecological transitions), rural economies and communities and related innovation by policy-makers, rural citizens, innovation support services and scientists;
- combating and transforming gender norms and stereotypes, fostering broad social equalities and advancing Sustainable Development Goal 5 on gender equality; and
- enhanced capacity of rural women to innovate for change, including improved skills, solutions to challenges faced by rural women, stronger networks and enhanced knowledge flows from, between and towards women innovators in rural areas and in farming, facilitating the uptake and dissemination of successful innovations and innovation-support tools, in particular those contributing to ecological transitions.

Scope: The role that European women play in rural development and in farming is still widely under-researched. And so is their role as entrepreneurs and innovation leaders, the specifics of the innovations they develop and how the current governance framework contributes to

³⁹⁹ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁴⁰⁰ https://ec.europa.eu/food/farm2fork_en

⁴⁰¹ https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

⁴⁰² https://ec.europa.eu/commission/presscorner/detail/en/IP_20_358

⁴⁰³ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12525-Long-term-vision-for-rural-areas>

boosting their innovation capacity or to hampering it. Current evidence suggests that this role is underestimated and that the potential of rural women to contribute to sustainability transitions remains partially untapped, in particular due to a lack of targeting in policy frameworks and innovation support systems.

Proposals should analyse the role that women play and will play in the future of rural areas considering megatrends in European rural economies and communities in general and in farming in particular (proportion of official and non-official farm labour, involvement in innovative activities, role in social capital, specific social challenges and risks, relation to environment and environmentally-friendly farming practices etc.), highlighting differences between and within studied countries. They should analyse the specifics of women-led or gendered innovations in farming and in rural communities (specific needs and challenges, sectors and activities, scope, outcomes and benefits, hurdles and obstacles, knowledge and support sources and various forms of social capital involved), the relevance of the agricultural and rural knowledge and innovation systems for women, including education, training and advice. To this end, proposals should actively support a number of practical user-centred women-led interactive innovation initiatives to create knowledge of the specifics of women-led innovation processes, favour exchanges across initiatives and derive new knowledge and practical tools for women, support organisations and policy makers at national (including Associated Countries) and EU level to enhance change.

Proposals should benchmark EU and national policy and legal frameworks on farming and rural development for their gender equality performance, taking into account the new European gender equality strategy. They should also formulate recommendations on how to improve legal, policy or governance frameworks in rural economies in general and in farming in particular to support women-led innovation and women's role in farming and rural economies.

Proposals should be transdisciplinary, with a key role for social sciences and humanities (SSH) such as sociology, psychology, economics and innovation studies. This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities. Proposals should fall under the concept of the multi-actor approach⁴⁰⁴, involving women rural innovators and supportive organisations in all tasks alongside scientists, innovation support services and other relevant actors all along the project. The consortia and practical innovation initiatives supported should be located in a set of different locations representing the diversity of European rural socio-economic conditions. Proposals should include a task to coordinate with other proposals funded under this topic, as well as under topics on the 'expertise and training centre on rural innovation' (HORIZON-CL6-2021-COMMUNITIES-01-02), 'smart solutions for smart rural communities' (HORIZON-CL6-2022-COMMUNITIES-01-01), 'deepening the functioning of innovation support' (HORIZON-CL6-2021-GOVERNANCE-

⁴⁰⁴ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

01-24), other relevant projects and with future common agricultural policy networks⁴⁰⁵, to build synergies in engagement activities and dissemination and exploitation of results.

HORIZON-CL6-2022-COMMUNITIES-01-02: Assessing and improving labour conditions and health and safety at work in farming

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: The successful proposal will contribute to fostering a sustainable, balanced and inclusive development of rural areas, supporting the implementation of the EU farm to fork strategy⁴⁰⁶, and of the European pillar of social rights⁴⁰⁷. It will do so by increasing the understanding of the social and behavioural drivers of change, especially in relation with social inclusion, labour, health and safety aspects, and by favouring the deployment of innovations that improve labour conditions, health and safety in farming, equipping the sector with smarter and innovative solutions that increase opportunities for most vulnerable groups, improve attractiveness of farm work and reduce the feeling of being left behind. Improved knowledge leading to more supportive policy frameworks alongside practical innovations will empower people and businesses to act for change and get prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience, good health and positive long-term prospects, including jobs, for all including women, young people and vulnerable groups.

Project results are expected to contribute to all of the following expected outcomes:

- enhanced understanding and awareness by policy makers, farmers organisations, trade unions and health authorities of farmers’ and farm workers’ health and safety, and on the implications of the perceptions of their work on the future of the sector and hence on long-term food security;
- improved policy and governance frameworks favouring safer and more inclusive working environments for farmers and farm workers;

⁴⁰⁵ Currently ENRD and EIP-AGRI (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en#enrd) to be replaced by the networks to be funded under the future CAP: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

⁴⁰⁶ https://ec.europa.eu/food/farm2fork_en

⁴⁰⁷ https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

- wider use of corporate social responsibility innovations by farm businesses; and
- improved health, safety and labour conditions in farming thanks to better performing European and national policy and legal frameworks and innovative bottom-up initiatives.

Scope: Proposals should analyse health and safety at work issues in the farming sector with a specific focus on working conditions (and how they will evolve with digital transitions, climate change, health risks, regulatory developments on chemicals, farmers mental health, injuries, etc.) and labour conditions (seasonal patterns, working time, income and work outside legal contracts, including mobile EU and non-EU workers) also in relation to the perceived attractiveness of farming or working in farming as a job. They should analyse work risks and the vulnerability of farm workers of different genders and ages. They should engage with current and potential future farmers and farm workers on their perception of work in farming and their perspectives and plans for the future, including farm inheritance/take over, seeking to understand the attractiveness of the job (e.g. in relation to wages, stability, seasonality etc.). They should assess the impact of the type of labour force involved (family, local, external) on society and on the farm (including from the workers' perspectives) and the consequences in case of external shocks such as the recent COVID-19 pandemic.

Proposals should explore the potential of corporate social responsibility (CSR) initiatives and social economy and entrepreneurship to improve the situation of farm workers, including business models that reward improved working conditions through premium prices or other forms of reward, including for non-productive functions such as social inclusion, empowerment and care (non-EU good practices could be considered). They should analyse consumers' willingness to pay for more ethical working conditions and enabling conditions for market development in this arena. To this end, they should support social innovation, social entrepreneurship or corporate social responsibility pilots in a limited number of localities to serve as role models or positive examples to learn from and be scaled-up.

They should explore the policy implications of the outcomes (including regulation and control); benchmark policy design and delivery and make recommendations for improved policy frameworks at the right level of governance considering the various competencies involved (EU, national, regional etc.). Finally, they should develop training and education actions to raise farmers, farm workers, trade unions and farmers organisations awareness of health-protecting innovations that can be scaled up.

Proposals should fall under the concept of the multi-actor approach⁴⁰⁸, bringing together multiple science fields, in particular the social sciences and humanities (SSH) (e.g. sociology, behavioural sciences, psychology etc.), actors with complementary knowledge of health, employment, farm contracts, taxation etc., farmers and farmer organisations or trade unions and support groups for farmers facing difficulties. This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities. Proposals should cover a

⁴⁰⁸ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

representative variety of countries and sectors at least in the EU, covering in particular countries and sectors in which intra-EU and non-EU mobile workers are a significant part of the sector's labour force. Attention should be paid to gender and age disparities in the cases analysed and pilots supported.

HORIZON-CL6-2022-COMMUNITIES-01-03: Integration of marine ecosystem service valuation, conservation and restoration in socio-economic models

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 9.00 million.
<i>Type of Action</i>	Innovation Actions

Expected Outcome: In line with the European Green Deal, the successful proposal will contribute to fostering a sustainable, balanced and inclusive development of coastal areas, thanks to deployment of digital, nature-based, social and community-led innovations, to deliver nature-based and scientifically validated solutions to existing coastal socio-economic and environmental threats. People are empowered to act for change through upgraded skills and innovative governance that favours an integrated and interlinked territorial development. Coastal communities are better prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience to various types of shocks, good health and positive long-term prospects, including jobs, for all including women, young people and vulnerable groups. Tourism, recreational and leisure activity development in coastal areas respects long-term environmental carrying capacity, and social goals.

Projects results are expected to contribute to all the following expected outcomes:

- Nature-based and community-led socio-economic development in the coastal sector, revitalising social capacities in fragile communities and supporting environmental improvements, based on integrated marine ecosystem service valuation, management, conservation and restoration.
- Lasting cooperation between local communities and coastal sectors and authorities through enhanced governance and social innovation in different regional contexts.
- Properly assessed and transdisciplinary scientifically validated, supported and monitored social innovation experiments related to coastal climate adaptation and mitigation, biodiversity, water quality, pollution, seafood production, ecotourism etc.

- Innovative socio-economic models resulting from the projects, based on a long-term perspective using a participatory process of visioning and experimentation, are implemented in integrated coastal zone management.
- Improved employment prospects through job creation, development and training of knowledgeable regional/local ambassadors for natural habitat restoration and transformation.
- Scientifically validated recommendations for tourism development in coastal areas reflecting long-term carrying capacity and social goals.
- Nature-based scientifically validated solutions to existing socio-economic and environmental threats, are embedded in new regulations and European Directives like the Maritime Spatial Planning Directive, the Water Framework Directive, the Marine Strategy Framework Directive and the NATURA 2000 Directives.

Scope: Coastal ecosystems play an important role in nutrient recycling/regulation, sediment stabilisation and transfer, food production, reducing risks and impacts of climate change, etc. They are the basis of important socio-economic activities such as tourism and wellbeing, fisheries and aquaculture, housing and transport, trade, renewable energy. Integrated coastal zone management requires more and better integration of ecosystem services' valuation, management, conservation and restoration in socio-economic models through partnerships and collaborations between a range of multi-sector organisations, authorities and coastal communities for a balanced sustainable development and management of potentially vibrant coastal areas.

The multi- and trans-disciplinary proposals shall design, scientifically guide and develop nature-based coastal socio-economic models, businesses and marine spatial planning, based on the limits and potential of coastal ecosystem services. These scientific activities shall aim to avoid traditional conflicts between human-based activities, reduce urban pressures, protect and restore coastal ecosystems, and support critical ecosystem services in order to ensure good environmental or ecological status, social cohesion and resilience. The proposals will stimulate and benefit from increased nature connectedness of coastal communities; cultural heritage including traditional skills, nature-based social and frugal innovation, active engagement and employments of knowledgeable regional/local ambassadors for natural habitat restoration and transformation, ocean literacy training towards and within companies, digital transformation and collaborative (e)governance improvements. Activities could usefully include innovative business models integrating land-based and sea-based production or service provision with simultaneous benefit for the local economy, local jobs and the environment.

The proposals should cover a representative set of coastal areas or regions across Europe varying according to size and geographical, environmental, socio-economic, institutional and administrative conditions (regional, inter-regional, macro-region, cross-border). Interactive research approaches should be used to engage with relevant stakeholders, local businesses and citizens and elaborate options for cooperation, networking and integrated governance seeking

to enhance partnership. Proposals could seek to create long-lasting relationships within and between the case study areas benchmarked by the project in order to generate knowledge exchange to foster synergistic relationships in different coastal areas of Europe.

The potential use of instruments provided by the European Structural and Investment Funds for the period 2021-2027 should be explored. Some cooperation activities with projects financed under topic HORIZON-CL6-2021-COMMUNITIES-01-04, Destination 1 and Green Deal Call topics could be included; as well as with relevant projects from other EU programmes or with relevant EU initiatives and networks.

Proposals should fall under the concept of the 'multi-actor approach'⁴⁰⁹ and involve coastal actors and other land and sea-based businesses, and economic and local development bodies. Engaging with managing authorities of the European Structural and Investment Funds during the project would help increase implementation of the project outcomes and support further uptake.

This topic should be linked to the Horizon Europe Missions Ocean, seas and waters and Adaptation to Climate Change including Societal Transformation, the Partnership for a climate neutral, sustainable and productive Blue Economy, the Biodiversity Partnership or other partnerships where relevant.

Social innovation⁴¹⁰ is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2022-COMMUNITIES-01-04: Social innovation in food sharing to strengthen urban communities' food resilience

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as of the EU's Climate ambition for 2030 and 2050, the successful proposal will support the development of policies, business models and market conditions contributing to the sustainable, balanced and

⁴⁰⁹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.
⁴¹⁰ https://ec.europa.eu/growth/industry/policy/innovation/social_en

inclusive development of urban and peri-urban areas and to the empowerment and resilience of their communities, who can access, afford and choose healthier, nutritious and environmental-friendly food.

Projects results are expected to contribute to all following expected outcomes:

- The concept of urban food-sharing economy and of its impacts on the society, the planet and the economy at urban and peri-urban level are better understood, as well as the drivers to its development and the implementation gaps;
- Urban and peri-urban communities develop or strengthen their food-sharing economies as a step towards more innovative, inclusive, sustainable and resilient local food systems and supply chains that can also address emerging problems, such as the challenges posed by the measures to contain Covid-19;
- Prevention and reduction of food waste.

Scope: With the recent Corona virus pandemic, it is now evident that the risk of disruptions of food systems needs to be given greater attention. Strengthening the resilience of communities (in particular the most vulnerable and isolated, and those at risk of food poverty) to potential food system disruptions is at the heart of this topic.

The Pandemic has contributed to the emergence of territorialised and community-based food economies spontaneously created by citizens. These new sharing and circular economies are based on the redistribution of value, knowledge-sharing and reciprocal support, and are often supported by local governments.

Urban food sharing initiatives have been multiplying across a wide range of diversified cities, far beyond the wealthiest ones, and are often facilitated by new technologies such as apps, websites and social media. Such initiatives develop strategies that support an increase in resilience, social justice and empowerment of vulnerable and marginalised populations.

However, urban food sharing is still an unexplored – and debated – field; there is currently no agreed definition and many activities can be considered as part of it (e.g., kitchen spaces, meal sharing, food business incubators, collaborative delivery services, food donation). The lack of political interest, financing and sufficient data, as well as the existence of regulatory barriers and risks (both real and perceived), are holding back the rise of new food systems economies that work for all people and the planet.

The proposals will foster social innovation, with a special focus on building a more widespread and resilient food sharing economy, where different practices can be considered, while working on 5 distinct areas:

- Mapping, tracking and monitoring: building on the work of the EU-funded project ‘Sharecity’⁴¹¹, proposals will investigate the food sharing landscapes of at least 100 EU/Associated Countries cities to understand how food sharing landscapes differ within

⁴¹¹ <https://cordis.europa.eu/project/id/646883/>

and across countries; moreover, proposals will develop automated systems to search, collect and – especially – update existing urban and peri-urban initiatives;

- **Cost-benefit analysis:** proposals will define appropriate measures and indicators to assess the social, economic and environmental benefits of urban and peri-urban food sharing, including developing new indices to describe the specificity of food sharing economy. This will include the production of new knowledge on the challenges, implementation gaps and innovative mechanisms to foster for sustainable food sharing in cities, towns and neighbourhoods;
- **Comparative governance analysis:** proposals will investigate how different food sharing landscapes evolve and, also through a scenario analysis, how to transform the existing regulatory regimes, governance structures and habits, to promote sustainable food sharing;
- **Strategic planning:** proposals will exploit the potential for replicability/scale up of existing food sharing initiatives across the EU and associated countries and bring innovation into urban food systems design to integrate sustainable food sharing and build the urban food systems of the future;
- **Challenging the existing theories:** proposals will study the relationship between the evolution of social norms, culture and local conditions, including their change due to the global pandemics, and the rise of food sharing initiatives.

Furthermore, proposals will support the definition of innovative local strategies to overcome the barriers to food and nutrition security in urban areas and boost community resilience. This can include the creation and evaluation of distributive food systems (e.g. mutual aid programmes, local food systems networks) based on local needs and capacities, where value, knowledge and power would be redistributed fairly across actors and territories; tailored solutions - including social innovations, frugal innovation, technologies, new/adapted business models -, as well as new market places.

Proposals will address inequalities in urban food systems, whether they be due to gender, race and other social categories.

Proposals should implement the multi-actor approach by conducting inter and trans-disciplinary research and involving a wide diversity of food system actors, with a special attention to consumers and civil society organisations. They should ensure a strong involvement of citizens and civil society, as well as of academia, industry and public authorities in the development of the methods and approaches to innovation.

Proposals will explain and map how the co-benefits relevant to the four Food 2030 priorities will be achieved: Nutrition for sustainable healthy diets, Climate and environment, Circularity and resource efficiency, Innovation and empowerment of communities.

Proposals will set out a clear plan on how they will collaborate with other proposals selected under this and any other relevant topic/call, e. g. by participating in joint activities,

workshops, as well as common communication and dissemination activities. Proposals shall ensure that any data produced during the project will comply with the FAIR principles. In addition, they will adopt and open access and open data approach whereby research outcomes, tools and data will be freely-shared.

HORIZON-CL6-2022-COMMUNITIES-01-05: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: A successful proposal will contribute to the EU’s goal of leading just digital, economic and ecological transitions that will leave no one behind, supporting in particular European Green Deal priorities such as the Biodiversity Strategy for 2030. R&I will contribute to develop rural, coastal and urban areas in a sustainable, balanced and inclusive manner thanks to the deployment of nature-based solutions (NBS)⁴¹² and to a better understanding of the environmental, socio-economic, behavioural and cultural drivers of change. R&I will also further support the empowerment of communities to deploy NBS to adapt to climate change and turn digital and ecological transitions into increased resilience, well-being and positive long-term prospects, such as jobs for all (including for women, young people and vulnerable groups).

Project results are expected to contribute to all of the following expected outcomes:

- Enhanced contribution of nature-based solutions (NBS) to social and economic targets, especially in vulnerable communities and notably regarding the transformative change needed to address the biodiversity and climate crises.
- New NBS governance models and co-creation approaches and tools, as well as NBS design and technologies that enhance social benefits while providing ecological and economic benefits.

⁴¹² As defined by the European Commission: Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services. In <https://ec.europa.eu/research/environment/index.cfm?pg=nbs>.

- NBS are better suited to respond to different socio-political contexts and have higher replicability in the diverse environmental, economic and social conditions across Europe.

Scope: Nature-based solutions (NBS) are already being delivered, with increasing evidence on their effectiveness, but implementation issues persist, hindering NBS uptake and upscale. There is a need to move beyond seeing the implementation challenge as primarily a technical issue, to develop our understanding of the economic, social, political, moral and cultural dimensions of designing and implementing NBS⁴¹³.

Most of the available approaches seem inadequate to fully take into consideration synergies and trade-offs among different actions, notably in what concerns the social and cultural benefits of NBS. They often also fail to understand the social, political and institutional contexts and the material and discursive elements that shape NBS implementation. This, in turn, affects the long-term success of NBS, notably in contributing to the transformative change needed to address the biodiversity and climate crises. This understanding is particularly crucial when implementing NBS to support vulnerable communities and regions to cope with transformative change in old-industrialised, low-income or disaster-hit areas. NBS can also contribute to addressing inequities and well-being in communities and regions who need it most, especially in terms of the post-COVID19 recovery. Additionally, our understanding of how diverse actors – who may operate at different scales and through multiple networks – are engaged in the development and implementation of NBS is still limited, especially when the deployment of NBS implies collaboration across different regions, administrative areas or simply different types of land owners.

The successful proposals will:

- Gain a wider understanding of the role of actors involved in NBS, considering: a) particular groups of actors that have been under-researched (e.g. land holders such as churches, charitable organisations, educational establishments, utilities, etc.); b) sectors of the economy (e.g. agriculture, forestry, tourism, finance, etc.) and c) landscapes (e.g. coastal areas, river catchments, wetlands, etc.);
- Investigate how different NBS designs and governance can contribute to environmental justice, prevent environmental racism and gentrification, or include the views of women, youth, minority groups, immigrant communities, etc.;
- Develop innovative governance models: a) exploring different forms of engagement, inclusion and stewardship; b) enabling the breaking of silos in public administration and between different administrative domains; and c) tackling other legal, management and administrative issues;
- Propose ways in which NBS governance and design can contribute to transformative change and to a just transition in support of the SDGs;

⁴¹³ The economic aspects of NBS are the focus of HORIZON-CL6- 2021-BIODIV-01-05: The economics of nature-based solutions (NBS): cost-benefit analysis, market development and funding.

- Understand and propose solutions to functional conflicts in land-use for better and more integration between NBS, land-use planning and other (possibly conflicting) sectors, their policies and planning processes;
- Explore governance techniques (e.g. standards, certification, incentives, subsidies, etc.) that develop private and voluntary governance alongside formal regulatory and planning powers, with a view to mainstreaming NBS in the public and private sectors.
- Identify the possibilities for, and limits to, the full co-creation approach in NBS (including co-design, co-implementation, co-maintenance and co-monitoring), their underlying governance arrangements and instruments;
- Provide approaches based on citizen science, big data or artificial intelligence tools to better communicate the science of NBS and promote citizen engagement in the co-creation, co-implementation and co-monitoring of NBS;
- Understand how the meanings and values attached to nature in urban, rural, coastal, periurban or post-industrial areas affect the long-term success of NBS. To this end, investigate what counts as nature, what is valued and why this varies amongst individuals and communities as well as how this can be taken into account in the development of NBS.
- Investigate the impact of citizens' perceptions and expectations towards NBS on management decisions and delivery of ecosystem services, while considering also the role of NBSs in generating new kinds of connections and values for nature and with what consequences.

Proposals should address all of the above points.

Proposals should bring together from the start multiple types of scientific expertise in both natural sciences and social sciences and humanities (e.g. geography, sociology, political ecology, behavioural sciences, anthropology, philosophy, etc.).

Proposals should set out a clear plan on how they will collaborate with other projects selected under this and any other relevant topic/call⁴¹⁴, by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals should adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles⁴¹⁵. Applicants should plan the necessary budget to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase

⁴¹⁴ Notably the Horizon 2020 NBS project portfolio and its relevant task forces; HORIZON-CL6- 2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding; HORIZON-CL6- 2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector; HORIZON-CL6- 2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions; HORIZON-CL6- 2022-COMMUNITIES-01-06: Developing nature-based therapy for health and well-being; HORIZON-CL6- 2021-COMMUNITIES-01-06: Inside and outside: educational innovation with nature-based solutions.

⁴¹⁵ https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_0.pdf.

with the Commission. Proposals must ensure that all evidence, information and project outputs will be accessible through the Oppla portal (the EU repository for NBS)⁴¹⁶.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

In order to achieve the expected outcomes, international cooperation is advised, in particular with the CELAC region and the USA.

Call - Resilient, inclusive, healthy and green rural, coastal and urban communities

HORIZON-CL6-2022-COMMUNITIES-02-two-stage

Conditions for the Call

Indicative budget(s)⁴¹⁷

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ⁴¹⁸	Number of projects expected to be funded
		2022		
Opening: 28 Oct 2021				
HORIZON-CL6-2022-COMMUNITIES-02-01-two-stage	IA	14.00	Around 7.00	2
HORIZON-CL6-2022-COMMUNITIES-02-02-two-stage	RIA	19.00	Around 6.00	3
Overall indicative budget		33.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General

⁴¹⁶ <https://oppla.eu/>.

⁴¹⁷ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

⁴¹⁸ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

	Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-COMMUNITIES-02-01-two-stage: Smart solutions for smart rural communities: empowering rural communities and smart villages to innovate for societal change

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 14.00 million.
<i>Type of Action</i>	Innovation Actions

Expected Outcome: The successful proposal will contribute to fostering a sustainable, balanced and inclusive development of rural areas, supporting the implementation of the European green deal⁴¹⁹, in particular its fair and just transition component, the European digital strategy⁴²⁰, the European pillar of social rights⁴²¹ and the EU long-term vision for rural areas⁴²². It will do so by supporting digital, social and community-led innovations and by equipping rural communities with innovative and smarter solutions that increase access to services, opportunities and adequate innovation ecosystems, including for women, youth and

⁴¹⁹ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁴²⁰ https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/shaping-europe-digital-future_en

⁴²¹ https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

⁴²² <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12525-Long-term-vision-for-rural-areas>

the most vulnerable groups, improve attractiveness and reduce the feeling of being left behind, even in the most remote locations like mountains. The increased availability of smart solutions and support to community-led innovations will empower people to act for change and get prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience, good health and positive long-term prospects, including jobs, for all including women, young people and vulnerable groups.

Project results are expected to contribute to all of the following expected outcomes:

- enhanced capacity of rural communities and rural people to innovate for change thanks to the specific outcomes below;
- Enlarged set of smart solutions for rural communities (practical and transferable innovative solutions to challenges faced by rural communities in a variety of fields e.g. social services, health, energy, mobility, climate adaptation and mitigation, biodiversity and ecosystem management, education, access to culture, etc.).
- Upgraded approaches, methods, tools and skills to design, implement, monitor and evaluate community-led innovations contributing to the implementation of smart village⁴²³ strategies and social innovation⁴²⁴ initiatives improving i) rural people's well-being, ii) rural community resilience to shocks, iii) rural contributions to the United Nations Sustainable Development Goals and to the EU long-term vision for rural areas⁴²⁵.
- Strengthened human capital, including networks, enhanced relations and knowledge exchange between smart villages and rural community innovators on transferable innovations and innovation processes.

Scope: Proposals should start from past work conducted in the framework of i) EU action on smart villages⁴²⁶, including the related preparatory actions⁴²⁷ ii) Horizon 2020 projects dedicated to social innovation in rural areas⁴²⁸. Proposals should support a large number of rural community-led, social innovation or smart village pilot initiatives in a set of locations in the EU and Associated Countries representative of the diversity of social and geographical

⁴²³ Smart villages are defined for this call as “communities in rural areas that use innovative solutions to improve their resilience, building on local strengths and opportunities”. A more complete definition is available on p.2 of the briefing note from February 2019: <https://digitevent-images.s3.amazonaws.com/5c0e6198801d2065233ff996-registrationfiletexteditor-1551115459927-smart-villages-briefing-note.pdf>

⁴²⁴ Social innovation is defined for this topic as “the reconfiguring of social practices, in response to societal challenges, which seeks to enhance outcomes on societal well-being and necessarily includes the engagement of civil society actors”. (SIMRA)

⁴²⁵ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12525-Long-term-vision-for-rural-areas>

⁴²⁶ https://enrd.ec.europa.eu/enrd-thematic-work/smart-and-competitive-rural-areas/smart-villages_en;

⁴²⁷ https://enrd.ec.europa.eu/smart-and-competitive-rural-areas/smart-villages/smart-villages-portal_en

⁴²⁷ <http://www.pilotproject-smartvillages.eu>;

⁴²⁷ <https://www.smartrural21.eu>

⁴²⁸ In particular:

SIMRA: <https://cordis.europa.eu/project/id/677622>

- RURITAGE:

<https://cordis.europa.eu/project/id/776465> RURACTION: <https://cordis.europa.eu/project/id/721999>

contexts. They should prototype, test, pilot and demonstrate innovations that answer the most pressing rural challenges found at these locations, with particular attention to social and environmental challenges.

Proposals should explore various forms of innovations: technical, technological, business, organisational and social. Social innovation is recommended when the solution is at the interface between social and technical solutions and requires social change, new social practices, social ownership or market uptake. Proposals should exploit in particular the potential of digital technologies to answer rural communities' challenges, respecting the principles of the declarations on "joining forces to boost sustainable digital transformation in cities and communities"⁴²⁹ and on "a smart and sustainable digital future for European agriculture and rural areas"⁴³⁰. Proposals should build on the work of projects funded under the topic DT-ICT-09-2020⁴³¹ and avoid duplications.

Criteria for selecting the pilot initiatives supported should include the contribution to rural people's well-being, rural community resilience to shocks, Sustainable Development Goals and the EU's long-term vision for rural areas as well as the potential transferability or replicability of the innovations to other European villages facing similar conditions. The experience gained from supporting these community-led innovation pilot initiatives should lead proposals to formulate upgraded approaches, methods and tools, that should be widely disseminated in close coordination with the 'expertise and training centre on rural innovation funded under HORIZON-CL6-2021-COMMUNITIES-01-02. Proposals should also capitalise on i) rural innovation processes and knowledge and innovation systems or ecosystems needed to support rural community-led or social innovation and smart villages; and ii) lessons learnt to improve policies and governance frameworks, especially on instruments supporting the development of social capital, social networks, social economy and social innovation and with attention to various needs of various target groups.

Proposals should fall under the concept of the multi-actor approach⁴³², bringing together scientists alongside rural community organisations, action groups or networks with a demonstrated ability to connect to a large number of local communities and disseminate and exploit project results. The consortium should bring together a multiplicity of competences and science disciplines to ensure a skilled accompaniment of a wide range of innovation areas likely to come from the pilot initiatives (climate mitigation and adaptation, social care and services, energy, mobility, culture, education etc.) and innovation approaches and technologies (technical, organisational, social, digital...). It should demonstrate substantial prior experience in facilitating community-led bottom-up innovation initiatives.

As an option, proposals may involve financial support to third parties, particularly for SMEs or entities who would need to develop specific innovative solutions needed in the pilot

⁴²⁹ <https://www.living-in.eu/declaration>

⁴³⁰ <https://ec.europa.eu/digital-single-market/en/news/eu-member-states-join-forces-digitalisation-european-agriculture-and-rural-areas>

⁴³¹ <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/dt-ict-09-2020>

⁴³² See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

initiatives.. Consortia who decide to use this option must define the selection process of entities for which financial support will be granted.

Proposals should include a task to cooperate with other projects funded under this topic, other relevant innovation projects and with the ‘expertise and training centre on rural innovation’ funded under HORIZON-CL6-2021-COMMUNITIES-01-02 from the beginning of the project (taking up tools and training kits) until its end (dissemination of upgraded tools and smart solutions) and with the project funded under HORIZON-CL6-2022-COMMUNITIES-01-02 for issues related to women-led innovation. Proposals should also foresee close coordination with the common agricultural policy networks⁴³³ to maximise the contribution of project activities to the achievement of future common agricultural policy (2021-2027) objectives⁴³⁴, in particular in relation with smart villages⁴³⁵. Finally, proposals are encouraged to liaise with the relevant European Institute of Technology knowledge and innovation communities⁴³⁶.

HORIZON-CL6-2022-COMMUNITIES-02-02-two-stage: Developing nature-based therapy for health and well-being

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 19.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: A successful proposal will contribute to the EU’s goal of leading just, digital, economic and ecological transitions that will leave no one behind, supporting in particular European Green Deal priorities such as the Biodiversity Strategy for 2030. R&I will support the development of nature-based therapy to help communities turn the ecological transition into opportunities for good health and well-being, increased resilience, and positive long-term prospects such as the creation of green jobs.

Project results are expected to contribute to all following expected outcomes:

- Sharper view of green space management, nature protection, agriculture and forestry sectors as care providers and their possible linkages with the healthcare, social and educational sectors;

⁴³³ Currently ENRD and EIP-AGRI (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en#enrd) to be replaced by the networks to be funded under the future CAP: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

⁴³⁴ https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

⁴³⁵ https://enrd.ec.europa.eu/enrd-thematic-work/smart-and-competitive-rural-areas/smart-villages_en

⁴³⁶ <https://eit.europa.eu/our-communities/eit-innovation-communities>

- Stronger evidence base for the causal relationships between nature and health and well-being for more effective nature therapy prescriptions;
- Cost-effective nature therapy prescriptions are more widely used in the health care sector;
- Greater citizen and policy-maker awareness of the positive benefits of nature for health and well-being;
- Wider utilization by healthcare professionals and citizens of nature therapy as a form of preventive medicine.

Scope: Nature affects human health in different ways. In particular, urban environments can have a negative impact on physical and mental health. This is due to urban stressors such as increased noise levels, higher crime rates and higher levels of pollution. The total global burden of disease attributable to mental illness has recently been estimated to be as high as 32% of total years lived with disability and 13% of disability-adjusted life-years, on par with cardiovascular and circulatory diseases. It is important, therefore, to determine the degree to which nature experience might lessen and address this burden. Even more so in view of the fact that the opportunities and time spent in nature are decreasing.

However, despite many putative positive correlations identified between nature and health and well-being, the causal understanding of relationships between health and nature exposure are not well understood. The long-term effects are also less well studied and recognised in policies. Social, economic and cultural factors strongly mediate the strength and direction of linkages between health and nature. Age, gender and especially socio-economic status may modify the association between greenness and health behaviours and outcomes and need to be better understood to create more effective nature therapy. Additionally, mental health benefits may vary with the type of interaction with nature and the form of sensory input. Furthermore, the health and well-being benefits of exposure to nature are affected by cultural perspectives and experiences relating to social interaction and contact with the natural environment.

A successful proposal will:

- Develop a common framework to increasingly recognize and promote contact with nature, including protected areas and other green and blue spaces, as a cost-effective response for the prevention and treatment of human health and well-being;
- Propose an interdisciplinary and cross-sectoral approach, including the involvement of the health care sector, land owners, as well as green space management and nature protection sectors;
- Improve schemes monitoring nature-health linkages to enhance the evidence base and tools for the health care sector, green space management, nature protection, urban planning and landscape architecture;

- Develop longitudinal prospective methods, (quasi-) experiments or well-controlled interventions, to provide more evidence of the causal relationships between nature and health and well-being:
 - Understanding of when people explicitly choose to go to an urban green space and what experiences they have there (e.g., active versus passive activities).
 - Determining the type of interactions and dose of interactions necessary for long-term health and well-being benefits.
 - Understanding the mediators of the health-nature relationship, such as age, gender, socio-economic status or culture.
 - Considering the difference between greenness quantity and quality and determining which aspects of natural features are relevant to mental health.
 - Understanding how different geographical locations and factors such as population density affect the health-nature relationships;
- Test nature therapy sessions, identify best-practices and develop the necessary tools and guidelines for integration of nature-based care in the public health sector;
- Identify legal and administrative arrangements, partnerships, and financial mechanisms for implementation of nature therapy sessions.

The proposals should address all of the above points.

Proposals should bring together from the start multiple types of scientific expertise in both health and natural sciences, as well as social sciences and humanities, together with a variety of community and health sector representatives, businesses, civil society organizations and citizens.

Proposals must ensure that all evidence, information and project outputs will be accessible through the Oppla portal (the EU repository for nature-based solutions)⁴³⁷.

Proposals should set out a clear plan on how they will collaborate with other projects selected under this and any other relevant topic/call⁴³⁸, by participating in joint activities, workshops, as well as common communication and dissemination activities. In addition, proposals should adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles⁴³⁹. Applicants should plan the necessary budget

⁴³⁷ <https://oppla.eu/>.

⁴³⁸ Notably the Horizon 2020 projects on nature-based solutions and their relevant task forces; HORIZON-CL6-2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding; HORIZON-CL6-2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions; HORIZON-CL6-2022-COMMUNITIES-01-07 Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities; HORIZON-CL6-2021-COMMUNITIES-01-06: Inside and outside: educational innovation with nature-based solutions;

⁴³⁹ https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_0.pdf.

to cover these activities without the prerequisite to define concrete common actions at this stage. The details of these coordination activities will be defined during the grant preparation phase with the Commission.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

In order to achieve the expected outcomes, international cooperation is advised, in particular with the USA, Japan and the CELAC region.

DRAFT

Destination 7 – Innovative governance, environmental observations and digital solutions in support of the Green Deal

Transformative changes such as the ones required within the Green Deal are dynamic processes that require appropriate governance. At the same time, to ensure coordination and for collaborative decision-making, governance requires multiple channels and networks that provide readily available data and information coming from different sources.

R&I activities under this destination aim at both: experimenting with new ways to govern the transition process and modernising the governance, in particular by making information and knowledge available and accessible. R&I for governance to support the Green Deal shall provide insights into institutional barriers such as lock-ins, path dependency, political and cultural inertia power imbalances and regulatory inconsistencies or weaknesses.

Innovative governance supporting the Green Deal objectives needs to recognise, cope with and promote resilience in the face of on-going shocks and disruptions both globally and across Europe, whether these be climatic, ecological, economic, social, geo-political or related to health. Critical risk assessment and reduction strategies need to be incorporated, including the diversification of infrastructures, resources and knowledge through more self-sufficiency and autonomy.

Taking advantage of the use, uptake, deployment and exploitation of environmental observations⁴⁴⁰ as well as digital solutions, assessed through the “do not harm” principle of the Green deal, is key for innovative governance models and a more science-based policy design, implementation and monitoring. To maximise impacts of R&I on the ground and spark behavioural and socio-economic change, the knowledge and innovation produced throughout the whole Cluster should be widely disseminated to key stakeholders of the relevant sectors of the Cluster. In particular, the Agricultural Knowledge and Innovation Systems (AKIS) needs to be reinforced to accelerate the required transformative changes.

Data and information obtained through Environmental Observation is of great value when assessing the state of the planet and is delivering crucial information to support the Green Deal and the climate and ecological transition. Integration of this information from different sources (space-based, airborne including drones, in-situ and citizens observations) with other relevant data and knowledge while ensuring (better) accessible, interoperable or deployable information, delivers information necessary for shaping the direction of the development of policies in the broad context of Cluster 6 of Horizon Europe. A strong link to the European Earth observations programme Copernicus (in Cluster 4) and the European Space Agency’s (ESA) Earth observation programme, as well as support to the Group on Earth Observation (GEO), its European regional initiative (EuroGEO) and the Global Earth Observation System of Systems (GEOSS) is foreseen for topics on environmental observations under this destination. R&I activities relevant to oceans, seas and coastal waters will complement and

⁴⁴⁰ The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

support the UN Decade of Ocean Science for Sustainable Development and of Restoration, the G7 Future of the Seas and Oceans, the pan-Commission Destination Earth initiative, the European Global Ocean Observing System (EOOS) and the GOOS 2030 strategy.

Digital innovation, in complementarity with Cluster 4 and Digital Europe Programmes activities, should bring benefits for citizens, businesses, researchers, the environment, society at large and policy-makers. The potential of the ongoing digital transformation, and its wider impacts, positive and negative, need to be better understood and monitored in view of future policy design and implementation, governance, and solution development

This destination will develop innovative digital and data based solutions to support communities and society at large, and economic sectors relevant for this Cluster to achieve sustainability objectives. R&I activities will add value to the knowledge and cost-effectiveness of innovative technologies in and across primary production sectors, food systems, bioeconomy, oceans and biodiversity.

Knowledge and advice to all actors relevant to this Cluster are key to improve sustainability. For instance, primary producers have a particular need for impartial and tailored advice on sustainable management choices. Knowledge and Innovation Systems are key drivers to enhance co-creation and thus speed up innovation and the take-up of results needed to achieve the Green Deal objectives and targets. This will include promoting interactive innovation and co-ownership of results by users, as well as strengthening synergies with other EU Funds in particular the CAP, reinforcing the multi-actor approach and setting up structural networking within national/regional/local AKISs. AKIS goes beyond agriculture, farming and rural activities and covers environment, climate, biodiversity, landscape, bio-based economy, consumers and citizens, i.e., all food and bio-based systems including transformation and distribution chains up until the consumer.

Expected impact

Proposals for topics under this Destination should set out a credible pathway to contributing to innovative governance and sound decision making in policy for the green transition, and more specifically to one or several of the following impacts:

- Innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, societal engagement and innovation;
- Green Deal related domains benefit from further deployment and exploitation of Environmental Observation data and products ;
- A strengthened Global Earth Observation System of Systems (GEOSS)⁴⁴¹;

⁴⁴¹ The European Commission is a member and co-chair of the Group on Earth Observations (GEO), as such the European Commission adopted the GEO Canberra Declaration (https://earthobservations.org/canberra_declaration.php and Commission Decision C(2019)7337/F1) and committed to contribute to the GEO objectives, including to the Global Earth Observation System of Systems (GEOSS).

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

- Sustainability performance and competitiveness in the domains covered by Cluster 6 are enhanced through further deployment of digital and data technologies as key enablers;
- More informed and engaged stakeholders and end users including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS)
- Strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals

Topics under this destination will have impacts in the following areas: “Climate change mitigation and adaptation”; “Clean and healthy air, water and soil”; “Enhancing ecosystems and biodiversity on land and in water”; “Sustainable food systems and nutrition security”; “High quality digital services for all” and “A Competitive and secure data-economy”.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2021	2022	
HORIZON-CL6-2021-GOVERNANCE-01	183.50		02 Sep 2021
HORIZON-CL6-2022-GOVERNANCE-01		133.00	15 Feb 2022
HORIZON-CL6-2022-GOVERNANCE-02-two-stage		37.00	15 Feb 2022 (First Stage) 06 Sep 2022 (Second Stage)
Overall indicative budget	183.50	170.00	

Call - Innovative governance, environmental observations and digital solutions in support of the Green Deal

HORIZON-CL6-2021-GOVERNANCE-01

Conditions for the Call

Indicative budget(s)⁴⁴²

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ⁴⁴³	Number of projects expected to be funded
		2021		
Opening: 15 Apr 2021 Deadline(s): 02 Sep 2021				
HORIZON-CL6-2021-GOVERNANCE-01-01	CSA	2.50	Around 2.50	1
HORIZON-CL6-2021-GOVERNANCE-01-02	RIA	17.00	Around 17.00	1
HORIZON-CL6-2021-GOVERNANCE-01-03	CSA	5.00	Around 5.00	1
HORIZON-CL6-2021-GOVERNANCE-01-04	CSA	4.00	Around 4.00	1
HORIZON-CL6-2021-GOVERNANCE-01-05	CSA	4.00	Around 4.00	1
HORIZON-CL6-2021-GOVERNANCE-01-06	RIA	8.00	2.00 to 3.00	3
HORIZON-CL6-2021-GOVERNANCE-01-07	CSA	5.00	Around 2.50	2
HORIZON-CL6-2021-GOVERNANCE-01-08	CSA	5.00	Around 2.50	2
HORIZON-CL6-2021-GOVERNANCE-01-09	CSA	5.00	Around 2.50	2
HORIZON-CL6-2021-GOVERNANCE-01-10	CSA	4.00	Around 4.00	1

⁴⁴² The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

All deadlines are at 17.00.00 Brussels local time.

The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

⁴⁴³ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

HORIZON-CL6-2021-GOVERNANCE-01-11	CSA	2.00	Around 2.00	1
HORIZON-CL6-2021-GOVERNANCE-01-12	RIA	10.00	Around 10.00	1
HORIZON-CL6-2021-GOVERNANCE-01-13	RIA	10.00	Around 5.00	2
HORIZON-CL6-2021-GOVERNANCE-01-14	RIA	20.00	3.00 to 5.00	4
HORIZON-CL6-2021-GOVERNANCE-01-15	CSA	2.00	Around 2.00	1
HORIZON-CL6-2021-GOVERNANCE-01-16	IA	10.00	Around 10.00	1
HORIZON-CL6-2021-GOVERNANCE-01-17	IA	10.00	3.00 to 5.00	2
HORIZON-CL6-2021-GOVERNANCE-01-18	RIA	10.00	Around 10.00	1
HORIZON-CL6-2021-GOVERNANCE-01-19	RIA	4.00	2.00 to 4.00	1
HORIZON-CL6-2021-GOVERNANCE-01-20	RIA	4.00	2.00 to 4.00	1
HORIZON-CL6-2021-GOVERNANCE-01-21	CSA	4.00	Around 2.00	2
HORIZON-CL6-2021-GOVERNANCE-01-22	RIA	15.00	Around 15.00	1
HORIZON-CL6-2021-GOVERNANCE-01-23	CSA	10.00	Around 10.00	1
HORIZON-CL6-2021-GOVERNANCE-01-24	CSA	5.00	Around 5.00	1
HORIZON-CL6-2021-GOVERNANCE-01-25	CSA	8.00	Around 4.00	2
Overall indicative budget		183.50		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.

<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Innovating with governance models and supporting policies

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-GOVERNANCE-01-01: Mobilising the network of National Contact Points in Cluster 6

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 2.50 million.
<i>Type of Action</i>	Coordination and Support Actions
<i>Eligibility conditions</i>	<p>The conditions are described in General Annex B. The following exceptions apply:</p> <p>Applicants must be Horizon Europe national support structures (e.g. NCP) responsible for Cluster 6 ‘Food, Bioeconomy, Natural Resources, Agriculture and Environment’ and officially nominated to the Commission, from a Member State or Associated Country or any third country associated to Horizon Europe.</p> <p>Only in case and as long as Horizon Europe structures would not yet be officially nominated, national support structures responsible for Societal Challenges 2 (SC2) and 5 (SC5) would be eligible.</p>
<i>Procedure</i>	<p>The procedure is described in General Annex F. The following exceptions apply:</p> <p>The granting authority can fund a maximum of one project.</p>

Expected Outcome: In line with the European Green Deal priorities, the successful proposal will interconnect National Contact Point (NCP) service across Europe and will help develop

innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, societal engagement and innovation.

- An improved and more interconnected National Contact Point (NCP) service across Europe, in the areas covered by Horizon Europe Cluster 6 ‘Food, Bioeconomy, Natural Resources, Agriculture and Environment’, thereby simplifying access to Cluster 6 Horizon Europe calls, lowering the entry barriers for newcomers, and raising the average quality of proposals submitted;
- A more harmonised level of NCP support services across Europe.
- Widening – promoting participation in actions in the areas covered by Horizon Europe Cluster 6 ‘Food, Bioeconomy, Natural Resources, Agriculture and Environment’ to new stakeholders, such as, but not limited to, civil society organisations.
- Enhanced integration of all the crosscutting issues throughout Horizon Europe.
- Increased participation of less active member states, associated countries, regions and stakeholders in the actions funded under Horizon Europe Cluster 6 programme to leverage the full R&I potential.
- Connection with NCP Academy activities.
- Increased cooperation of NCPs with the Enterprise Europe Network.

Scope: Proposals should aim to facilitate trans-national co-operation between National Contact Points (NCPs) in the areas covered by Horizon Europe Cluster 6 ‘Food, Bioeconomy, Natural Resources, Agriculture and Environment’, with a view to identifying and sharing good practices and raising the general standard of support to programme applicants, taking into account the diversity of actors that make up the constituency of this Cluster. In addition, the action will provide important feedback on issues relating to programme planning, design and evaluation.

Proposal should aim to facilitate trans-cluster cooperation in the areas covered by Pillar 2, with a view to identifying synergies, to make it possible to share good practices and tools. Close coordination and cooperation are key to achieve the objectives and impacts of the NCP networks.

The activities of this topic should build on the knowledge and tools already generated by the NCP networks developed under Horizon 2020.

In view of the changes brought about by the adoption of Horizon Europe, the network of NCPs will organise transnational events to communicate with all interested actors regarding new research activities; to draw lessons from previous research programmes on best practice for cooperation; to help interested stakeholders prepare for new funding schemes and structures.

The network will organise NCP Information Days, NCP trainings, brokerage events for interested actors, dissemination of relevant results and provide appropriate tools and instruments to support NCPs, researchers and other actors. Activities will support researchers and other actors in the areas of Food, Bioeconomy, Natural Resources, Agriculture and Environment to connect into all Clusters of Pillar 2 and across the three Pillars of Horizon Europe. To achieve its expected outcomes and objectives, the NCP network must cooperate with, but should not duplicate actions foreseen in other thematic and horizontal Horizon Europe NCP networks, and in particular the NCP Academy Enterprise Europe Network.⁴⁴⁴

The proposal shall include a task on widening promoting participation indicating measures to increase participation of newcomers throughout Europe less active member states, associated countries, regions and stakeholders in the actions funded under Horizon Europe Cluster 6 programme.

Special attention should be given to enhancing the competence of NCPs, including helping new and less experienced NCPs rapidly acquire the know-how built up in other countries. This should contribute to increase the quality of proposals submitted, including those from countries where success rates in Horizon 2020 Societal Challenges 2 and 5 were lower than average.

The consortium shall have a good representation of experienced and less experienced NCPs.

Submission of a single proposal is encouraged and it should cover the whole duration of Horizon Europe. NCPs from EU Member States or Associated Countries choosing not to participate as a member of the consortium shall be identified.

HORIZON-CL6-2021-GOVERNANCE-01-02: Furthering food systems science and federating researchers

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 17.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 17.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 2-3 (according to the activity) by the end of the project – see General Annex B.

⁴⁴⁴ Building notably on the booklet of good practices for the NCP-EEN Cooperation developed by NCPs CaRE the network of SC5 NCPs <http://www.ncps-care.eu/?wpdmpromo=booklet-good-practices-for-the-ncp-een-cooperation>

Expected Outcome: The selected project results are expected to contribute to the following outcomes:

- New game changers to provide sustainable diets and nutrition for all, ways to meet the green deal targets, establish cross cutting priorities, establish knowledge as a legitimate player/enabler in public debate, accelerate scientific progress, redesign farming systems, cope with unforeseen system shocks, and develop smart diversification.
- A food systems transformation, which achieves co-benefits for nutrition and health, climate mitigation and adaptation, environment, circularity, inclusion and overall sustainability.
- Novel understanding on how, and to which degree, such a transformation can be catalysed and sustained in the long term, and how the resulting trade-offs can be mitigated.
- Knowledge and understanding of how to move towards true cost accounting of food and food systems services that adequately integrate social and environmental externalities and embed environmental accounting (e.g. LCA).
- New insights, methods and tools to assess and manage the full systemic complexity of food systems and their multiple drivers, their dynamics and the issues and opportunities that relate to them.
- Ways to measure food system performance across all three dimensions of sustainability, which can provide more informed decision and policymaking, and implementation.
- An increase in the scientific understanding of food systems, in particular their systemic aspects, as to how they function, and how to transform them for co-benefits and minimised trade-offs.
- Engagement of academia and the necessary practitioners in science, innovation and beyond, to can deliver the necessary scientific methodologies and approaches to put complex transformations into practice.
- The establishment of a broad interdisciplinary network of researchers, scientists, universities and research centres covering a wide diversity of food systems-related disciplines, as well as those dealing with complex systems, to further systems science in this area.
- A strengthened European Research area for food systems transformation for co-benefits

Scope: This topic will support and strengthen the science, and the science-policy interface relevant to food systems, in particular in relation to delivering on Farm to Fork and Green Deal policy priorities. Proposals are expected to address the following inter-connected transformation actions:

Action a) Advance food systems science through:

- **Mapping of existing food systems** and typologies and design of new/existing indicator sets that could be applied at different spatial levels (local to global), with a focus on Europe.
- Development of methods and **means to assess food system sustainability**, such as establishing an overall food systems sustainability score incorporating common agreed Life Cycle Analysis methodologies.
- Development of **innovative cause-effect simulation models** that include all food system sectors and actors beyond the economic focus and which can integrate the three pillars of sustainability to explore the potential impact of different food systems transition options and scenarios delivering co-benefits, while minimising trade-offs.
- Providing sound **evidence for policy** and regulatory science needs to deliver food systems transition towards sustainability; including on how to transition to a **true cost** of food and food systems services that adequately embed social and environmental externalities relevant to various levels (global to local).

Action b) Contribute to building up a food systems European Research Area – part 1 - through:

- Launching new and assessing ongoing food systems **foresight** activities (building on existing ones including the fifth SCAR Foresight), detecting emerging trends, and delivering early warnings to policy makers and other relevant actors.
- Establish a **project for policy support** capacity to extract, summarize and disseminate findings and achievements of relevant EU Horizon projects and clusters of projects to policy makers, food systems actors and the public.
- Perform measurement of, and increase **research impact** of food system science (for example by assisting scientists to adopt inter and transdisciplinary approaches), and encourage the exchange of scientists for mutual learning and knowledge transfer across disciplines
- **Foster citizen science** in support of food systems transformation by assessing existing attempts, communicating successes, and catalysing new citizen science initiatives across Europe, in particular by engaging with youth, women, and under-represented communities

Action c) Contribute to building up a food systems European Research Area – part 2 – by creating an interdisciplinary **pan-European academic network** for food system science that integrates the social sciences and humanities, natural science and engineering, and design. This will:

- **Federate universities, academics and researchers** across Europe to support and engage in inter and trans-disciplinary research, foster debate, reflexivity and responsible

research and innovation (RRI) in support of food systems transition and improved policymaking at all levels from global to local.

- Develop and share freely available open access **educational material/curricula** to be used by Higher Education Institutes (bachelors and post-graduate levels) to help strengthen their exiting food systems-related teaching and research with an inter and transdisciplinary systems dimension that integrates all three aspects of sustainability, and Farm to Fork policy and Green Deal priorities.
- Support researcher **training**, mobility, mutual learning and knowledge sharing, and open science approaches.
- **Disseminate and communicate** scientific outcomes adapted for multiple audiences including researchers, policy makers, industry, science media and society. This will also include the organisation of a major international annual/bi-annual **conference** dedicated to advancing food systems science.
- Establish a **high-level liaison** with EU and relevant international initiatives.

All projects must explain and map how co-benefits will be achieved relevant to the four **Food 2030** priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities.

All projects will ensure a clustering mechanism with each other and feedback mechanisms with other governance topics and provide general scientific advice for related **food systems oriented Horizon Europe projects**.

All projects will set out a clear plan on how they will collaborate with other projects selected under this and any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities and channels. In addition, the project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

HORIZON-CL6-2021-GOVERNANCE-01-03: Preparatory action for the Horizon Europe Food System Partnership

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In line with the objectives of the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, the successful proposal will support the establishment of innovative governance models, to establish the EU Horizon Europe Partnership entitled “Safe and sustainable food systems for people planet and climate, to underpin the needed transition to sustainable food systems, provide solutions to the Farm to Fork Strategy by connecting national, regional and European research and innovation programmes and food systems actors, to deliver co-benefits for nutrition, climate, circularity and communities.

The results of the project will support European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, and for tackling the EU's Climate ambition for 2030 and 2050.

- It is a Horizon Europe food systems governance topic that is dedicated to the alignment of European R&I policy priorities, programmes, agendas, and the leveraging of R&I investments to transform food systems for co-benefits.
- It will seed the creation of a more structured Food Systems *European Research Area* as a preparatory action towards the build-up of the EU Horizon Europe Partnership entitled “Safe and sustainable food systems for people planet and climate”, expected to be launched in 2023, that will mobilize public authorities designing and implementing more coherent and ambitious EU R&I policy.

Scope: This project will:

- Convene R&I funders to help shape a more impactful and ambitious European Food Systems Research Area.
- Maximize alignment, leverage focus, and impact by exploring and building on common R&I policy priorities with and between R&I public funders in Member States.
- Support the relevant SCAR Strategic and Collaborative Working Groups, in particular the SCAR Food Systems Working Group and relevant Joint Programming Initiatives, to play a leading role in framing the partnership.
- Foresee a mechanism to engage with EU and national food chain policy makers, relevant EU Agencies, industry, academia, civil society organisations, philanthropic organisations, education establishments, and finance sectors to leverage investments and support the deployment of good practices and responsible research and innovation-driven business opportunities, as well as outcomes for the public good.
- Liaise with international organisations and initiatives (e.g. FAO, WFP, WHO, OECD, WEF, Project Drawdown, etc.) and private funders (EIT FOOD KIC and relevant European Technology Platforms and foundations), urban and regional food systems strategies (including actions relevant to smart specialization).

- Foster programmes that will encourage the greater take up of digitalisation and social sciences and humanities, to improve social legitimacy and focus more on consumer and citizens needs and aspirations, and foster behavioural changes at all levels.
- Assess existing and foster improved food systems education and training programmes across member states, in cooperation with Higher Education Institutes (HEI) and professional/vocational training centres to fill skills and knowledge gaps.
- Explain and map how co-benefits will be achieved relevant to the four Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities.
- Establish a branded network of European universities, where rectors develop and adhere to code of practice and action plan that motivates the organisation, staff and students to foster Food 2030 inspired food system transition for co-benefits relevant to their internal corporate practices, local/regional communities, link to similar international networks for example in the EU-AU Partnership on food and nutrition security and sustainable agriculture.

The project will set out a clear plan on how it will collaborate with other projects selected under this and any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. In addition, the project will adopt and open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

HORIZON-CL6-2021-GOVERNANCE-01-04: Strengthening bioeconomy innovation and deployment across sectors and all governance levels

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The successful proposal will contribute to the development of a Strategic Deployment Agenda for the Bioeconomy, including Food Systems, one of the actions in the 2018 Bioeconomy Strategy and Action Plan. The European Bioeconomy Strategy and Action Plan⁴⁴⁵ aims to deploy innovations across Europe to ensure that the bioeconomy as a whole is a vehicle for inclusive and sustainable growth at the local level, and is a key contributor to

445 <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583773927512&uri=CELEX:52018DC0673>

EU's Climate ambition for 2030 and 2050. It will contribute to improved governance for innovation ecosystems and enable advances in sustainability and resilience.

Project results are expected to contribute to all following expected outcomes:

- Improved understanding about which measures should be taken, by EU, Member States, and others to strengthen the innovation ecosystem within and across food systems and bio-based sectors, based on a detailed mapping exercise and on a comprehensive view on issues related to deployment
- Improved impact and efficiency of bioeconomy innovation and innovation systems

These outcomes will also support the Farm to Fork Strategy for fair, healthy and environmentally friendly food systems, the EU Green Deal policy priorities and the EU's Climate ambition for 2030 and 2050.

Scope: Innovation today and the initiatives and structures that are part of it at EU, national, regional, and local level already contribute to the uptake and deployment of innovative solutions for example by supporting testing, demonstration, and training, and by investing in the infrastructure that enables these activities. However, more action is needed to (1) address the fragmentation of this innovation ecosystem across food systems and bio-based sectors, (2) to create linkages between the different levels of governance, and (3) to improve the interfacing between the research communities, the innovation communities, investors and citizens. Actions that address these areas of improvement across the bioeconomy are to be preferred because their crosscutting nature and trans-disciplinarity might be a further source of innovation, and because they enable sharing of best practices across sectors and actors.

Proposals will:

- Identify instruments and initiatives that contribute to spreading knowledge and deploying innovations in and across food systems and bio-based sectors, at EU, national, regional, and local level. Identify links with other policies (e.g. education) and instruments (e.g. financial instruments, regulation);
- Analyse possible interactions and complementarities between initiatives, instruments and policies;
- Identify opportunities for improved governance and for enhanced cooperation between instruments and initiatives within the bioeconomy's innovation ecosystems, across the EU, Member States and private sector;
- Recommend actions to improve bioeconomy innovation and the deployment of new knowledge, technologies and practices, in particular by strengthening cooperation between entities and activities that support different forms of innovation.

Proposals should:

- Map the structures, instruments and initiatives that make up the innovation ecosystem of the bioeconomy with respect to food systems, bio-based sectors (including the blue economy), at local, regional, national and EU level
- Put in place networking and matchmaking activities to allow these structures, instruments and initiatives to raise their profile, to identify opportunities for new collaborations both amongst themselves, and across the different sectors of the bioeconomy
- Provide advisory support to these structures, instruments and initiatives to align themselves to policy priorities at different levels of governance, and in full awareness of existing schemes of sustainability and circularity indicators of the bioeconomy
- Identify best practices to improve the exploitation of outcomes from funded research within innovation communities, innovators and entrepreneurs, and public and private investment communities
- Examine the possibilities for improved reporting on the state-of-play and results of innovation in the bioeconomy
- Address specific barriers to reducing the fragmentation of the innovation ecosystem
- Deliver specific recommendations related to thematic financial instruments and tools applicable to sectors of the bioeconomy and to innovation. Targets of this activity shall be previously mapped public and private investors, entrepreneurs and all the structures, institutes, programs and initiatives. Advice shall focus on the effective and integrated use of financial tools to support innovation in the long term, and on the contribution to building a sustainable and responsible financing framework in Europe
- Where appropriate, link to Horizon 2020 and Horizon Europe projects that demonstrate innovative and cross-sectoral solutions, as well as to relevant EU initiatives such as EIP AGRI, EIC, BBI JU, and EIT KICs
- Engage with policy makers and other stakeholders/initiative-owners that are responsible for innovation support at different levels of governance, to co-create recommendations to improve bioeconomy innovation and the deployment of new knowledge, technologies and practices

Proposals will set out a clear plan on how they will collaborate with other projects selected under this and any other relevant topics/calls, by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals will ensure that any data produced during the project will comply with the FAIR principles. In addition, proposals will adopt an open access and open data approach whereby research outcomes and data will be freely shared.

HORIZON-CL6-2021-GOVERNANCE-01-05: Fostering strategic advice and synergies between national and EU Research and Innovation agendas, including SCAR foresight

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Improved coordination of national research programmes on food, agriculture and the wider Bioeconomy with a view to integrate them better within the European Research Area (ERA) through:

- Regular portfolio analysis to support a better structured organisation, facilitation and reporting of SCAR Strategic and Collaborative Working Groups (SWGs/CWGs) activities on the various themes of main relevance for Horizon Europe, the Common Agricultural Policy, the Green Deal, Digital Europe and the Farm to Fork and Biodiversity strategies. This will lead to enhanced R&I cooperation between Member States and Associated Countries and to synergies at national and EU level;
- Improved linkages between Horizon Europe, the CAP and the Green Deal, including its Farm to Fork and Biodiversity strategies through enhancing Agricultural Knowledge and Innovation Systems (AKIS) in the countries and a more efficient European Innovation Partnership (EIP-AGRI) on Agricultural Productivity and Sustainability, bridging the gap between science and practice;
- More inclusive SCAR SWGs and CWGs, fostering mutual learning, covering as much as possible all European Member States and Associated Countries and serving the development and implementation of foresight based research and innovation policy strategies on European and national level;

Scope: The main focus of the support action will be to support the work of the SCAR SWGs and CWGs. This includes notably the organisation and facilitation of the activities, particularly meetings and workshops of SCAR SWGs, CWGs and potential ad hoc task forces, according to the initiatives taken by the Working Groups themselves.

This should in the short- to medium-term improve the quality of outputs of the SCAR SWGs or CWGs in the different areas covered, thus having a positive impact on achieving the objectives of the European Green Deal, the Farm-to Fork Strategy, the Common Agricultural Policy, the Biodiversity Strategy, the wider food systems and bioeconomy research and innovation policies and the Agricultural Knowledge and Innovation Systems in Member States and Associated Countries.

Main activities are the collection of a portfolio of ongoing or finished projects at national, regional and EU level relevant to the various themes covered in the work plans of the SCAR SWGs and CWGs, as well as on other issues that may arise in light of policy developments and priorities. This includes the search, the summarising and analysis of relevant project content and outputs in order to help prepare the activities of each SWG/CWG, including their regular meetings, according to the specific theme(s) covered. This should support the depth of strategic discussions in the Working Groups. At the end of each year, an annual overview document of all portfolios per theme should be made.

Activities will consider the linkages to Horizon Europe Partnerships and Missions, to Joint Programming Initiatives and ERA-Nets, other relevant policies (e.g. Education policy) and interesting Member States/Associated Countries networking activities.. Support for phasing-in of SCAR SWGs or CWGs that may be set up in the future also forms part of the scope. Ad hoc task forces may be used to support specific activities for short time periods.

This coordination and support action should furthermore ensure broader dissemination of the output of the SCAR SWGs and CWGs, including the portfolio analysis, to any actor interested in their respective domains, both in classical ways (e.g. with reports, factsheets, videos, workshops, conferences, etc) as by using up to date IT tools and websites, providing on a case by case basis interactive linkages with the young generation of scientists, innovators and citizens for example by hackathons. These materials and tools should be widely spread and also be made available to the SCAR Steering Group and the SCAR Plenary. It includes helping to prepare the input from the SWGs/CWGs for the SCAR Foresights and to help disseminate outcomes, as well as supporting its take-up by SCAR Working Groups and possible ad hoc task forces, including linking to international R&I partnerships (EU-AU) and processes, such as the UN Food Systems Summit follow-up.

The consortium should be representative of the EU Member States and Associated Countries. Entities in EU Member States and Associated Countries not integrated in the consortium should be identified and the reasons for not participating in the Consortium clearly explained in the proposal. These countries should nevertheless be invited and encouraged to participate in the project activities (e.g. meetings, workshops).

The Commission considers that proposals requesting a contribution from the EU around EUR 4 million would allow the expected outcomes to be achieved appropriately. Nonetheless, this does not preclude the submission and selection of proposals requesting other amounts. A project duration of 4 years is expected.

HORIZON-CL6-2021-GOVERNANCE-01-06: Environmental and social cross-compliance of marine policies

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of between EUR 2.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a

<i>project</i>	proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: Successful proposals will enhance new knowledge and design or improve tools to achieve better informed decision-making processes and better integrated policies, supporting the implementation of the European Green Deal. In this way proposals will contribute to the development or improvement of innovative governance models enabling sustainability and resilience and of EU and international science-policy interfaces.

Project results are expected to contribute to all the following expected outcomes:

- Better understanding of the weaknesses in cross-compliance of marine/maritime policies, legislation and regulation is used by the policy making community
 - to halt biodiversity decline and enhance biodiversity and ecosystem restoration and conservation for the benefit of local communities
 - to favour nature-based climate adaptation and mitigation measures
 - to achieve progress towards zero pollution.
- Analytical contributions, orientations and proposals to improve international, European, national or regional marine/maritime policies, legislation, regulation and their implementation, are provided to the policy making community in order to fully integrate the environmental, social and health requirements and considerations, enabling a better integration and harmonisation of policies.
- Better understanding of (a potentially regulatorily consolidated) lack of biodiversity, pollution or climate related considerations and socio-economic power balances in decision making that could disadvantage biodiversity and ecosystem conservation and restoration and ecosystem services' benefits to local communities or disadvantage pollution prevention, reduction and remediation; is used to the benefit of international cooperation and development aid for local communities.
- Better understanding of the effects of different climate adaptation measures on good ecological, environmental or conservation status, is leading to tangible support for nature-based and socially acceptable climate adaptation and mitigation strategies with low carbon footprint.
- Better understanding of the weaknesses in consistency between emission control regulation and fresh water and marine environmental quality standards for chemical substances and user or prohibition guidelines at local level (communes, garden maintenance companies etc.), as well as food quality and safety or other health standards is used by the policy making community.

- Better understanding of the weaknesses in cross-compliance between Common Agricultural Policy and the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) such as in relation to eutrophication in fresh and marine waters has inspired the policy making community to introduce improvements.
- The policy making community exploited a better insight in how the Member States' Maritime Spatial Plans, River Basin Management Plans and MSFD measures link together concerning climate adaptation and mitigation, biodiversity and ecosystem conservation and restoration, and pollution.

Scope: Proposals shall focus on implementation research on environmental and social cross-compliance of a broad range of marine and maritime policies to detect inconsistencies between different policies, legislation and regulations as barriers for the Green Deal and its strategies (EU Biodiversity Strategy for 2030, Climate Adaptation Strategy, the Zero Pollution ambition) in the marine domain.

Actions should address one or more of the following options:

1. Environmental and social cross-compliance of marine policies for nature-based climate adaptation and mitigation

A sufficient scientific knowledge base is needed to be able to judge and avoid potential exemptions of Water Framework Directive and Marine Strategy Framework Directive requirements or conflicts with NATURA 2000 legislation for new coastal infrastructure licences for climate adaptation and mitigation actions. The implementation of Article 4(7) of the WFD on how to deal with new physical modifications to (including coastal) water bodies currently differs considerably from one Member State to another ⁴⁴⁶. Proposals shall analyse European, national or regional marine/maritime policies, legislation and regulation, in particular related to the Water Framework Directive, Marine Strategy Framework Directive and NATURA 2000 Directives versus marine sectorial and marine spatial planning legislation, regulation and implementation focusing on climate adaptation and mitigation. Proposals shall review the knowledge on the effects of different climate adaptation and mitigation measures on good ecological, environmental or conservation status, also taking into account the benefits of traditional and indigenous knowledge and experience on climate adaptation and mitigation ecosystem services for integration in policy implementation. Proposals shall weaknesses in cross-compliance of marine/maritime policies, legislation and regulation to favour nature-based climate adaptation and mitigation measures. They shall make proposals for improvement and define research and innovation needs to cover gaps in knowledge to assess effects of different climate adaptation and mitigation measures on good ecological, environmental or conservation status to support environmentally friendly decision making.

1. Environmental and social cross-compliance of marine policies to halt biodiversity decline and enhance restoration and conservation for the benefit of local communities

Proposals European, national or regional marine/maritime policies, legislation and regulation (Convention on Biological Diversity, Biodiversity Beyond National Jurisdiction, Environmental Impact Assessment etc.) Proposals shall identify weaknesses in cross-compliance of marine/maritime policies, legislation and regulation to halt biodiversity decline and enhance restoration and conservation for the benefit of local communities. They shall make proposals for improvement to support environmentally friendly decision making at all governance levels, also taking into account the benefits of traditional and indigenous knowledge and experience on biodiversity and ecosystem services for integration in policy implementation.

1. Environmental and social cross-compliance of marine policies to achieve progress towards zero pollution

Proposals shall focus on implementation research on environmental and social cross-compliance of a broad range of marine and maritime policies to detect inconsistencies between different policies, legislation and regulations in order to achieve progress in the elimination of historical and future pollution. Proposals shall analyse international, European, national or regional marine/maritime policies, legislation and regulation, versus marine sectorial legislation, regulation and implementation focusing on all kinds of pollution. They shall make proposals for improvement to eliminate inconsistencies at all relevant governance levels and define potential scientific needs to achieve them.

The size of requested EC contribution should be commensurate to the breadth of the project scope.

The proposals should cover a representative set of coastal areas or regions across Europe varying according to size and geographical, environmental, socio-economic, institutional and administrative conditions (regional, inter-regional, macro-region, cross-border).

Interactive research approaches should be used to engage with local, regional, national and – where relevant - international authorities, as well as local communities, citizens and other relevant stakeholders.

Projects should build on existing knowledge and integrate results from multiple origins, including other EU, international (for example UN) or national projects or studies. Some cooperation activities with projects financed under topics from Destination 1 and 4 and Green Deal calls (like LC-GD-7-1-2020 Restoration of Biodiversity and Ecosystem Services) could be included. This topic should also be linked to the Horizon Europe Missions Ocean, seas and waters and Adaptation to Climate Change including Societal Transformation, the Partnership for a climate neutral, sustainable and productive Blue Economy, the Biodiversity Partnership, the Partnership Water security for the planet (Water4All) or other partnerships where relevant.

HORIZON-CL6-2021-GOVERNANCE-01-07: Regional governance models in the bioeconomy

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Successful proposals will contribute to the expected impacts of the Destination 7, and the European policies it supports, in particular the European Green Deal, and EU Bioeconomy Strategy, by supporting the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation. In addition, the topic supports the strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

Projects results are expected to contribute to all of the following expected outcomes:

- Creation of a supporting governance structure and related capacities for regional authorities, contributing to the Circular Cities and Regions Initiative (CCRI)⁴⁴⁷ and aiming at developing comprehensive and innovation- and sustainability-driven bioeconomy strategies.
- Support to local economic and implementing authorities, including at bioeconomy clusters' level, to improve engagement of regional and local actors, considering hierarchy of use, trade-offs, synergies, business models, participatory approaches etc. with improved environmental, social and economic impacts.
- Support to the development of regional/local strategies, aiming at exploiting and developing balanced local potentials and innovation (in terms of feedstock, infrastructures (e.g. biorefineries) for logistics, services and production, investments) within the framework of local development and investment as well as environmental protection plans.
- Integration of the opportunities created by the local bio-based economy within broader bioeconomy transition, e.g. by linking ecosystem/nature services' valorisation with sustainable biomass production, processing, product design and manufacture, circular use and upcycling to new applications.

⁴⁴⁷ <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

- Development of the best practice guidelines for local operators and innovation developers, supporting climate-neutrality and low environmental footprint improvements of bio-based products and services;
- Development of novel business models and related social measures to enable consumers, industry and public bodies to switch to socially and environmentally responsible behaviour within their choices (e.g. regulatory measures, corporate responsibility initiatives, education); ensuring synergies, transparency and inclusiveness of all actors;

Scope: Improved and informed governance including social innovation contributes to reducing resource consumption and results in an increased innovation capacity of all actors, and reducing the risk of leaving anyone behind. This should take into account the regional and local peculiarities, including feedstock availability, industrial development, consumption patterns, market measures and available investment streams (financial models), while ensuring effective sharing of best practices across European regions. This also helps to advance innovation at local scale and engage all actors.

This action shall support the implementation of sustainable bio-based value chains, in regional settings (toolbox of instruments including strategies, plans and programmes, including the social dimension). Proposals will benefit from social creativity and opportunities at regional scale unleashed for bio-based systems, ensuring their low environmental footprint, and providing for its operational verification. Robust environmental protection plans should underpin the effort undertaken.

The local dimension refers to regional scales, in terms of rural/urban/coastal areas, to be identified/defined in their specific characteristics to act as optimal frameworks for coherent and replicable strategies of bio-based systems. The proposals will seek complementarities with related actions⁴⁴⁸ on the governance of bio-based innovation and ensure inclusiveness and the engagement of all actors.

Proposals will:

- a. Analyse and structure the regional bioeconomy-related policy mix (e.g. regional operational programmes, bioeconomy strategies under the Common Agricultural Policy instruments, innovation action plans, business models, environmental protection plans) to understand the potentials, bottlenecks, and opportunities, capacities etc. for feedstocks, infrastructure, investment, human skills, innovation actors (including community knowledge) etc. to enable sufficient impacts/benefits/positive trade-offs and performances of the specific bioeconomy/bio-based value chains;
- b. assess existing/develop a new policy monitoring system and key performance indicators of the effectiveness and robustness of existing governance schemes, to allow replication across Europe (e.g. income generation for all stakeholders, labour conditions, environmental indicators, social engagement, innovation parameters etc);

⁴⁴⁸ Such as the projects funded under Horizon 2020 calls SwafS-14-2018-2019-2020: Supporting the development of territorial Responsible Research and Innovation

- c. ensure efficient exchange of best practice and engagement of all actors (regional and local authorities, SMEs, civil society organisations including NGOs, knowledge providers) via robust and transparent communication and awareness-rising campaigns;
- d. analyse social and economic barriers and potentialities to enable the transition towards socially and environmentally responsible behaviour within all ranges (e.g. regulatory measures, corporate responsibility initiatives, education), ensuring inclusiveness of all actors (NGOs, civil society etc, considering gender and age, where relevant.)

HORIZON-CL6-2021-GOVERNANCE-01-08: Improving understanding of and engagement in bio-based systems with training and skills development

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Successful proposal(s) will contribute to the expected impacts of the Destination 7, and the European policies it supports, in particular the European Green Deal and EU Bioeconomy Strategy, by supporting the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation. In addition, the topic supports the strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

Projects results are expected to contribute to all of the following expected outcomes:

- Creation of guidelines for training and mentoring programmes in specific European regions and local communities, on knowledge and skills useful in the bioeconomy, and in particular bio-based sectors.
- Increased awareness, understanding and engagement of all actors (especially stakeholders involved in adult learning, retraining and skills' development) with focus on co-creation, and social innovation.
- Support to the local balanced local potentials and innovation (in terms of feedstock, infrastructures, capacities) within the framework of local development and investment as well as fostering sustainability-driven policy.
- Integration of the opportunities created by the human-centric principles, offered by art, culture and (eco)-design, in respect to the bio-based feedstocks, including traditional and novel biological materials.

- Support to the feedback loops from the society to the policy makers, by developing the best practice guidelines for local operators and innovation developers, supporting climate-neutrality and low environmental footprint improvements of bio-based products and services;
- Development of skills leading to the novel business models and related social measures to enable consumers, industry and public bodies to switch to socially and environmentally responsible behaviour within their choices (e.g. regulatory measures, corporate responsibility initiatives, education); ensuring synergies, transparency and inclusiveness of all actors;

Scope: Improved and informed governance including social innovation contributes to reducing resource consumption and results in an increased innovation capacity of all actors, and reducing the risk of leaving anyone behind. This should take into account the need to promote social engagement, supporting the permanent learning and re-training, in the area of bio-based economy.

This needs to take into account local specificities, such as the sustainable biological feedstocks available (both traditional materials such as wood, cork or straw), but also innovations such as sustainable bio-textiles, bio-composites, 3-D printed biomaterials, recycled agro-food residues etc. This also helps to advance innovation and awareness including on social level, looking on the role of design, arts and culture, as technological capacities. The improved understanding of the social attitudes in diverse European regions forms an important part of this action.

This action shall support the implementation of sustainable bio-based value chains, in the regional settings, by developing guidelines and creating feedback loops to the respective policy makers. Proposals will benefit from social creativity and opportunities for bio-based systems unleashed at regional scale ensuring their low environmental footprint and sustainability. Robust environmental evaluation should underpin the effort undertaken.

The proposals will seek complementarities with related actions on governance of bio-based innovation and ensure inclusiveness and engagement of all actors, especially SMEs, civil society organisations including NGOs and broader civil society (e.g. educational institutions, museums, science, art centres).

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake. Proposal could explore intersectionality approaches and consider aspects like gender, ethnicity, migrant or refugee status, social class, sexual orientation and disability to ensure inclusion of marginalised groups in decision-making, citizen engagement and training activities.

Proposals will:

- a. Analyse and develop guidelines on the regional bioeconomy-related skills/(re)-training/adult learning programmes to allow replication across Europe, taking into account the diversity of regional/local approaches, including the existing support

measures (e.g. bioeconomy strategies, sectorial public and industry programmes and initiatives).

- b. Assess and integrate the contribution from the humanities/art/design/culture into bioeconomy/bio-based economy sectors (e.g. role of innovation and sustainability for the new bio-based materials, new functionalities, safety, user-friendliness, understanding);
- c. Ensure efficient exchange of best practice and engagement of all actors (e.g. regional and local authorities, SMEs, civil society organisations including NGOs, University alliances and professionals' associations, knowledge providers, artists, designers and architects) via robust and transparent communication and awareness-rising campaigns;
- d. Analyse and develop recommendations on social and economic barriers and potentialities (e.g. job creation capacity and its quality) to enable the transition towards socially and environmentally responsible behaviour within all ranges (e.g. regulatory measures, corporate responsibility initiatives, education), ensuring inclusiveness of all actors (NGOs, civil society, including women, ethnic and religious minorities, migrants and refugees, the LGBTIQ community, disabled persons, youth and the elderly, etc);
- e. Link with relevant activities under H2020, BBI JU, BIOEAST Initiative and EIT Knowledge and Innovation Communities, in particular their education efforts.

HORIZON-CL6-2021-GOVERNANCE-01-09: Revitalisation of European local communities with innovative bio-based business models and social innovation

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Successful proposal(s) will contribute to the expected impacts of the Destination 7, and the European policies it supports, in particular the European Green Deal, and EU Bioeconomy Strategy, by supporting the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation. In addition, the topic supports the strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

Projects results are expected to contribute to all following expected outcomes:

- Higher awareness of stakeholders (e.g. by development of a programme that focuses on helping local stakeholders, including primary biomass producers, civil society

organisations including NGOs and SMEs to be integrated in and benefit from bio-based value chains) – identifying local actors and improve communication between them, showing opportunities for collaboration along the bio-based value chain.

- Increased opportunities to develop skilled jobs and small-scale establishments in the bioeconomy, thus helping to revitalise local communities (by supporting the local and regional rural development, economic and implementing authorities, to raise awareness of bio-based options)
- Advancement of the role of ‘social enterprise’ model for local communities, including the low-income populations, benefiting from creativity linked to bio-based solutions and promoting inclusiveness and cooperation at all levels.
- Increased opportunities created by the local bio-based economy within broader bioeconomy transition, e.g. by linking valorisation of ecosystem/nature services’ (e.g. recreation) with sustainable biomass production, processing, product design and manufacture, circular use and upcycling to new applications.
- Supporting the development of for small businesses and for business-to-consumers communication of innovation, climate-neutrality and low environmental footprint/benefits/trade-offs and performances of bio-based products and services (e.g. by development of best practice guidelines);
- Supporting novel business models and related social measures to enable consumers, industry and public bodies to switch to socially and environmentally responsible behaviour within their choices (e.g. guidelines on regulatory measures, corporate responsibility initiatives, education); ensuring synergies, transparency and inclusiveness of all actors)

Scope: The action advances the role and impact of bio-based innovation to accelerate the transition from a linear fossil-based economy, which leads to overuse and depletion of natural resources, into a resource-efficient and circular bio-based systems operating safely within planetary boundaries. Improved and informed governance and especially social innovation contributes to reducing resource consumption and results in an increased innovation capacity of all actors, while reducing the risk of leaving anyone behind, particularly in the areas and communities in need of revitalisation. This also helps to advance innovation at local scale and engage all actors (especially the ‘social enterprise’ model relevant for vulnerable populations).

Proposals will benefit from social creativity and opportunities at regional scale unleashed for bio-based systems, ensuring their low environmental footprint, in terms of feedstock, resources, processes, materials and products. Impacts and trade-offs, such as the carbon footprint and environmental footprint of the whole value chains shall be part of the assessment of the bio-based systems. The proposals will seek complementarities with related

actions⁴⁴⁹ under rural development programs on the governance of bio-based innovation and ensure inclusiveness and engagement of all actors.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake. Proposal could explore intersectionality approaches and consider aspects like gender, ethnicity, migrant or refugee status, social class, sexual orientation and disability to ensure inclusion of marginalised groups in citizen engagement and the development of tools and guidelines.

Proposals will:

- a. select a range of bio-based systems where value chains can be tailored to specific needs in respect to the revitalisation of local communities (understood both in territorial and social sense), to their environmental and social impacts (benefits and trade-offs) from trade in the primary materials to the final products;
- b. focus on relevant new or updated business models and local capacities (feedstocks, infrastructure, human skills, etc), and innovation actors (including community knowledge and marginalised groups), to enable sufficient impacts/benefits/positive trade-offs and performances of the specific value chains;
- c. assess existing/develop new monitoring system and indicators of the effectiveness and robustness of existing governance schemes, to allow replication across Europe (e.g. income generation for all stakeholders, labour conditions, environmental indicators, social engagement, innovation parameters etc);
- d. ensure efficient engagement of all actors (public authorities, SMEs, NGOs, knowledge providers) via robust and transparent communication and awareness-rising campaigns;
- e. analyse social and economic barriers and potentialities to enable the transition towards socially and environmentally responsible behaviour within all ranges (e.g. regulatory measures, corporate responsibility initiatives, education), ensuring inclusiveness of all actors (NGOs, civil society etc).

HORIZON-CL6-2021-GOVERNANCE-01-10: Raising awareness of circular and sustainable bioeconomy in support of Member States to develop bioeconomy strategies and/or action plans

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

⁴⁴⁹ Such as the topic HORIZON-CL6-2021-COMMUNITIES-01-02: Expertise and training centre on rural innovation

<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Successful proposal(s) will contribute to the expected impacts of the Destination 7 “Innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, social engagement and innovation”. This action will support Member States that do not have a bioeconomy strategy and/or an action plan in developing one as part of their preparation for a sustainable economic, social and environmental transition to climate neutrality as called for in the European Green Deal.

Projects results are expected to contribute to all of the following expected outcomes:

- Increased awareness of decision makers and public administrators in different ministries about the various bioeconomy sectors, the role of the bioeconomy in the EU policies, the benefits of the bioeconomy and particularly the circular bio-based sector, including products substituting fossil-based and carbon-intensive products and reducing of respective emissions of GHGs and other pollutants.
- Improved inter-ministerial interaction and engagement in Member States that are developing or are preparing to develop their Strategy and/or Action Plan through exchange of good practices and experiences at meetings and conferences.
- Increased awareness of the bioeconomy and its potential among a broad range of national stakeholders, such as the general public, knowledge providers, universities, investors, industry, primary producers and NGOs, through tools such as for example workshops, living lab activities, exhibitions.
- Better interconnection of stakeholders into national bioeconomy hubs with the aim of providing a framework and the assurance that even without national level strategic orientation they are in line with the EU objectives.
- Improved information about current policy instruments and solutions to bridge between strategies and actual policy, including exploitation of opportunities offered by the current EU policy framework (e.g. related to circular economy, energy, innovation, agriculture).

Scope: The European Green Deal, the Commission’s growth strategy, has set Europe on its path to be the first climate neutral continent by 2050 and achieve a green transition that will be just, fair and inclusive. One of the seven core pathways to deliver on climate neutrality, identified in the Clean Planet Strategy is the bioeconomy. The updated EU Bioeconomy Strategy has highlighted the relevance of developing national bioeconomy strategies and action plans to deploy a sustainable and circular bioeconomy across Europe taking into account economic, social and environmental aspects.

To date, there are still Member States in Europe, including many from Central and Eastern Europe that do not have a national bioeconomy strategy and/or action plan despite their high biomass resource base and new bioeconomy potential. This topic shall support Member States

to develop strategies and/or action plans by improving knowledge and raising awareness of a sustainable, circular bioeconomy, its challenges and opportunities as well as experiences made elsewhere.

Moreover, the topic should help to bring together national stakeholders in deploying and fostering the bioeconomy related research and innovation developments by engaging local stakeholders into the participation in macro-regional and European thematic networks and into building the common European Research Area.

The focus of the topic will be two-fold: reaching out to decision makers and public administrators in different ministries as well as to a wide range of stakeholders crucial for the development of the national strategies and bioeconomy deployment across Europe. These stakeholders could consist for example of investors, industries, SMEs, feedstock providers (e.g. waste, side streams, farmers, foresters, fishermen). It is also relevant to cooperate and establish links with relevant existing initiatives such as the BIOEAST, EUBIONET, BBI JU and the Circular Bio-based Europe (CBE) Partnership.

This topic should ensure that Member States without bioeconomy strategies and/or action plans become equally empowered to make the transition to climate neutrality as those that already have a bioeconomy strategy in place.

HORIZON-CL6-2021-GOVERNANCE-01-11: Education on the bioeconomy including bio-based sectors for young people in primary and secondary education in Europe

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 2.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: Successful proposal(s) will contribute to the expected impacts of the Destination 7 and support the European Green Deal priorities and the updated European Bioeconomy Strategy with the aim to accelerate the transition to a sustainable and circular bioeconomy in Europe. This will contribute to achievement of a climate-neutral Europe by 2050.

Projects results are expected to contribute to all of the following expected outcomes:

- Increased awareness of the environmental, social and economic benefits of sustainable and circular bioeconomy and its sectors, in particular bio-based sectors among young people at pre-school, elementary and high school level.

- Increased interest among new generations to join education and training on sustainable and circular behaviours and to become responsible consumers that will take on a sustainable and circular lifestyle; and new ways of attracting talent in the life science, technology and the bioeconomy opportunities.
- Innovative approaches to provide a toolkit with educational and information material, such as videos, games, social media, prize competitions, including nomination of “Bioeconomy Youth Ambassadors” campaigns for children and young adults in high schools.
- Preparing the younger generation to assume their role in the transition to a circular and sustainable bioeconomy, e.g. through the uptake of innovative solutions.
- Strengthened cooperation between teachers, parents and youth by developing new approaches.

Scope: The updated European Bioeconomy Strategy highlights the importance of education and increasing public awareness of all areas of the bioeconomy as crucial to understanding the challenges and the opportunities offered by the bioeconomy.

This topic should focus on the bioeconomy in general but with a specific focus on circular bio-based sectors and their potential, to prepare citizens for a future that will assume a sustainable and circular lifestyle (in terms of consumption, recycling, etc.) and to inspire young people to pursue education in life science, technology and bioeconomy related areas. The actions shall promote the bioeconomy and bio-based solutions that provide environmental, climate-neutral and socio-economic benefits through education, training and awareness raising on sustainable production, consumption and lifestyles by engaging children and young adults.

Strengthening the knowledge and sensitivity of future generations to environmental issues, sustainability and circularity through information and education programmes targeting younger generation can contribute to raising a future generation of decision-makers and a workforce that are informed and interested in bioeconomy.

HORIZON-CL6-2021-GOVERNANCE-01-12: EU agriculture within a safe and just operating space and planetary boundaries

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: Successful proposals will set out a credible pathway to contributing to innovative governance and sound decision making in policy for the transition of European agriculture required by the European Green Deal.

Project results are expected to contribute to the following expected outcomes:

- Boost EU and Associated Countries analytical and modelling capacity in agriculture in both bio-physical and socio-economic domains
- Develop an analytical and policy framework and timeframe for the European farming sector to operate within safe and just operating space and planetary boundaries and achieving EU climate change policy objectives
- Analyse policies and develop policy recommendations for the agricultural policies in Europe in 2030

Scope: In order to enable the transition to sustainable agriculture, it is crucial to establish the necessary policy framework and related monitoring and evaluation activities. This implies the development of appropriate tools for measurement and monitoring of socio-economic and biophysical data in order to model and project scenarios and derive the necessary targets, trajectories and relevant policy measures and the development of relevant analysis.

Projects will:

- operationalise the concept of safe and just operating space, including planetary boundaries, in the case of the EU agriculture and at different spatial scales;
- boost the analytical and modelling capacity of the EU and Associated Countries in the farming sector with a view to informing impact assessments and formulating policy recommendations, with a particular focus on conditions and policy measures for the EU farming sector to respect planetary boundaries, in particular regarding climate change and biodiversity, and safe and just operating space;
- work at various geographical scales, from local, national, EU to global levels, and simulations and projections will range from short / medium term (to capture the accelerating impact of climate change) to long term policy scenarios;
- Within a foresight exercise, develop post-2027 science-based targets for European farming allowing the sector to remain within the planetary boundaries and a safe and just operating space, and the conditions to achieve the targets, and develop a roadmap and the related policy framework to reach those objectives;
- mobilise running Horizon 2020 projects and build on their main results. It will aim to bridge gaps in modelling approaches relevant to the exercise, including those identified by the Horizon 2020 project Suprema. Projects will link in particular with the projects

financed under RUR-03-2018 (CONSOLE⁴⁵⁰, Contract2.0⁴⁵¹ and EFFECT⁴⁵²) and RUR-04-2018-2019 (Mind Step⁴⁵³, BESTMAP⁴⁵⁴ and AGRICORE⁴⁵⁵);

- include a task to collaborate with other projects financed under this topic and under topic HORIZON-CL6-GOV-2021-00-00 “Modelling land use and land management in the context of climate change”;
- work in a multidisciplinary manner and involve a broad community of scientists including climate, land, biodiversity, health, human, economic and environment sciences;
- establish a regular dialogue with the European Commission regarding objectives, timeline and main deliverables with the goal to provide analyses, analytical tools, simulations and policy recommendations for the Common Agricultural Policy (CAP) post 2027, as well as other relevant EU programmes (for instance EU climate and biodiversity policies). Project duration will not be shorter than five years;
- ensure that the proposed approach will be compatible with and improve the tools used at the European Commission. The JRC may participate as a member of the consortium but is not eligible for funding.

As an option, necessary additional analysis and modelling may be supported through grants to third parties. In this case, the proposal must define the process of selecting entities for which financial support will be granted, of up to 60.000 EUR per third party. Grants to third parties may be utilised to ensure a comprehensive coverage of technical issues and the participation of pluralistic approaches to the analytical work on a series of key issues.

HORIZON-CL6-2021-GOVERNANCE-01-13: Modelling land use and land management in the context of climate change

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility</i>	The conditions are described in General Annex B. The following

450 <https://console-project.eu/>

451 <https://www.project-contracts20.eu/>

452 <http://project-effect.eu/>

453 <https://mind-step.eu/>

454 <http://bestmap.eu/>

455 <https://agricore-project.eu/>

<i>conditions</i>	exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
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Expected Outcome: Successful proposals will set out a credible pathway to contributing to innovative governance and sound decision making in policy for the transition required by the European Green Deal.

Project results are expected to contribute to the following expected outcomes:

- Boosting of economic and environmental modelling of land use and management and carbon sequestration in Europe and use of modelling for policy purposes (mainly climate policy, agricultural policy, land use policy).
- Contribution to the formulation, implementation and monitoring of land-related issues of agriculture and forestry policies, in particular linked to climate change.

Scope: To ensure the sustainable management of land resources in the long term there is a need for an integrated framework that addresses society's objectives appropriately by understanding the trade-offs between uses and by incentivising actions / behaviours / investments contributing to desirable targets. Land use and management has a key role to play in Europe in terms of boosting carbon storage, producing biomass for the bioeconomy, reducing urban sprawl and attaining the objective of climate neutrality by 2050 while ensuring food and nutrition security, biodiversity commitments and well-being in general. There are however substantial knowledge gaps regarding, in particular, the understanding of the impacts of farming / forestry practices at various scales, from local to global, and the capacity to model these impacts (economic and environmental). Work should include the analysis of land use dynamics and trends between arable land, permanent grassland, land abandonment / marginal lands, forest areas, for which quantifications and an identification of drivers and impacts should be done in an integrated manner.

Projects will:

- work on land use dynamics and explore the effects of policy measures that can influence such dynamics, in particular agricultural, land use and climate policies.
- focus activities mainly on agriculture and forest land use/cover and will extend to interactions of the former with other main land uses/covers and drivers. This should ensure usability of the results in larger contexts. While focusing on Europe, proposals are encouraged to draw on good examples from elsewhere.
- work at various spatial scales – farm level, regional to EU levels - and simulations and projections will range from medium-term to long-term policy scenarios and should cover the whole of the EU and its Member States and possibly Associated Countries.

- ensure that the proposed approach will be compatible with and/or improve existing databases and tools used at the European Commission and ensure open access to data. The JRC may participate as a member of the consortium but is not eligible for funding.

include a task to collaborate with other projects financed under this topic and under topic HORIZON-CL6-GOV-2021-00-00 “EU agriculture within a safe and just operating space and, including planetary boundaries”. They will also liaise with relevant Horizon 2020 modelling projects (including LandSupport⁴⁵⁶).

Deploying and adding value to Environmental Observations

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-GOVERNANCE-01-14: User-oriented solutions building on environmental observation to monitor critical ecosystems and biodiversity loss and vulnerability in the European Union

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 3.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 20.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: A successful proposal will support the delivery of services and solutions for the implementation of the European Green Deal and the Biodiversity Strategy, through the deployment and exploitation of environmental observations⁴⁵⁷, benefiting a broad range of end-users and helping them restore biodiversity and ecosystems under threat, thus contributing to the global observation and monitoring of the living realm.

Proposals are expected to contribute to some of the following outcomes:

- Better informed policy formulation for biodiversity & ecosystem services on European/national and regional level, built on enhanced understanding of better

⁴⁵⁶ <https://www.landsupport.eu/>

⁴⁵⁷ The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

quantified and characterised changes in biodiversity and ecosystem services and the prediction of their trajectories;

- Enhanced understanding of the adverse cumulative impacts of climate change and anthropogenic activities on biodiversity and ecosystem functioning and in particular on habitats and key species at risk of extinction in sensitive ecosystems to define enhanced management, adaptation and mitigation actions;
- Enhanced planning and ecosystem-based management of land and sea with the objectives to minimize the adverse effects of climate change and anthropogenic activities on ecosystems and biodiversity;
- Dependable data, information and knowledge to support adaptation and mitigation of biodiversity loss resulting from climate change and anthropogenic activities, through maximised exploitation of information and data from European data infrastructures, European programmes (such as EMODnet⁴⁵⁸ and European research infrastructures⁴⁵⁹) and GEO⁴⁶⁰ initiatives.
- Support to the development of the European service sector regarding end-user climate services related to biodiversity and ecosystems and deliver usable results to the monitoring framework of the EU Biodiversity Strategy for 2030;
- A contribution to the EC-ESA Joint Earth system science initiative⁴⁶¹ (in particular to the Flagship Action on Biodiversity and Ocean Health);

Improved governance of biodiversity monitoring and reporting, in particular together with the ‘Rescuing biodiversity to safeguard life on Earth’ partnership⁴⁶², the EU Knowledge Centre for Biodiversity and GEOBON⁴⁶³.

Scope: The projects are expected to further the harmonisation, mobilisation, and uptake of monitoring and environmental data to better characterise and understand the natural and anthropogenic pressures on biodiversity, the extent of the destruction of natural biological resources and its connection with ecosystem conditions within safe planetary boundaries. There is a need for knowledge of both better quantified and more precisely characterised changes in biodiversity and related ecosystem services (in coastal, marine, terrestrial and freshwater ecosystems), and of ecosystem status and quantified impacts of the main direct drivers of changes (i.e. land and sea use changes, pollutions, climate change, invasive alien species and exploitation of natural resources) on European natural capital.

The projects should deliver new Earth Observation (EO) data services building on the potential of EO capabilities in order to address end-user needs facing the deterioration and

458 <https://www.emodnet.eu/en>

459 <https://www.esfri.eu/>

460 <http://www.earthobservations.org/index.php>

461 https://ec.europa.eu/info/news/commission-and-european-space-agency-plan-earth-system-science-initiative-address-critical-environmental-challenges-2019-may-13_en

462 https://ec.europa.eu/info/files/european-partnership-rescuing-biodiversity-safeguard-life-earth_en

463 <https://geobon.org/>

destruction of their living environment and ecosystems. The projects under this topic should tackle issues raised within the European Green Deal calls⁴⁶⁴ and provide solutions to halt biodiversity loss and protect vulnerable ecosystems, and ensuring ecosystem capacity to continue to provide services to society and the environment. The projects should make mapping tools and information solutions available, which are needed by a wide variety of end users in order to meet targets for conservation and restoration of diverse terrestrial, coastal and marine ecosystems. Hence, the development of tools to support decision-making and participatory management are crucial in this context. Solutions related to improving ecosystem health and resilience should be integrated into best practice monitoring activities within respective monitoring governance schemes. This should enable stakeholders and policy makers to take the right conservation and restoration measures, in particular with the use of a holistic ecosystem-based management in response to the urgent need for halting biodiversity loss and, consequently, alterations to ecosystem functions and sustain the delivery of precious ecosystem services.

Building on existing services and frameworks provided through GEO, EuroGEO⁴⁶⁵, European research infrastructures, European Ocean Observing Systems, EMODnet, Copernicus, ESA⁴⁶⁶ Earth Observation Programmes and EGNSS, this topic should address the downstream part of the value chain to support mitigation and adaptation to climate change impact on biodiversity and ecosystems. The consortia should engage with end users and stakeholders, contribute to customising of data and exploitation platforms, deliver scaling-up and replication of existing service models, and brokerage of knowledge and dissemination to the public. The successful proposals should build on outcomes of EU funded projects such as Horizon 2020 projects like ECO-POTENTIAL⁴⁶⁷, initiatives like EUBON⁴⁶⁸ and programmes like LIFE⁴⁶⁹, and should feed into the EU Knowledge Centre for Biodiversity, and deliver usable results to the monitoring framework of the EU Biodiversity Strategy for 2030.

HORIZON-CL6-2021-GOVERNANCE-01-15: Preparing for pre-commercial procurement (PCP) for end-user services based on Environmental Observation in the area Climate Change Adaptation and Mitigation

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 2.00 million.

464 <https://ec.europa.eu/easme/en/news/european-green-deal-call>

465 https://ec.europa.eu/info/research-and-innovation/knowledge-publications-tools-and-data/knowledge-centres-and-data-portals/eurogeo_en

466 <https://www.esa.int/>

467 <http://www.ecopotential-project.eu/ps://www.esa.int/>

468 <http://www.eubon.eu/>

469 <https://ec.europa.eu/easme/en/life>

<i>Type of Action</i>	Coordination and Support Actions
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Expected Outcome: The successful proposal will support the preparation, facilitation and paving of the way for pre-commercial procurement in the area of climate change adaptation and mitigation to enable up-scaling and wide use of end user services to respond to common needs in this area. The successful proposal will be contributing to the European Green Deal objectives by further deploying and exploiting the use of environmental observations⁴⁷⁰.

In order to do so the project is expected to contribute to all of the following outcomes:

- Creation of a critical mass of procurers of solutions and services in the area of climate change adaption and mitigation, which will undertake joint, cross-border or coordinated procurements;
- Description of the common needs of the public procurers for end-user services in the area of climate change adaption and mitigation;
- Reduced fragmentation of public sector demand via creation of a network(s) of public procurers capable of collectively implementing PCPs and/or public procurement of innovative solutions (PPIs);
- Increased awareness in the network of procurers of relevant standards, certification and GEO data sharing principles;
- Leverage of additional investment in research and innovation in the domain of environmental observation and the Copernicus Climate Change Service;
- Increased awareness and successful use of public procurement to boost innovation and increased exchange of experience in procurement practices and strategies (organising trainings and other information exchange tools) in the specific area Climate services.

Scope: The scope of this CSA is to prepare a pre-commercial procurement due to be part of the Cluster 6 Work Programme for 2023 in the domain of climate change services using the information and data from the Copernicus programme, GEO initiatives, other relevant initiatives such as EMODnet, European research infrastructures and the broad range of environmental information.

The action should deliver all the necessary elements in preparation of the PCP as described in part H of the General Annexes to this Work Programme.

Proposals should lead to the establishment of a critical mass of public and/or private procurers in the area of climate change adaptation and mitigation, to overcome the fragmentation of demand for solutions and services and to lead to a more rapid market uptake of such solutions and their early deployment. Clear commitments from participants for a further Europe-wide

470

The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

take-up and rollout of results during and following the proposal are expected. Proposals should implement an open market consultation to gain insights into state-of-the-art technologies and ongoing developments, including prototypes and demonstration services coming out of relevant Horizon 2020, Horizon Europe, ESA and national projects. This could include new approaches for market consultations with suppliers, paying special attention to SME suppliers.

Proposals should engage public and/or private procurers from each country participating (at national, regional or local level) that have responsibilities and budget control in the relevant area(s).

The network(s) of public and/or private procurers created should investigate the feasibility of, test and prepare the launch of joint or coordinated procurements (PCP), which would ultimately develop innovative, fully tested, fit-for-purpose and cost-effective end-user services in the area climate change adaptation and mitigation. These solutions should be based on a complete set of common needs and specifications. Finally, to facilitate future replication, a set of well-documented practices should be made available.

Preparation activities for the joint or coordinated PCP will be supported, but not the costs of the procurement resulting from any PCP procedures.

Project duration should be 24 months.

Projects may collaborate with the Joint Research Centre by linking to the European Commission’s Knowledge Centre on Earth Observation hosted at JRC.

HORIZON-CL6-2021-GOVERNANCE-01-16: Tools to support the uptake and accessibility/exploitability of environmental observation information at European and global level

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.
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Expected Outcome: A successful proposal will enhance access and usability of environmental observation⁴⁷¹ information and promote pre-operational European services through global infrastructures in line with the objectives of the European Green Deal, the European Strategy for Data and the European Digital Strategy, thus deploying and adding value to environmental observations and contributing to a strengthened Global Earth Observation System of Systems (GEOSS).

Proposals are expected to contribute to all of the following outcomes:

- Conversion of existing environmental platforms into fully interoperable digital ecosystems, taking advantage of the progresses made in artificial intelligence, machine learning and high performance computing;
- Enhance the FAIRness (Findability, Accessibility, Interoperability and Re-usability) of environmental observation data, for example, through annotations turning them into relevant, open and accessible knowledge and provide support to decision makers involved in implementing the objectives of the European Green Deal⁴⁷², the new EU Climate Adaptation Strategy⁴⁷³ and European Strategy Data⁴⁷⁴;
- Improve the environmental observation knowledge at regional and local level across all European regions, leveraging existing platforms to foster the usability and practicability of digital services in support to the Horizon Europe Missions and Partnerships;
- Better access for European stakeholders to global environmental observation data, actionable information and knowledge, especially to the data derived from European programmes such as Copernicus⁴⁷⁵, Galileo⁴⁷⁶/EGNOS⁴⁷⁷ and INSPIRE⁴⁷⁸ to establish a Common European Green Deal data space, fully interlinked with the Common European data space for research and innovation and the European Open Science Cloud;
- Contribution to the Destination Earth initiative⁴⁷⁹.

Scope: The scope of this topic will be to enhance access and usability to Environmental observation information and promote pre-operational European services through global infrastructures, notably through the GEOSS (Global Earth Observation System of Systems) infrastructure. Proposals should turn existing platforms into consolidated digital systems which provide analytical tools, including machine learning for large-scale analysis, improve

471 The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations
472 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
473 https://ec.europa.eu/clima/news/commission-launches-online-public-consultation-new-eu-strategy-adaptation-climate-change_en
474 https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en
475 <https://www.copernicus.eu/en>
476 <https://www.gsc-europa.eu/>
477 https://egnos-user-support.essp-sas.eu/new_egnos_ops/
478 <https://inspire.ec.europa.eu/>
479 <https://ec.europa.eu/digital-single-market/en/destination-earth-destine>

the value of environmental observations (including in-situ data) to enrich the knowledge base needed to facilitate the reduction of anthropogenic impacts and to assure on optimal management of the transition to a climate neutral economy and a more resilient society.

Proposals should build on the relevant existing infrastructures⁴⁸⁰ and facilitate access and exploitation of EO derived data. The tools and services developed under the proposal(s) should be made available for future integration in the common topical European open infrastructure, Destination Earth. Proposals should deliver a plan for the sustained uptake of services by the European commercial sector and leverage the tools developed for the benefit of users from a variety of different sectors (e.g. public, private, civil society, citizen science). Proposals should contribute to support the ESA-Commission initiative on Earth System science⁴⁸¹.

HORIZON-CL6-2021-GOVERNANCE-01-17: Common European Green Deal data space to provide more accessible and exploitable environmental observation data in support of the European Green Deal priority actions

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 3.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to unleashing the potential of environmental and climate data through dedicated European data spaces in line with the objectives of the European Green Deal and the European Strategy for Data, by further deploying digital and data technologies as key enablers and strengthening EU and international science-policy interfaces as well as contributing to the Global Earth Observation System of Systems (GEOSS).

Proposals are expected to contribute to all of the following outcomes:

480 Such as the Copernicus DIAS, the European Open Science Cloud, EMODNet, the European research infrastructures, the Euro Data Cube, the GEOSS Infrastructure, INSPIRE and GBIF (Global Biodiversity Information Facility).

481 https://ec.europa.eu/info/news/commission-and-european-space-agency-plan-earth-system-science-initiative-address-critical-environmental-challenges-2019-may-13_en

- Available FAIR⁴⁸² data, information and knowledge in support of the European Green Deal priority actions on climate change, circular economy, zero pollution, biodiversity, deforestation and compliance assurance;
- Consolidated arrangements for European Green Deal data access, sharing and interoperability, in line with the FAIR principles for data, to facilitate the combination of data for policy analysis fostering as such innovative data analytic solutions;
- Concrete solutions and tools using data analytics and machine learning techniques to support to the European Green Deal priority actions;
- Increased convergence of the use of high performance computing, cloud, edge, computing, data analytics and artificial intelligence resources for Earth system modelling.

Scope: The scope of this topic is to contribute towards unleashing the potential of environmental, biodiversity and climate data through dedicated European data spaces. This will allow to exploit the major potential of environmental observation⁴⁸³ data in support of one or more of the European Green Deal priority actions: climate change, circular economy, zero pollution, biodiversity, deforestation and compliance assurance. Successful proposals are expected to address these challenges and contribute across all environmental areas to help harness the power of big data and artificial intelligence for the benefits of the European Green Deal. The proposals should also help in the convergence of use of high performance computing, cloud, data and artificial intelligence resources for Earth system modelling.

Proposals should contribute to the implementation of the European Strategy for Data in the domain of environment/climate and will act as a digital enabler for the European Green Deal in those domains. To provide a sustainable perspective for the results achieved, the data and services developed under the proposals should firmly aim to be connected into the common topical European open infrastructure, Destination Earth. Proposals should leverage environmental, geospatial and climate-related data, which are a prerequisite to better understand issues and trends on how our planet and its climate are changing and to address the role humans play in these changes. Proposals should contribute to the release and use of those data to strengthen evidence-based analytical capabilities for policy-making and implementation, including through building on the planned efforts of the European Commission Knowledge Centre on Earth Observation. Proposals should deliver open access to data useful for decision-making by public administrations, investors, insurers, businesses, cities, rural communities, citizen scientists, civil society and citizens, and for the development of new instruments to integrate climate change into risk management practices across the EU. Proposals should build on significant gains in our knowledge over the past decades on data management, to contribute to defragmenting data flows across topics, time and space, and develop best practices in the use of existing relevant platforms such as the Copernicus DIAS

482 Findable, Accessible, Interoperable and Re-usable

483 The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

and the GEOSS Infrastructure, or platforms in development under e.g. Destination Earth⁴⁸⁴, and communities in order to help prioritise and direct the efforts undertaken in the context of the European Strategy for Data;

Projects may collaborate with the Joint Research Centre by linking to the European Commission’s Knowledge Centres on Earth Observation, on Biodiversity and on Bioeconomy hosted at JRC.

Digital and data technologies as key enablers

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-GOVERNANCE-01-18: Mapping and improving the data economy for food systems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-5 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: This action will enhance the sustainability performance and competitiveness in the domains covered by Cluster 6 through further deployment of digital and data technologies as key enablers. It will help to achieve better informed decision-making processes, social engagement, governance and innovation. It will help deliver solutions to advance the European Green Deal priorities, the EU's Climate ambition for 2030 and 2050 and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system. In particular, it will contribute to improving the data economy for food systems.

Project results are expected to contribute to all of the expected outcomes:

- address the lack of solid knowledge about the data economy in food systems, its development, its fairness and inclusiveness, and its impacts including on EU policy objectives such as those related to food and nutrition security (FNS), sustainable and resilient food systems⁴⁸⁵, climate change, health, competitiveness, fair trading practices, privacy, and consumer protection

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⁴⁸⁵ Including the EU Farm-to-Fork Strategy and the priorities of the FOOD 2030 initiative

- increase insights in the state-of-play, the actual and potential impacts (positive and negative), the drivers, barriers and enablers of digital transformation, its fairness and inclusiveness
- accelerate the positive impacts of the digital transformation, and broaden the group of citizens, communities, companies and other food system stakeholders that benefit from it

Scope: Data driven innovation is fast reshaping the way we produce and consume food. It enhances the potential to manage natural resources more efficiently and to care for the ecosystems that our food production relies on without exceeding finite boundaries. It improves the transparency of our food systems, processes and products from farm to fork, enables a more resilient, safe, circular and customised supply and more personalised diets. It motivates policy-makers, regulators and researchers to make better use of data for monitoring and for generating new insights.

Proposals will gather expertise from a broad range of disciplines and food system participants to obtain new insights and achieve a deepened and more comprehensive understanding of the data economy for food systems. New insights and understanding should relate to the data economy's structure, its functioning, its present and potential development and its performance versus relevant EU policy objectives, as a basis for future policy recommendations, improved governance and monitoring.

The research that is conducted will therefore go well beyond technology insights and include a holistic assessment of the state-of-play of the data economy, data driven innovation and data reuse⁴⁸⁶ in EU food systems, of the drivers, barriers and enablers of digital transformation, and of ongoing and expected trends, including behavioural. Proposals will assess actual and expected impacts (positive and negative) of this transformation on the performance of EU food systems versus the 3 dimensions of sustainability and versus relevant EU policy objectives, including “the European Green Deal” (and therein “the EU Farm-to-Fork Strategy”), an “Economy that works for people” and “a Europe fit for the digital age”. In their assessment of impact, proposals will include a review of the inclusiveness of the ongoing digital transformation in EU food systems (e.g. participation of micro-companies and SMEs, role of gender), and study the fairness of the data economy (e.g. presence of power asymmetries based on data holdings, unfair competition and practices, fair distribution of added value among actors, empowerment of consumers, including the most vulnerable). Proposals will perform 5-10 detailed end-to-end case studies of data flows and reuse in specific parts of our food systems, from farm to fork.

Proposals will put in place a broad stakeholder dialogue to facilitate and discuss new insights, to boost mutual learning and cooperation, to increase awareness among policy makers and stakeholder representatives about the benefits and pitfalls of digital transformation, and to generate new ideas and approaches to improve governance of the data economy in food systems. The stakeholder dialogue should attract and involve players from all parts of the data value chain and representing different sectors and markets. Special care should be taken to

involve SMEs, young entrepreneurs, young farmers, start-ups, cities and consumers, and to include relevant actors that are not directly linked to the food value chains (e.g. social media companies, knowledge brokers, educators).

Proposals will develop a framework for the data economy in food systems, as a basis for monitoring its future development, its performance and impacts.

Proposals will formulate recommendations (including technological, societal, economic, legal) for policy makers (EU, national, regional, local) and other stakeholders. They will do this with a view to accelerating the uptake of data driven innovation and data reuse in a socially acceptable way and to improving the development, functioning, governance, monitoring, impact and fairness of the data economy in food systems, within the context of overall EU policy objectives. These recommendations will also take into account trends and opportunities⁴⁸⁷ that the research identified, that are expected to be important drivers of change in food systems, and for which improved governance, adapted legal frameworks, new policy initiatives and enhanced societal engagement (from citizen science to prosumer approaches) can significantly increase the positive and mitigate the negative impacts of future changes. This includes efforts to explain and map how the recommendations will bring about co-benefits for the four Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities.

These recommendations should also address the need for more (and more effective) exchange and reuse of data assets across parts of EU food systems, national boundaries and language barriers, public and private sectors, and for a wider adoption of data driven-innovations. They should also help to mitigate power asymmetries based on data holdings, ensure fairer competition in the data economy, maximize benefits for citizens and food system actors and enable more open access to data. More specifically, an EU data space for Food systems, in which data is shared for the common good (“data commons”), should be examined to support the objectives of the EU Farm-to-Fork Strategy. Integration of such a data space, with the European Open Science Cloud, the Common European data space for Research and Innovation, should aim at allowing the research community to create new knowledge in this domain.

Proposals will set out a clear plan on how it will collaborate with other projects selected under this and any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals will ensure that any data produced during the project will comply with the FAIR principles. In addition, the project will adopt an open access and open data approach whereby research outcomes and data will be freely shared.

⁴⁸⁷ Trends and opportunities can be cross-cutting (example: demands for a better trade-off between the need for data-driven innovation and the need for personal data protection and data sovereignty) or specific to food systems (examples: demands for greater transparency about the food people eat with regards to health and sustainability; demands for more circular, resilient and customized food supply; a greater prevalence and uptake of personalized nutrition solutions)

HORIZON-CL6-2021-GOVERNANCE-01-19: Development of the markets and use of digital technologies and infrastructure in agriculture – State of play and foresight: Digital- and Data technologies for the agricultural sector in a fast changing regulatory, trade and technical environment

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the Farm to Fork Strategy and the Headline ambitions of a Digital Age –the data Strategy in particular - and the headline ambition an Economy that works for all, the successful proposals will support the capacities to understand and develop the markets and use of digital technologies in agriculture. They will therefore contribute a) to the enhancement of the sustainability performance and competitiveness in agriculture through further deployment of digital and data technologies as key enablers, and b) to the development of innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, and innovation through research and innovation in the field of digital technologies and infrastructure in agriculture.

Project results are expected to contribute to all of the following expected outcomes:

- Increase transparency in the markets for digital and data technologies in the agricultural sector and in data sharing in the agricultural value chain, and support competition.
- Lower the risk of investments in digital and data technologies in the agricultural sector.
- Strengthen policy-making and-monitoring and foresight capacities in agriculture and digital and data technologies.
- Contribute to an increased uptake of digital and data technologies in the agricultural sector and indirectly contribute an increase in environmental and economic performance of the agricultural sector through increased and enhanced used of digital technologies and data.

Scope: The potential of digital technologies in the agricultural sector to enhance its sustainability and economic performance and to enhance working conditions has been acknowledged. The uptake of digital technologies in the agricultural sector and the development of supplementing data-technology-based solutions in the EU are increasing. However, there is hardly comprehensive, independently collected data about the actual uptake and use of digital technologies by farmers, the trade of sector-related digital technologies, and

about the extent and structure of the provision of digital and data services in the agri-food supply chain, which is of global outreach.

To the same time, policies and the regulatory framework directly or indirectly influencing the deployment of digital and data technologies in the EU is evolving in a fast pace and will continue to do so.⁴⁸⁸ Also trade regimes are continuously changing. For stakeholder in the agricultural and the digital sector to invest in digital and data technologies, it is important to be able to assess the possible implications of changing regulatory and market conditions on the development, purchase and use of digital and data technologies in the agricultural sector.

An increase in information on markets and on the actor networks, and of the storage and the flows of goods and data, increases transparency, strengthens the consumers`/ users` position and boost competition.

Capacities in modelling and in carrying out foresight analyses for the development of markets and of the situation in the agricultural sector is also one pre-requisite for tailored policy-making.

Proposals should cover all of the following aspects:

- Development of innovative approaches to assess the uptake of digital technologies and digital infrastructure (incl. platforms) in the agricultural sector globally with special attention to the situation in the EU and associated countries.
- Development of innovative approaches to forecast the markets and the uptake of digital technologies and digital infrastructure (including platforms) globally with special attention to the situation in the EU under consideration of fast-changing regulatory framing conditions in the fields of data-, digital and machinery technologies and of agricultural policies.
- Demonstration of the qualitative and quantitative implications for the use of digital and data technologies by farmers and other actors along the supply chain in a way that demonstration results can be steadily adapted to changing framing conditions. Demonstrations should allow for the reflection of scenarios.

Proposals are expected to consider innovation in digital technologies brought onto the market during the life-time of the project. It is expected that a multi-actor approach is followed involving targeted stakeholders, including farmers, agri-businesses, policy-makers etc. to test demonstration and communication tools. They should also provide a basis for the development of business cases, e.g. for the integration and sharing of databases across entities and infrastructure.

For the assessment of the uptake of digital technologies by farmers, static approaches evolving in the EU are to be considered; assessment approaches may vary between continents.

⁴⁸⁸ See, e.g. the announcements in the Digital package published by the European Commission in February 2020, and the Data Strategy in the package, in particular. <https://ec.europa.eu/digital-single-market/en/policies/building-european-data-economy>.

HORIZON-CL6-2021-GOVERNANCE-01-20: Data economy in the field of agriculture – Effects of data sharing and big data

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 2.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the Farm to Fork Strategy and the Headline ambitions of a Digital Age –the data Strategy in particular - and the headline ambition an Economy that works for all, the successful proposals will support capacities to understand, develop and demonstrate the data economy in agriculture and its effects. This topic aims to contribute a) to the enhancement of the sustainability performance and competitiveness in agriculture through further deployment of digital and data technologies as key enablers, and b) to the development of innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes through research and innovation related to data economy in agriculture.

Project results are expected to contribute to all of the following expected outcomes:

- Awareness and informed decisions based on the demonstration of the costs, benefits, risks, and added value as well as the economic and societal potential of agricultural data sharing taking an EU perspective.⁴⁸⁹
- Increase in transparency in data sharing in the agricultural value chain.
- Increased sharing of agricultural data, and the effective and efficient use of private and public data for private and public purpose, particularly through the demonstration of the costs, benefits, risks, and added value as well as the economic and societal potential of agricultural data sharing taking an EU perspective.⁴⁹⁰
- Contribute to an increased uptake of digital and data technologies in the agricultural sector and indirectly contribute an increase in environmental and economic performance of the agricultural sector through increased and enhanced used of digital technologies and data.

⁴⁸⁹ The main focus is with the agricultural sector and public interests in the EU. However, as data flows and trade relations are global, analyses have to go beyond the EU context.

⁴⁹⁰ The main focus is with the agricultural sector and public interests in the EU. However, as data flows and trade relations are global, analyses have to go beyond the EU context.

- Strengthen policy-making and-monitoring capacities in agriculture and data technologies.

Scope: Used effectively, agricultural data has the potential to increase the performance of the sector and of businesses along the supply chain in a sustainable way as well to as to serve public good purposes. For instance, agricultural data forms a key ingredient to precision farming applications and can form input to the analysis on environmental conditions as well as to e. bioinformatics. Thus, agricultural data has a value and presents an interesting element for the data economy.

A crucial parameter to the effectiveness and efficiency of the application of data technologies is the quantity and quality of agricultural data serving as basis for such analyses. However, agricultural data, which stems from multiple sources and includes business, personal and public data, is not straightforward accessible, not even for financial resources.

Next to technical issues related to e.g. data interoperability, questions on the ownership of agricultural data and the readiness to share the data present a burden to the use of agricultural data. Farmers, for instance, need to trust that their farm data is handled and share carefully, and have to see their and societal benefit to share the data, and have a stake in the economic benefits of agricultural data.

Currently, some companies in the agri-food value chain are collecting agricultural data, e.g. through farmers as customers. Not always is the use of that data, e.g. for product development or farm-tailored advertisement, fully transparent. Moreover, some companies with high numbers of customers, easily gain enormous market power and generate income through the use of the collected data and the application of data technologies.

Developments in the agricultural sector as well as in EU policies⁴⁹¹, which are/ will be addressing those circumstance to increase the readiness to data sharing to increase the benefit for the economy and society and to overcome power imbalances and a lack of transparency in the use of data, occur rapidly. These changing framing conditions offer opportunities as well as challenges to the agricultural sector as well as to the data economy.

Proposals should cover all of the following aspects:

- Quantitative and qualitative analyses of the effects of various data sharing and marketing and use options (considering among others private and public data, private and public actions, and big data opportunities) for the actors along the agri-food supply chain and the development of scenarios for the data economy.
- Implications of the ongoing policy-making process at EU level including the development of relevant legislation in the analyses.

⁴⁹¹ Key policy ambitions related to the data economy and the use of data for the society/ the public good are reflected in a “European Strategy for Data” published by the European Commission in February 2020 (see <https://ec.europa.eu/digital-single-market/en/policies/building-european-data-economy>).

- Effects of multi-level governance systems in the EU under consideration of the situation and conditions in various Member States as well as effects of international (trade) relations.
- Consideration of multiple data-sharing business- and governance approaches and technical solution in data sharing in the agricultural sector.
- Consideration of climate adaptation and reducing administrative burden in the assessment of the potential of agricultural data sharing for the sector and the society.

Strengthening agricultural knowledge and innovation systems

Proposals are invited against the following topic(s):

HORIZON-CL6-2021-GOVERNANCE-01-21: Broaden EIP Operational Group outcomes across borders by means of Thematic networks, compiling and sharing knowledge ready for practice

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the Green Deal, CAP and Farm to Fork objectives and targets, the successful proposal will focus on knowledge sharing in a language that is easy to understand and is targeted to farmers and foresters. Primary producers have a particular need for impartial and tailored knowledge on the management choices related to the needs, challenges or opportunities they experience. This speeds up innovation and the uptake of results, and is key to improve sustainability. It adds value to the knowledge and cost-effectiveness of innovative practices and techniques in and across primary production sectors, food systems, bioeconomy and biodiversity. This will lead to more informed and engaged stakeholders and users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS⁴⁹²).

Despite the continued funding of scientific projects, innovative ideas and methods from practice are not captured and spread, and often research findings are not integrated into agricultural and forestry practice. Proposals, acting at EU level to remedy this, are essential because national and sectoral AKISs are insufficiently connected and organised to fully meet

⁴⁹² AKIS means the organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields (Agricultural Knowledge and Innovation)

the challenge of intensifying thematic cooperation between researchers, advisors and farmers/foresters. This exchange of knowledge will foster economically viable and sustainable agriculture and forestry and build trust between the main AKIS actors. It will scale up local solutions up to the EU level and may even influence policy design wherever useful.

Project results are expected to contribute to the following outcomes:

1. The collection and distribution of easily accessible practice-oriented knowledge on the thematic area chosen, in particular the existing best practices and research findings that are ready to be put into practice, but not sufficiently known or used by practitioners.
2. Conserve practical knowledge for the long term - beyond the project period – in particular by using the main trusted dissemination channels that farmers/foresters consult most often, delivering as much audio-visual material and as many “practice abstracts” in the common EIP-AGRI format as possible, including also education and training materials.
3. Increase the flow of practical information between farmers/foresters in the EU in a geographically balanced way, creating spill-overs and taking account of the differences between territories. In order to better reach and capture knowledge from the targeted farmers/foresters, the networks may organise 'cross-fertilisation' through sub-networks covering, for example, a region, a language or a production system.
4. Achieve greater user acceptance of collected solutions and a more intensive dissemination of existing knowledge, by connecting actors, policies, projects and instruments to speed up innovation and promote the faster and wider co-creation and transposition of innovative solutions into practice.
5. The cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁴⁹³, as well as contributing to the European Green deal and Farm to Fork objectives. Examples are climate issues, pesticide use, water use and pollution, short supply chains linking to the consumer, farm viability, animal welfare, generational renewal, etc.

Scope: Proposals should address the following activities:

- Build on the experience and outcomes of at least 5 EIP-AGRI⁴⁹⁴ Operational Groups of at least 3 Member States, scaling it up at European level choosing a related common theme on which to collect, summarise, share and translate the existing knowledge from science and practice in an easy-to-understand way for practitioners, while tackling the most urgent needs of farmers and foresters.
- Compile a comprehensive description of the state of current farming and forestry practices on the chosen theme to explain the added-value of the proposal and the

⁴⁹³ Art 5 CAP post 2020 proposal

⁴⁹⁴ EIP-AGRI : European Innovation Partnership (EIP) 'Agricultural Productivity and Sustainability'

relevance of the theme. Proposals shall pay attention to the cost/benefit aspects of the practices collected and summarized, and clarify how the project avoids duplication with ongoing or completed projects and networks;

- Deliver an extensive range of useful, applicable and appealing end-user material for farmers and foresters. This info should be easy to access and understand, and feed into the existing dissemination channels most consulted by farmers and foresters in the countries.
- All materials should also be provided to the EIP-AGRI in the common 'practice abstract' format, as well as to national/regional/local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-22);
- Besides giving the details about the EIP Operational Groups which are involved⁴⁹⁵, wherever possible and relevant to the chosen theme, provide also details on how further synergies will be built with running and future EIP-AGRI Operational Groups and interactive innovation groups operating in the context of the EIP-AGRI.
- Proposals should fall under the concept of the 'multi-actor approach'⁴⁹⁶, with a consortium based on a balanced mix of actors with complementary knowledge clearly activating farmers/foresters, farmers' groups and advisors and run for minimum three years.

HORIZON-CL6-2021-GOVERNANCE-01-22: Supporting knowledge exchange between all AKIS actors in the Member States by means of an EU-wide interactive knowledge reservoir

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 15.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In support of the Green Deal, Common Agricultural Policy and Farm to Fork objectives and targets, the successful proposal will focus on appropriate management of data and information derived from different sources that are readily available. The expected outcome of this topic is to multiply the use of practice-oriented knowledge, build capacities and to demonstrate innovative solutions to accelerate the transition to a sustainable

⁴⁹⁵ According to the requirements of the multi-actor approach

⁴⁹⁶ See the requirements for the 'multi-actor approach' on page 14-16 in the introduction to this Work Programme part.

management and use of natural resources in farming and forestry. This will lead to more informed and engaged stakeholders and users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS⁴⁹²).

Project results are expected to contribute to the following outcomes:

1. Making information and knowledge readily available and easy accessible to farmers, foresters, advisors and other users⁴⁹⁷ of practice-ready knowledge. This will support the policy objectives linked to Cluster 6, such as the European Green Deal, the Farm to Fork Strategy and the CAP, the Biodiversity Strategy and the wider bioeconomy research and policies by supporting the transition process across the EU in new and coherent ways

2. The cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁴⁹⁸. This project will provide overall support related to concrete practice-oriented knowledge co-creation, the (digital) organisation of it and the sharing of approaches to do so among Member States

3. The outcomes will be connecting actors, policies, projects and instruments to speed up innovation and the sharing of knowledge, in particular by:

(a) creating added value by better linking research, education, advisors and farming practice to trusted information sources and encouraging the wider use of available knowledge and innovation;

(b) connecting innovation actors and projects; resulting in faster and wider co-creation and transposition of innovative solutions into practice and communicating to the scientific community about the research needs of practice.

Scope: Proposals should address the following activities:

- Collect and enable sharing – as a minimum – of the outcomes of all multi-actor projects from Horizon 2020 and those from Horizon Europe, and of all EIP Operational Group innovative projects 2014-2020 and of those to come in the 2021-2027 period. This should be done by developing, operating and fine-tuning the use of an open access and open source digital EU-wide knowledge reservoir for practice. The knowledge reservoir should be refined to make the tool as interoperable as possible with Member States' growing number of websites and knowledge reservoirs for agriculture and forestry practice, and integrate as much as possible practice-oriented project outcomes from any other funding source. Where needed, this may entail policy dialogues and studies;
- Develop this tool, which will be owned and exploited by the EU, enabling it to serve the knowledge interactions within the EIP-AGRI network, in particular with a view to explore how to incentivise new EIP-AGRI innovation projects by connecting projects

⁴⁹⁷ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

⁴⁹⁸ Article 5 of the CAP post 2020 proposal

and actors. To this end, the project should collaborate with the EIP-AGRI networks at Member State and at EU level;

- Share the output of the EU knowledge reservoir as widely as possible, using existing dissemination channels for farmers and foresters and national/regional/local AKIS channels for awareness raising, with the support of AKIS coordination bodies and platforms in Member States. Explore the possibilities for translation of its content into EU languages;
- Develop interactive communication activities on the outcomes of clusters of projects in the reservoir, so that the knowledge comes to life through workshops and encounters between AKIS' actors, in particular those who have common interests across the EU. This will be the way to find out whether the knowledge reservoir meets end-users' expectations. Through peer-to-peer activities and mixed actor events on dedicated parts of the content of the knowledge reservoir, enable innovations to arise from existing work, using the inputs and suggestions received from key actors all over the EU;
- Use the collected material to develop educational material for students, farmers, foresters, advisors and others⁴⁹⁹, and to incentivise on-farm demonstrations. Give input for training of advisors and farmers (or other users). All this material is to be exploited across Europe through real life, one-to-one and virtual activities.
- The project should collaborate with all 27 EU Member States' AKIS' coordinating bodies⁵⁰⁰ and related networks, and strongly connect to the EIP-AGRI at EU level. Make use of the AKIS coordination in each Member State to connect actors all over Europe working on specific subjects. This collaboration should serve to verify whether the reservoir indeed meets Member States' AKIS' expectations.
- Make use of local connections in all 27 EU Member States to interpret the national/regional contexts, including in particular the innovation strand of national CAP Networks. Use the knowledge and innovation experts in the SCAR-AKIS Strategic Working Group to discuss the project strategy and progress in the various stages of the project.
- Projects should have a minimum duration of 7 years, and build on the developments of the projects EURAKNOS⁵⁰¹ and EUREKA⁵⁰², and where relevant of similar international initiatives. They should fall under the concept of the multi-actor approach⁵⁰³, including as a minimum EIP-AGRI and AKIS actors from many Member States as well as IT-experts with experience in knowledge reservoirs. Proposals should

⁴⁹⁹ See the requirements for the 'multi-actor approach' on page 14-16 in the introduction to this Work Programme part.

⁵⁰⁰ "AKIS coordination bodies" in the CAP plans are responsible for the management of the Member States AKIS' strategies

⁵⁰¹ <https://cordis.europa.eu/project/id/817863>

⁵⁰² <https://cordis.europa.eu/project/id/862790>

⁵⁰³ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

include tasks to collaborate with these Horizon 2020 projects to take over the agreed IT standards and languages according to the outcomes of the feasibility discussions.

HORIZON-CL6-2021-GOVERNANCE-01-23: Improving national AKIS organisation in a co-creative process across the EU

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the Green Deal, CAP and Farm to Fork objectives and targets, the successful proposal will focus on appropriate governance to interlink Agriculture Knowledge and Innovation System (AKIS⁴⁹²) actors and connect them with practice-oriented information derived from different sources that are readily available. The expected outcome of this topic is to develop sound AKIS governance in Member States. Member States' authorities and AKIS actors need insights and tools to advance knowledge exchange, build capacities and enable innovative governance solutions to accelerate the transition to a more sustainable management and use of natural resources in farming and forestry. This will lead to better informed and engaged stakeholders and users of innovative project results thanks to effective AKIS and related platforms.

Project results are expected to contribute to the following expected outcomes:

Member States need to find new ways to govern the transition process and at the same time modernise governance. Special attention must go to making information and knowledge more readily available and accessible and to improving knowledge flows between AKIS actors, as foreseen in the post 2020 Common Agricultural Policy. The task of the future AKIS coordination bodies and platforms will be to find adequate governance to share knowledge and innovation supporting the European Green Deal and Farm to Fork objectives, achieving the Sustainable Development Goals while trying to solve institutional barriers and lock-ins, political inertia and power imbalances.

Project results are expected to contribute to the following outcomes

1. New know-how to be used by policy makers and other AKIS actors⁵⁰⁴ to improve knowledge flows and develop a well-functioning AKIS in their country. This will support policy objectives linked to Cluster 6, such as the European Green Deal, the Farm to Fork

⁵⁰⁴ See the requirements for the 'multi-actor approach' on page 14-16 in the introduction to this Work Programme part

Strategy and the Common Agricultural Policy. Examples are farm viability and generational renewal, agro-ecology, climate mitigation and adaptation, pesticide reduction, reduction of water use and pollution, etc.

2. The CAP post 2020 cross-cutting objective of modernising the sector by fostering and sharing knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁵⁰⁵. CAP support related to knowledge creation, organisation and sharing will become available, but Member States need to learn about the best ways to choose AKIS interventions adapted to the local/regional and national situations and on how to organise their AKIS to improve its functioning.

3. The outcomes will be methods to better connect actors, policies and projects and instruments to speed up innovation and the uptake of knowledge, in particular to:

(a) create added value by better linking research, education, advisors and farming practice and encourage the wider use of available knowledge and innovation;

(b) connect innovation actors and projects at all levels; resulting in faster and wider co-creation and transposition of innovative solutions into practice and communicate to the scientific community the research needs of practice.

Scope: Proposals should address the following activities:

- Compare the various types of AKIS⁵⁰⁶ within the EU at national, regional and local level to discover how they effectively and efficiently enhance interaction between AKIS actors through activities at various geographical levels. Special attention must be paid to making practice-oriented information and knowledge better available, shared and accessible and to improve knowledge flows between AKIS actors, including informing research on needs from practice and finding ways to reward scientists for results useable in practice in particular. Project activities should help learning processes for practitioners within the country and regions, as well as support them to benefit from well-functioning AKISs. Project proposals shall also support development of various cross-border approaches between AKISs to enhance knowledge flows and initiatives to incentivise innovation projects among countries and regions within the EU, and to learn from each other.
- A specific part of the project should be dedicated to sharing the various ways and good examples of how advisors can be intensively integrated in AKIS⁵⁰⁷, including for innovation support⁵⁰⁸.
- Assess current AKIS, using practical tools and indicators capable of monitoring the functioning of Member States' AKIS. This should include institutional arrangements and

⁵⁰⁵ Art 5 CAP post-2020 proposal

⁵⁰⁶ Art 3 and 102 of the CAP post-2020 proposal

⁵⁰⁷ Result indicator 2 in the CAP, advisors' integration within AKIS is a newly introduced obligation in Art 13(2)

⁵⁰⁸ Art 13(4) of the CAP post 2020 proposal

ways to stimulate researchers to exchange information with practice and have an effective impact on the transition to a more sustainable agriculture by adjusting the focus of their research. Provide advice and support on how to measure improving the functioning of the AKIS, making use of a coherent and effective approach while taking into account the national/regional/local historical and cultural contexts.

- Provide all outcomes and materials to the European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI) in the common 'practice abstract' format for EU wide dissemination, as well as to national/regional/local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-22).
- Cover all 27 EU Member State in the project, and make use in all those countries of experts who understand and are able to make an accurate interpretation of the national/regional contexts of practitioners. Use the knowledge and innovation experts in the SCAR-AKIS Strategic Working Group to discuss the project's strategy and progress in the various stages of the project. Projects should have a minimum duration of 7 years. They should fall under the concept of the multi-actor approach⁵⁰⁹. Since innovation support is an essential element in a well-functioning AKIS, cooperation with the project under HORIZON-CL6-AKI-2021-00-00 is expected.

HORIZON-CL6-2021-GOVERNANCE-01-24: Deepening the functioning of innovation support

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the Green Deal, Common Agricultural Policy and Farm to Fork objectives and targets, the successful proposal will focus on discovering innovative ideas and enabling the relevant actors to work out these ideas in a co-creative way as from the very start of the making of the proposal. The expected outcome of this topic is to develop sound, coherent and well-prepared innovation support methods, which enable individual grassroots innovative ideas to come to fruition and for project coordinators to use the complementary knowledge of partners to develop ready-to-use solutions. Member States' authorities and AKIS' actors need insights and tools to improve the interaction, connections and drafting skills in preparation of innovation project proposals. This will eventually lead to useable and

⁵⁰⁹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

practice-oriented innovative project results, better informed practitioners motivated to implement those results and as a consequence, increased impact of funding for multi-actor research and innovation.

Project results are expected to contribute to the following expected outcomes:

Member States AKISs need to be equipped to advance knowledge, build capacities and co-create innovative solutions to accelerate the transition to a sustainable and circular management and use of natural resources. To this end, the CAP post-2020 introduced for all Member States an obligation to have innovation support services in place, to speed up innovation by helping to develop individual innovative grassroots ideas into interactive innovation projects⁵¹⁰. Such services can serve as one stop shops for innovation and should help future users of project results to prepare multi-actor innovative projects with a view to testing the potential innovation they have in mind. Member States need to find new ways to organise innovation support services which fuel generation of solutions for the transition process towards more sustainable farming and forestry. This can be done in particular in the form of a one-stop-shop for innovation, which can provide practical information on the subject of the potential project, existing scientific knowledge and project management as well as tips and tricks on how to develop such projects into a coherent project proposal. Being able to connect the most relevant actors with complementary knowledge is also an essential element to attain the objectives of the potential project. Deepening innovation support will need to take into account institutional barriers and lock-ins, political inertia and tackle power imbalances between potential actors involved in co-creative innovation processes.

Project results are expected to contribute to the following outcomes:

1. Helping innovation support services to tackle innovative ideas related to the policy objectives linked to Cluster 6, such as farm viability, agro-ecology, climate issues, pesticide reduction, reduction of water use and pollution, short supply chains, generational renewal, etc, as well as the European Green Deal, the Farm to Fork Strategy and the CAP, the Biodiversity Strategy and the wider bioeconomy research and policies..
2. Contribute to the CAP cross-cutting objective of modernising the sector by fostering and sharing knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁵¹¹. This topic will provide overall support to generate practical approaches ultimately leading to better capturing of emerging needs and/or innovative opportunities, knowledge co-creation, in relation to the new obligation for Member States under the CAP post-2020⁵¹² to have innovation support services in place, taking into account national and regional contexts.
3. The outcomes will connect actors, policies, projects and instruments to speed up creation of innovative solutions, in particular by:

⁵¹⁰ Such as Horizon Multi-actor projects or EIP-AGRI Operational Groups

⁵¹¹ Art 5 CAP post 2020 proposal

⁵¹² Art 13(4) CAP post 2020 proposal

(a) creating added value by better linking research, education, advisors and farming practice and encouraging the wider use of available knowledge which can serve the innovative idea;

(b) connecting innovation actors and projects; resulting in faster co-creation of ready-to-use innovative solutions, spreading them into practice and communicating the research needs of practice to the scientific community.

Scope: Proposals should address the following activities:

- Develop approaches to set up and improve the functioning of innovation brokers, which are expected to find individual innovative grassroots ideas at an early stage as well as practice needs or innovative opportunities. These innovative ideas should then be developed with the support of the owner of the idea and a number of relevant actors with complementary knowledge into an EIP-AGRI interactive innovation project⁵¹⁰, using methods ensuring co-ownership of the initiators and partners in the project. Seed funding as used for EIP Operational Group projects is often a good solution to accompany this process, but also other approaches such as “innovation advice” or “innovation coaching” are an option to investigate⁵¹³.
- Explore how such innovation support services could be embedded in the national/regional AKIS, in particular through useful connections with advisors, and how they can be linked to other broader innovation support mechanisms, including research, advisors and CAP networks at Member State or regional level.
- Investigate and compare among Member States how the governance of such innovation support services could be organised at the level of the managing authorities (single “one-stop-shop” service or mixed model with several smaller and/or bigger innovation support services, or...) taking into account the great variety of contexts in Member States and regions.
- Cover all 27 EU Member States in the project to ensure learning from diversity. Make use in all those countries of experts who understand and are able to make an accurate interpretation of the national/regional contexts and its impact to help develop the ideal solution for that Member State.
- Projects should have a minimum duration of 6 years and use the support from the knowledge and innovation experts of the SCAR-AKIS Strategic Working Group to discuss project strategy and progress in the various stages of the project. They should fall under the concept of the multi-actor approach⁵¹⁴, including existing experienced innovation support services which can share their methods and help develop solutions in other contexts.

⁵¹³ See EIP seminar on AKIS : <https://ec.europa.eu/eip/agriculture/en/event/eip-agri-seminar-cap-strategic-plans-key-role-akis>

⁵¹⁴ See definition of the 'multi-actor approach' on page 14-16 in the introduction to this Work Programme part.

HORIZON-CL6-2021-GOVERNANCE-01-25: Developing EU advisory networks on consumer-producer chains

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the Green Deal, CAP and Farm to Fork objectives and targets, the successful proposal will focus on advisor exchanges across the EU to increase the speed of knowledge creation and sharing, capacity building, of demonstration of innovative solutions, as well as helping to bring them into practice, which accelerates the needed transitions. Agricultural Knowledge and Innovation Systems in which advisors are fully integrated⁵¹⁵ are key drivers to speed up innovation and the uptake of research results by farmers.

Primary producers have a particular need for impartial, ready-to-use and tailored knowledge on the management choices related to the needs, challenges or opportunities they experience. This speeds up innovation and the uptake of results, and is key to improve sustainability. It adds value to the knowledge and cost-effectiveness of innovative practices and techniques in and across primary production sectors, food systems, bioeconomy and biodiversity. This will lead to more informed and engaged stakeholders and users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS).

Transformative changes such as those required within the European Green Deal are dynamic processes that require appropriate governance of AKIS actors. Advisors are key actors strongly guiding and with powerful influence over producers' decisions. A novelty in the post-2020 CAP plans⁵¹⁶ is that advisors now must be integrated within the Member States' AKIS, and that the scope of their actions has become much broader. They must now be able to cover economic, environmental and social domains, as well as be informed on up-to-date science and technology. They should be able to translate this knowledge into opportunities and use and adapt those to specific local circumstances. This specific topic focuses on the important role advisors can play to exploit the potential of connecting consumers with producers through short supply chains, an upcoming issue in the more sustainable and diversified agriculture of the future.

Project results are expected to contribute to the following outcomes:

⁵¹⁵ Article 13(2) of the CAP post 2020

⁵¹⁶ Art 13(2) of the post-2020 CAP regulation

1. Development of interaction with regional, national and EU policy makers, potentially leading to an EU network to discuss institutional barriers to producer-consumer chains, including bottlenecks, lock-ins, political inertia, ambiguous regulations, inequality between Member States and power imbalances;
2. Production of supporting services and sharing of materials to facilitate the upscaling of short supply chains, such as SWOT analysis schemes, (new) business model analyses, communication and education materials, knowledge networks and peer-to-peer counselling, master classes, inspiration tours, advice modelling, effective business models and possible accelerators serving both producers and consumers, etc
3. The policy objectives linked to Cluster 6, as well as the European Green Deal, and in particular the Farm to Fork Strategy and the Common Agricultural Policy, with a view to increasing farmer viability and raising consumer awareness by connecting producers and consumers in short food supply chains;
4. The CAP cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁵¹⁷. This topic will provide overall support related to knowledge creation, organisation and sharing of novel information across borders. It will help to fill gaps on emerging advisory topics which is useful in particular in relation with the new obligation for Member States to integrate advisors within their AKIS and cover a much broader scope than in the former period;
5. The outcomes should speed up the introduction, spread and bringing into practice of innovative solutions related to consumer-producer chains overall, in particular by:
 - (a) creating added value by better linking research, education, advisors and farming practice and encouraging the wider use of available knowledge across the EU;
 - (b) learning from innovation actors and projects, resulting in faster sharing and implementation of ready-to-use innovative solutions, spreading them into practice and communicating to the scientific community the bottom-up research needs of practice.

Scope: Proposals should address the following activities:

- Connect advisors having a broad and extensive network of farmers across all EU Member States in an EU advisory network on short food supply chains to better connect consumers with producers, securing producers' income, building on the outcomes of the EIP-AGRI Workshop "Cities and Food – Connecting Consumers and Producers" and the Focus Group on Short Food Supply Chains⁵¹⁸.

⁵¹⁷ Art 5 CAP post-2020 proposal

⁵¹⁸ <https://ec.europa.eu/eip/agriculture/en/event/eip-agri-workshop-cities-and-food-%E2%80%93-connecting>

- Share effective and novel approaches and experiences among this EU advisory network. These approaches must be sustainable in terms of economic, environmental and social aspects.
- Focus of cost-benefit elements. Collect and document good examples in this regard, connecting with farmers, intermediates and consumers in Member States to be able to take into account financial aspects and local conditions. Select the best practices, learn about the key-success factors, possible quick wins and make them available for (local) exploitation, to ensure financial win-wins for producers and consumers.
- Integrate the advisors of the EU short food supply chain network into the Member States' AKIS as much as possible. They can provide encouragement as innovation brokers in local short chain projects in specific EIP Operational Groups. They should give hands-on training to farmers and local advisors, lead national thematic and learning networks on the subject, deliver and implement action plans with interested farmers, inspire new and incoming farmers or farms at the cross-roads of intergenerational renewal, connect with education and ensure broad communication, support peer-to-peer consulting, develop on-farm demonstrations and YouTube demo films, and provide specific back-office support for generalist advisors within the national/regional AKIS..
- Explore if the some or all activities of the EU advisory network on short supply chains can be up scaled at the level of a number of Member States under a cooperative format. Wherever possible, develop digital advisory and accelerator tools for common and open use across the EU. Determine whether common instruments can be created to incentivise the implementation of short food supply chains linking producers with consumers, for instance in the framework of smart villages, or to incentivise novel food strategies for cities, villages and rural areas, etc.
- Include all 27 EU Member States in the EU advisory network. Make use in all those countries of experts who understand and are able to make an accurate interpretation of the national/regional contexts to help develop the best solutions for that Member State or region. Use the support from the knowledge and innovation experts of the SCAR-AKIS Strategic Working Group to discuss project strategy and progress in the various stages of the project. Projects should run at least 5 years. They should fall under the concept of the multi-actor approach⁵¹⁹.

Call - Innovative governance, environmental observations and digital solutions in support of the Green Deal

HORIZON-CL6-2022-GOVERNANCE-01

⁵¹⁹ See definition of the 'multi-actor approach' on page xxx in the introduction to this Work Programme part.

Conditions for the Call

Indicative budget(s)⁵²⁰

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ⁵²¹	Number of projects expected to be funded
		2022		
Opening: 28 Oct 2021 Deadline(s): 15 Feb 2022				
HORIZON-CL6-2022-GOVERNANCE-01-01	CSA	8.00	Around 8.00	1
HORIZON-CL6-2022-GOVERNANCE-01-02	COFUND	23.00	Around 23.00	1
HORIZON-CL6-2022-GOVERNANCE-01-03	RIA	6.00	Around 6.00	1
HORIZON-CL6-2022-GOVERNANCE-01-04	CSA	3.00	Around 3.00	1
HORIZON-CL6-2022-GOVERNANCE-01-05	CSA	4.00	Around 4.00	1
HORIZON-CL6-2022-GOVERNANCE-01-06	IA	20.00	Around 3.00	6
HORIZON-CL6-2022-GOVERNANCE-01-07	IA	14.00	3.00 to 5.00	3
HORIZON-CL6-2022-GOVERNANCE-01-08	RIA	10.00	Around 5.00	2
HORIZON-CL6-2022-GOVERNANCE-01-09	RIA	7.00	Around 7.00	1

⁵²⁰ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

⁵²¹ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

HORIZON-CL6-2022-GOVERNANCE-01-10	RIA	12.00	Around 3.00	4
HORIZON-CL6-2022-GOVERNANCE-01-11	CSA	9.00	Around 3.00	3
HORIZON-CL6-2022-GOVERNANCE-01-12	CSA	4.00	Around 2.00	2
HORIZON-CL6-2022-GOVERNANCE-01-13	CSA	5.00	Around 5.00	1
HORIZON-CL6-2022-GOVERNANCE-01-14	CSA	8.00	Around 4.00	2
Overall indicative budget		133.00		

General conditions relating to this call	
<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant Agreements</i>	The rules are described in General Annex G.
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Innovating with governance models and supporting policies

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-GOVERNANCE-01-01: Mobilization of society to transform food systems for co-benefits

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In line with the European Green Deal priorities and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050, the successful proposal will involve the mobilization of society to transform food systems for co-benefits. This will lead to innovative governance models enabling sustainability and resilience, which achieve better-informed decision-making processes, societal engagement, and innovative solutions.

With the overarching aim to help transform food systems for co-benefits to nutrition, climate, circularity and communities, the project will:

- Build on the Fit4Food2030⁵²² initiative to further the mobilisation of all relevant Food System public and private sector stakeholders, researchers, non-governmental organisations, educators, knowledge brokers, media and society, to work together via an interlinked structure at the level of cities, regions, and countries across Europe, and that supports mutual learning and good practices.
- A new and improved structured network of evidence-based policy labs throughout Europe so as to raise awareness, foster joint action, good practices and knowledge sharing amongst stakeholders relevant to food system policy developments and implementation at various levels: local, regional, national, EU and international level. Key to this will be the inclusion of decision and policy makers, scientists, and public authorities to ensure the sustainability and legitimacy of the governance process.
- Increased pan-European citizen engagement, social innovation and co-creation through local or regional living labs; promote food systems science education for children and youth, and measure the food systems transition progress in society.

Scope:

- Establish a pan-European Food 2030 multi-actor and public engagement mechanism to raise food system awareness and foster more citizen (including youth) involvement and

⁵²² <https://fit4food2030.eu/>

interest in science, research and innovation, necessary to foster support for a food system transformation that delivers co-benefits.

- Engage a network of science museums to co-create and deploy a Food 2030 “food systems lab” inspired by the Oceans Plastic Lab⁵²³ to be deployed across Europe linking in particular to EU presidencies, important global meetings (e.g.: COP), and other relevant place-based initiatives (like I-Capital, Green Capital, etc.).
- Support emerging relevant citizen science projects at local level (neighbourhoods, towns and cities), conduct hackathons, hold science cafés, and set up a dedicated video channel to display food systems success stories, all with the aim of raising awareness of the need to transform food systems and to co-create citizen-inspired solutions.
- Develop and deploy innovative interactive food systems education material in support of both the informal and formal education of children and youth (including gender-specific messaging) across Europe, in cooperation with relevant European school networks, associations and local media outlets.

The project will set out a clear plan on how it will collaborate with other projects selected under this and any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities. In addition, the project will adopt an open access and open data approach whereby research outcomes and data will be freely shared following FAIR data principles.

HORIZON-CL6-2022-GOVERNANCE-01-02: European Partnership for a climate neutral, sustainable and productive Blue Economy

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 23.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 23.00 million.
<i>Type of Action</i>	Cofund Actions
<i>Total indicative budget</i>	The total indicative budget for the topic is EUR 150 million committed in annual instalments over the 6 years, 2022-2027 (EUR 23 million from the 2022 budget).
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply:

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[1] <https://oceanplasticlab.net/>

	If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
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Expected Outcome: The partnership is expected to contribute to all of the following expected outcomes:

In line with the objectives of the European Green Deal and Digital Europe priorities, the successful proposal will contribute to the sustainability and resilience of the blue economy by supporting the establishment of innovative governance models. It will also contribute to strengthening the EU and international science-policy interfaces in marine- and maritime-related domains as well as the Global Earth Observation System of Systems (GEOSS) by supporting the further deployment and exploitation of Environmental Observation data and products and of digital and data technologies.

- EU and national multi-level cooperation and alignment across and within regional seas of research and innovation programmes, priorities and investments are enhanced, based on established strategic research and innovation agendas and related cooperation activities, including international agreements and outreach; as well as cooperation with other Horizon Europe initiatives, European Partnerships and Missions.
- Europe's role in ocean science, research, social and technological developments, innovation and productivity in the marine domain is clearly strengthened by 2030 and transformative governance enables the advances of the role of Europe in business, finance and social developments in the marine/maritime domain.
- By 2030, Europe has contributed significantly and in a measurable way to the climate neutrality of the blue economy, the European Green Deal objectives and its different strategies.
- The science-based implementation of EU marine-related legislation, regulations and objectives is supported, as well as the advanced sustainability of activities, practices and existing and new products and services of the blue economy value chains throughout European regional seas and the Atlantic.
- Transformative change is promoted and enabled through actionable science and sustainable, fair and just solutions for the blue economy and for communities, involving a participatory and multi-stakeholder approach.
- The deployment of digital, nature-based and social innovations as well as community-led and purpose-driven technology for the blue economy is supported.
- Ocean literacy in the EU and beyond is increased.

- Sustained ocean and coastal observations and availability of FAIR data for environmental, climate and blue economy purposes are substantially increased.
- Global cooperation with key partners bordering the different EU sea basins is strengthened.

Scope: Europe's seas and ocean do not stop at national borders, nor do the challenges they face. Many of the issues are common throughout European seas and the Atlantic, even globally. A major effort is needed to increase the development of ocean science, research, technological developments and innovation, both to protect the ocean and to increase the resilience of its ecosystems and to ensure a strong sustainable blue economy and science-based design of marine spatial planning, involving all stakeholders. No nation can face this on its own and undertake the investments in research, technology and innovation that are needed to steer new business, governance and social developments⁵²⁴.

Many of the identified research priorities and activities of the EU and individual countries are similar and, therefore, require alignment over all European seas and ocean. Existing and new funding streams from national, public and private sources will need to be pooled, together with EU funding, in order to maximise efforts and achieve efficiency gains. To address these issues, sea basin-specific Research and Innovation Agendas (RIAs) have been developed for the Atlantic, the Mediterranean, the Baltic Sea and the North Sea, and the Black Sea. An impact-driven and coherent approach needs to be designed to combine all of these research and innovation agendas, in order to structure the European landscape, so that common issues can be addressed jointly, and national marine strategies are developed in a consistent way.

The partnership will catalyse the transformation of Europe's ocean economy towards climate neutral status by 2050. By aligning national, regional and EU R&I priorities and bringing together science, industry, governance and society, it will deliver knowledge and solutions to make ocean business sustainable. Responding to national and EU policy goals (e.g. MSFD, Green Deal), the partnership will target a healthy ocean and a sustainable, productive ocean economy and the well-being of citizens.

The partnership will increase scientific contributions, applicable in a legal/regulatory context, related to biodiversity, ecosystem conservation and restoration, climate mitigation and adaptation, and pollution, including eutrophication, noise, marine litter and hazardous substances, and will facilitate the use of scientific knowledge by regulators and policy-makers, contributing to the EU Biodiversity Strategy for 2030, the Farm to Fork Strategy, the Mission in the area "Oceans, seas and waters", the Circular Economy Action Plan and the Zero Pollution ambition.

The partnership will promote technological, nature-based, social, economic and cultural innovation and experiment with new planning, governance, business and finance models. It will also contribute to the future EU initiative on ocean observation⁵²⁵, to the development of

524 The final evaluation of the BONUS programme, the mid-term review of the EU Atlantic Strategy, the OECD report on the Blue Economy, the IPCC report on the oceans and cryosphere, etc. support this.

525

a common European ocean data space, to the Ocean Digital Twin and to the implementation of the European Ocean Observing System (EOOS).

The partnership should put the emphasis on the development of basin- or Europe-wide holistic, integrated, systemic and cross-sectoral approaches and foster co-creation processes involving all relevant stakeholders and actors, while remaining operationally manageable. It will engage local, regional and national authorities, industry and businesses, including SMEs, knowledge institutions and citizens through Open Science and an inclusive governance, policy and decision-making. It will harness the full potential of social sciences and humanities, social innovation and citizen engagement to deliver portfolios of solutions, measures and tools and facilitate their replication, and upscaling.

It should contribute to improve the quality of life and long-term socio-economic prospects of coastal communities, including women, youth and the most vulnerable groups like indigenous people, in the context of major transitions and rising threats to climate, resources and health, including by increasing their resilience to crises like the COVID-19 pandemic. In line with the European Commission's political vision of leaving no one behind, the wide diversity and heterogeneity in levels of socio-economic, technological, institutional, innovation and skills potential shall be taken into account.

The European Partnership for a climate neutral, sustainable and productive blue economy should be implemented through a joint programme of activities for high impact, relevance and capacity building, ranging from research to coordination and networking activities, including training, demonstration, communication and dissemination activities in all research and innovation projects of the partnership. Emphasis should be given to demonstration, upscaling and experimentation calls. To ensure effective and smooth implementation, three dedicated pillars of activities within the partnership are needed:

- i. Implementation of joint activities in particular calls for proposals with co-funding from the Union.
- ii. Implementation of joint activities without co-funding from the Union.
- iii. A broad set of activities supporting coordination, international cooperation and outreach, uptake of results etc.

These activities will be structured along the following main building blocks of activities:

- Development of work programmes as implementation steps of the high-level Strategic Research and Innovation Agenda (SRIA). This SRIA shall be included in the proposal, outlining implementation modalities and building on existing SRIAs or equivalent in the EU sea basins. It should include the demonstration of the achievability of policy targets at sea-basin scale.
- Joint calls for challenge-driven R&I to address critical issues for a sustainable climate-neutral blue economy with integrated and multi-stakeholder approaches.

- Setting-up a multi-stakeholder community of practice to facilitate science-policy-business-society dialogues, share experiences and disseminate results and innovations on key issues for social transition and sustainable development.
- Undertaking communication and dissemination measures to make R&I results accessible for all stakeholder groups and users and prepare guidelines, references, tools and trainings for replication and mainstreaming; communicating to citizens and civil society at large, and involving them to achieve policy goals.
- Synthesising R&I results and achievements from clusters of projects.
- Setting-up (a) knowledge hub(s) to support capacity-building on integrated approaches.
- Setting-up rigorous monitoring to follow progress of projects and taking stock of diverse solutions, good practice cases and the contribution to the achievement of the objectives of the partnership and the related policy targets.
- Exploring interfaces with public procurement and investment programmes by developing links with other programmes, private funds, etc. to support take-up and larger-scale implementation of tested approaches and solutions.

Given the global dimension of ocean policy, membership and other modalities of participation from organisations and institutions in non-European countries is encouraged, in particular key partners bordering the different EU sea basins. International cooperation should contribute to align strategies and research agendas, strengthen data collection, monitoring and sharing, as well as access to infrastructures, promote good practice for maritime policies, promote the exchange and export of key technologies and gradually open up cooperation with new countries outside of Europe. It should support the EU's strong commitment to the UN Decade of Ocean Science, the G7 agenda on healthy oceans, the All Atlantic Ocean Research Alliance, the BLUEMED Initiative, and other international initiatives.

The partnership will cover the Atlantic, the Baltic Sea, the North Sea, the Mediterranean and the Black Sea. It is expected to include and be open to all relevant public marine/maritime funding organisations and ministries from EU Member States and associated countries as core members, in close cooperation with the private sector, including SMEs and foundations. Appropriate links to other relevant ministries and organisations, including civil society, will be established.

Partners are expected to provide financial and/or in-kind contributions for the governance structure, the joint calls and other dedicated implementation actions and efforts for national coordination. The partnership is expected to mobilise EU, national and regional capacities to leverage investments, including from the private sector, increase up-scalability and market accessibility for the developed solutions and thus increase the return to investments.

To ensure the coherence and complementarity of activities, and to leverage knowledge investment possibilities, the partnership is expected to foster close cooperation and synergies with other relevant proposed European Partnerships, notably "Rescuing biodiversity to

safeguard life on Earth”, “Safe and Sustainable Food Systems”, “Water security for the planet (Water4All)”, “Zero-emission waterborne transport”, “Clean Energy Transition” and others where relevant, as well as the EIT Climate KIC and the EIT FOOD. The partnership will also be linked to the relevant objectives of the Mission in the area of “Ocean, seas and waters”. Proposers are expected to describe in details the way to implement such collaborations.

Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joint call for transnational proposals resulting in grants to third parties. Financial support provided by the participants to third parties is one of the primary activities of this action in order to be able to achieve its objectives. Therefore, the 60 000 EUR threshold provided for in Article 204 (a) of the Financial Regulation No 2018/1046 does not apply. It is expected that the partnership will organise joint calls on an annual base from 2023-2027 and will consider ample time for the implementation of the co-funded projects.

Up to one proposal will be funded. The Commission considers that proposals requesting a contribution from the EU of EUR 150.00 million would allow these challenges to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. The EU contribution for this action will be implemented in annual instalments of around EUR 20-30 million.

The conditions are described in General Annex B. The following exceptions apply: if projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

HORIZON-CL6-2022-GOVERNANCE-01-03: Multi-layer governance performance of marine policies

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 6.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: The successful proposal(s) will enhance new knowledge and design or improve tools to achieve better informed decision-making processes, social engagement and innovation, supporting the implementation of the European Green Deal. Proposals will contribute to the development or improvement of innovative multi-layer governance models enabling sustainability and resilience and of EU and international science-policy interfaces.

Project results are expected to contribute to all the following expected outcomes:

- Better understanding by the policy making community of the institutional barriers such as lock-ins, path dependency, bounded rationality, political inertia and power imbalances in the formulation and implementation of marine policies.
- The policy making community exploited analyses and better understanding of formal and informal policy governance work streams or processes, including public consultation and encompassing local, regional, national, European and global ocean governance aspects.
- Stronger e-government and easily achievable open government data facilitate greater access to public services.
- Appropriate communication, exchange, coordination and management is enabled at regional, national and European level.
- Improved collaborative governance performance allowing social and technical innovations to provide opportunities for the social contract between the State and the citizenry through increased transparency, enabling better spatial planning and natural resource management, ultimately leading to increased trust in policy making.

Scope: The management of the ocean, seas and coasts is largely carried out in a fragmented manner, at institutional as well as legal governance level and through several related sectors. Poor coordination between sectoral approaches, low institutional capacity, weak implementation of international conventions and lack of technical knowledge and of financial resources for regional, cross-regional and national processes are common issues in Member States and partner countries, affecting coastal communities severely in terms of food security and livelihoods (loss of jobs). Current policy governance models and work streams, including public consultation, at different governance levels, need to be analysed in relation to their performance and further challenged to intensify regional and local integration in the policy dialogue, as the (total, regional and local) transitions towards a sufficiently protected marine natural capital and health and wellbeing of citizens should also be just and inclusive. Proposals shall address the need to meet increasing public demands and to address declining public trust.

Proposals shall conceptualise and operationalise strategies to address identified barriers to collaborative governance related to seas and oceans based on a long-term perspective using a participatory process of visioning and experimentation, accompanied by strong and justified recommendations on the required capacity building.

Proposals shall improve or develop and leverage innovative digital tools, towards a stronger e-government and easily achievable open government data.

The proposals should cover comparisons within, across and between different spatial governance layers (local, regional, inter-regional, macro-regional, cross-border, international) to cover a representative set of governance structures across Europe varying according to size and geographical, environmental, socio-economic, institutional and administrative conditions.

Interactive research approaches should be used to engage with local, regional, national and international authorities, as well as local communities, citizens and other relevant stakeholders.

Projects should build on existing knowledge and integrate results from multiple origins, including other EU, international (for example UN) or national projects or studies. Some cooperation activities with projects financed under topic HORIZON-CL6-2021-GOVERNANCE-01-06 on environmental and social cross-compliance of marine policies from Destination 7 could be included. This topic should also be linked to the Horizon Europe Mission Ocean, seas and waters and the Partnership for a climate neutral, sustainable and productive Blue Economy or other partnerships where relevant.

HORIZON-CL6-2022-GOVERNANCE-01-04: Consumer-focused labelling options for bio-based products

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 3.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The successful proposal will support the deployment of business-to-consumers communication by producers and traders of bio-based products to enable responsible production and consumption, in line with of the objectives of the European Green Deal, the EU Bioeconomy Strategy and the European Climate Pact. Project outcomes will contribute to improve the sustainability performance and competitiveness in the bio-based systems and to the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation. Project results are expected to contribute to all of the following expected outcomes:

- Transparency of bio-based products and information to consumers and public authorities are provided through effective and robust business-to-consumers labelling on products’ traceability, quality, carbon footprint and other environmental footprints;
- Consumers, industry and public bodies are enabled to switch towards socially and environmentally responsible behaviour within their choices (e.g. through regulatory measures, corporate responsibility initiatives, education) in a transparent and inclusive way;
- Improved understanding of metrics on value generated per unit of biological resources.

Scope: The action advances the role and impact of bio-based innovation to accelerate the transition from a linear fossil-based economy, which leads to overuse and depletion of natural resources, into a resource-efficient and circular bio-based systems operating within safe planetary boundaries. Improved and informed governance and social innovation contributes to reducing resource consumption and results in an increased innovation capacity of all actors. Informed consumers may pursue the objectives of circular economy, asking for efficiency and inclusiveness of services provided through less resources and goods, changing consumption patterns (e.g. reducing meat consumption), preventing food waste and separating bio-waste from other waste streams so that it can be (partly) converted to bio-based materials.

Proposals will focus on consumer-oriented labelling options for the bio-based systems with low environmental footprint, in terms of feedstock, resources, processes, materials and products.

Proposals will:

- a. select a range of bio-based systems where value chains can be monitored in their environmental and social impacts (benefits and trade-offs) from the primary materials trade to the final products;
- b. develop pre- and co-normative research to design or update standards and labels for business-to-consumers communication of climate-neutrality and environmental impacts/benefits/trade-offs and performances of materials and products. Environmental impacts shall include carbon footprint, climate neutrality and any other environmental footprint relevant for the specific bio-based value chain and final products. Metrics on value generated, in the final product, per unit of biological feedstock used, including bio-waste, will be assessed;
- c. develop guidelines on the design of labels for bio-based products that include the perspectives of public authorities (national, regional, local) and consumers;
- d. assess existing/develop new monitoring system and indicators of effectiveness and robustness of existing business-to-consumers labels and certification schemes
- e. demonstrate/test effectiveness of existing (voluntary) business-to-consumers labels and certification schemes and monitor robustness. This action includes the identification of labels and certification schemes and testing of the monitoring system and indicators assessed/developed;
- f. assess costs and benefits from the adoption of business-to-consumers labels and certification schemes in selected bio-based systems;
- g. assess and develop smart options for the consumers in the digital age (e.g. mobile applications) aiming at sound understanding and practical use;
- h. analyse social measures to enable consumers to switch towards socially and environmentally responsible behaviour within their choices (e.g. regulatory measures,

corporate responsibility initiatives, education), ensuring inclusiveness of all actors (NGOs, civil society etc) and taking into account differences between gender, age and socio-economic background.

The proposals will seek complementarities with related actions on bio-based innovation and market measures⁵²⁶, and ensure inclusiveness and engagement of all actors along bio-based value chains.

HORIZON-CL6-2022-GOVERNANCE-01-05: Innovative tools and methods to evaluate the design and support, monitoring and implementation of effective CAP Strategic Plans

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: The successful proposal will contribute to innovative governance and sound decision making in agricultural policies for the green transition. In particular, they will contribute to achieving better informed decision-making processes, to establishing and monitoring innovative governance models enabling sustainability and resilience through enhanced and shared use of new knowledge, tools, foresight, and environmental observations as well as digital, modelling and forecasting capabilities. They will also contribute to strengthened EU science-policy interfaces to support the European Green Deal and to achieve the Sustainable Development Goals.

Project results are expected to contribute to all of the following expected outcomes:

- Policymakers are supported with cutting-edge tools and methods to design, monitor and implement tailored and results-based CAP Strategic Plans that fully reflect the ambition of the Green Deal, in particular the Farm to Fork Strategy and the Biodiversity Strategy
- Accountability of the CAP Strategic Plans is improved through SMART⁵²⁷ targets for improved performance against clear baselines, which are coherent with EU objectives and international commitments
- Good practices on the application of innovative tools and methods are widely shared and used across Member States

⁵²⁶ E.g. topic "HORIZON-CL6-EPS-2021-00-00: International and European sustainability certification schemes of biological feedstock"
⁵²⁷ specific, measurable, achievable, relevant, and time-bound

Scope: Agri-food systems are key sectors for the delivery of the objectives of the European Green Deal while the Common Agricultural Policy (CAP) is the most important EU policy mechanism with the capacity to have a significant impact on the agricultural dimension of these systems at European level.

In the new results-based delivery model of the CAP, Member States are in charge of tailoring CAP interventions to maximise their contribution to EU objectives and to achieve agreed targets. In developing their CAP Strategic Plans, Member States need to analyse their specific situation and needs, set their targets and design the interventions that will allow them to reach these targets, while being adapted to the national and specific regional contexts.

They also have a say in designing the compliance and control framework applicable to beneficiaries while continuing to ensure effective monitoring and enforcement of the attainment of all policy objectives.

Proposals will:

- Review and benchmark existing tools and/or methods used in different Member States to support the development, implementation and monitoring of effective CAP Strategic Plans.
- Develop, test and demonstrate a set of innovative tools and/or methods, both qualitative and quantitative, to evaluate the design and support the implementation and monitoring of effective CAP Strategic Plans.
- The proposed tools and/or methods must:
 - take into account all objectives and policy instruments post-2020 CAP;
 - enable analysis of coherence between the multiple instruments of the CAP as well as with other EU policies and international commitments;
 - be compatible with and/or innovative in relation to the tools and methods used by the European Commission.
- Apply and evaluate potentials and limitations of the proposed tools to different case studies within Member States, with attention given to balanced geographical coverage and taking into account the diversity of farming systems across the EU, including the outermost regions, and different government structures, e.g. regional/federal administration approaches.
- Develop methodological protocols and guidelines for the users of the tools and methods.

The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.

Deploying and adding value to Environmental Observations

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-GOVERNANCE-01-06: New technologies for acquiring in-situ observation datasets to address climate change effects

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 20.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: Through the development of new technologies a successful proposal will contribute to addressing the lack of ground observation (in-situ observation)⁵²⁸ necessary to cope with climate change effects in hard to reach areas, areas facing extreme physical conditions and critical areas for human health and security. As such contributing to the European Green Deal objectives and a strengthened Global Earth Observation System of Systems (GEOSS), by deploying and adding value to environmental observation⁵²⁹.

Proposals are expected to contribute to some of the following outcomes:

- Lower cost of in-situ observation in terms of capital cost, deployment/recovery, and maintain leading;
- Improved geographical coverage and long-time series of in situ environmental observations;
- Tested and validated new in-situ measurement technologies in hard-to-reach under-sampled areas;
- Dedicated technical protocols ensuring validation, interoperability, and synchronisation between in-situ and remote sensing systems in compliance with the GEOSS and Copernicus requirements;
- Established collaboration with environmental observation data providers to ensure proper gap filling and adequate responses in terms of acquisition protocols;

⁵²⁸ All non-space based observations which may include remote sensing from ground-based, marine or airborne platforms

⁵²⁹ The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

- Coherent business model(s) involving industrialists, research centres, and users ensuring the sustainability of systems developed;
- Contribute to reinforcing the in-situ component of the GEO initiative, the Copernicus Programme and the ESA-Commission initiative on Earth system science, and to strengthen in-situ observations to adequately complement the space-based observations planned through Copernicus Expansion Missions.

Scope: The geographical coverage and acquisition of long time series of in-situ observation of the various components of the Earth's systems should be improved in order to ensure a proper monitoring and modelling of the environmental processes. This is recognised in the context of the Copernicus programme, by the GOOS 2030 Strategy, and was reiterated at global level at the GEO Ministerial Summit⁵³⁰ in November 2019 in the Canberra Ministerial Declaration⁵³¹. This topic is intended to support innovative technological solutions building on cutting-edge technologies in the domain of measurement and testing, big data and ICT to acquire necessary parameters from in-situ measurements required to ensure an integrated monitoring and model data assimilation necessary to respond to the climate transition and the European Green Deal challenges. This call covers marine and/or terrestrial measurements in hard-to-reach areas or areas with extreme physical condition such as the polar regions, the tropical regions and desert regions, the deep-sea, and the high-altitude regions where the lack of in-situ data makes global assessment and mitigation of climate change effects very challenging. Proposals could also address geographical and high temporal resolution gaps in observations such as the real-time monitoring of aeroallergens or other atmospheric aerosols affecting health. The proposals should be conducted, inter alia, in collaboration with Copernicus and other, relevant activities⁵³² and communities in order to guaranty coherent approaches regarding the acquisition of new in-situ data and development of related monitoring systems – in particular in view of supporting the calibration of remote-sensing data. During the development of the systems, special attention should be given to data management, standardisation and dissemination issues.

The development of new in-situ observation systems should be conducted in close collaboration with the commercial sector. The sustainability of the systems beyond the duration of the project should be part of the work plan of the proposal and be the subject of concrete actions with the relevant partners in the proposal (users, industrialists, research organisations, including European research infrastructures).

HORIZON-CL6-2022-GOVERNANCE-01-07: Uptake and validation of citizen observations to complement authoritative measurement within the urban environment and boost related citizen engagement

Specific conditions

530 <http://www.earthobservations.org/geoweeek19.php>

531 https://earthobservations.org/documents/geo16/MS%204.2_Draft%20Canberra%20Declaration_final.pdf

532 European research infrastructure, EMODnet, INSPIRE, GEOSS, EGNSS, ESA etc.

<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 3.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 14.00 million.
<i>Type of Action</i>	Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to the wide deployment of and adding value to environmental observations⁵³³, by improving the uptake and validation of data collected by citizens and by increasing citizen involvement and engagement, thus contributing to the European Green Deal objectives and a strengthened Global Earth Observation System of Systems (GEOSS).

Proposals are expected to contribute to all of the following outcomes:

- A more widespread participation of citizens, (e.g. new and/or existing associations/groupings of citizens observers) in the monitoring, observation, and protection of the urban environment, complementary to governmental measures;
- Greater availability of qualitative and quantitative in-situ data for long time series and better geographical coverage, contributing to the in-situ component of existing observation systems (such as Copernicus⁵³⁴, European research infrastructures⁵³⁵ and GEOSS);
- Broader use of data and information collected by citizens in policy and research, with crowdsourcing and citizen observations acknowledged as valuable information complementary to authoritative observations;
- Increased use of existing toolkits and development of new toolboxes (methodologies, methods, technologies) for broad use, which could include the development of efficient passive sampling systems;

533 The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

534 <https://www.copernicus.eu/en>

535 <https://www.esfri.eu/>

- Leveraged use of wearables for citizens and other low-cost technologies in the domain of environmental observation.

Scope: The scope of this topic is to support citizen engagement, specifically the active role of citizens in the collection and use of data and information within the urban environment to complement the data and information collected through other means of observation (space-based, airborne, etc.). The proposals selected under this topic should increase societal awareness about the urban environment and lead to an increase in actions necessary to protect it. The proposals should contribute to more comprehensive and available data and information of good quality to assess the state of the urban environment in support of the climate transition and the European Green Deal and to the GEO initiatives related to urban environment and urban resilience.

The information derived by the selected projects will help in shaping policies targeting the monitoring and greening of the urban environment, in addition to monitoring schemes already set out by public authorities at different levels (regional, national, European, even global).

Proposals selected under this topic should pay particular attention to encouraging the validation and uptake for policy and compliance use.

The proposals should ensure that the observations/data produced will be available on relevant existing platforms such as GEOSS, European research infrastructures, INSPIRE⁵³⁶ and EMODNet⁵³⁷.

The sustainability of the (existing) validation methods should be ensured for a broader use in the future, through the development of toolboxes, containing tested methodologies, methods and technologies.

The social and cultural dimensions of the citizen observation should be given due consideration within the proposals and therefore be looking into possibilities to engage citizens through e.g. social innovative⁵³⁸, cultural or art-related initiatives. This should be in the context of further engaging and raising the interest and awareness of all citizens in observing their environments, but also in looking into the possibilities for co-creation of solutions for the urban environment. Particular attention should be paid to engaging women and marginalised groups, such as ethnic minorities and disabled persons, in co-creation efforts.

Particular attention should be directed to cooperation between different groups of engaged citizen observers, strengthening mutual learning and the exchange of good practices (in particular with respect to data quality). This could include the build-up of skills, capacity and networking possibilities between citizen associations to help them get involved in citizen observations.

536 <https://inspire.ec.europa.eu/>

537 <https://www.emodnet.eu/en>

538 Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

Selected projects in this area are expected to be developed in co-creation and to build upon the results of the WeObserve project⁵³⁹, as well as demonstrating measures to communicate and cooperate with other relevant citizen science projects⁵⁴⁰ funded under Horizon 2020 and Horizon Europe as far as possible.

The Commission Staff Working Document ‘Best Practices in Citizen Science for Environmental Monitoring’⁵⁴¹ published on 27 July 2020 is of interest in the context of this topic.

Applicants should seek cooperation with local, regional, national and European environmental agencies.

HORIZON-CL6-2022-GOVERNANCE-01-08: Environmental observations solutions contributing to meeting “One Health” challenges

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: A successful proposal will contribute to the deployment of and adding value to environmental observations⁵⁴², focussing on how the use of environmental observation can contribute to the ‘One Health’ domain, in line with the European Green Deal objectives.

Proposals are expected to contribute to some of the following outcomes:

- Better insights in how to foster the use of environmental observation in the large domain of One Health⁵⁴³ and the areas within this domain that could benefit the most from environmental and Earth observation;
- An increase of the capacity to trace environmental parameter changes on how they impact on the emergence of diseases;
- Monitoring of the evolution of ecosystem barriers and reinforcement of their sustainability, specifically in densely populated or intensively used areas;

539 <https://www.weobserve.eu/>

540 e.g. <https://cordis.europa.eu/article/id/421641-environmental-observations-informing-citizens-and-supporting-policymaking-through-innov>

541 https://ec.europa.eu/environment/legal/reporting/pdf/best_practices_citizen_science_environmental_monitoring.pdf

542 The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

543 <https://www.who.int/news-room/q-a-detail/one-health>

- Contributing to understanding the emergence and tackling the spread of new infectious diseases affecting human, animal or plant health, and the interlinkages that may exist between them and building up of more resilient ecosystems;
- Better insights into the concept of alert and early warning systems, including, where possible, the next steps taken (e.g. exploitation/scaling up) in working with the outcomes of the EIC Horizon Prize on Early Warning for Epidemics⁵⁴⁴.

Scope: The general scope of this topic is to explore areas of the One Health policy that would benefit from the use of environmental observation and how environmental observations can be used for further shaping policies in the context of e.g. human health, animal health (including zoonoses) and plant health.

The proposal should build on the holistic integrative concept of 'One Health' that includes not only the health of humans, but also of animals, soil and plants including ecosystems and environmental health. Information deriving from environmental observation combined with health data over the broad range of the One Health concept will be delivered through an integrated approach aggregating all the components of the One Health with the intention to support related policies within the health area in a comprehensive way.

A specific focus of the proposal should be on the monitoring of the evolution of ecosystem barriers in densely populated, industrialised or agricultural areas. The proposal should also investigate how environmental observations could provide information that can contribute to improving the effectiveness, sustainability and resilience of these ecosystem barriers in facing emerging diseases. The proposal should include the reanalysis of long time series of environmental observations and their correlation with the emergence or spread of diseases.

It should also work on the concept of alert or early warning systems based on observation that would contribute informing governments and authorities, and finally operators, on the health risks related to the destruction of ecosystems and biodiversity with a One Health approach, including a consideration of disease hazards, human (or animal) exposure and vulnerability. Research on the risk for human health and ecosystems of new contaminants could help early detection and reduce negative effects within the One Health domain. A particular area of interest in this context is the follow up to the EIC Horizon Prize on Early Warning for Epidemics and how the insights gained from the outcomes of the prize could be further developed.

Links to the European Earth observation programme Copernicus, the Global Earth Observation System of Systems (GEOSS), and the EU satellite navigation programme (EGNSS) are relevant and expected.

Digital and data technologies as key enablers

Proposals are invited against the following topic(s):

544 Reference to prize winner when available (expected in Sept/Oct 2021)

HORIZON-CL6-2022-GOVERNANCE-01-09: Piloting approaches and tools to empower citizens to exercise their “data rights” in the area of food and nutrition

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 7.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 4-6 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will support the deployment of digital and data technologies as key enablers for the European Green Deal priorities, the EU's Climate ambition for 2030 and 2050 and the Farm to Fork Strategy for a fair healthy and environmentally friendly food system. It will help to bring about innovative and inclusive governance, better informed decision-making processes, social engagement, and innovation.

Project results are expected to contribute to all of the expected outcomes:

- empower citizens to exercise their “data rights” and to contribute to a just transition of food systems
- pilot digital solutions in food systems and nutrition with enhanced personal data protection and data sovereignty and which achieve a fairer distribution of wealth and benefits
- advance alternative approaches to food system data sharing that promote innovation and increase competition

Scope: This topic will support the implementation of the European Data Strategy⁵⁴⁵ in food systems. The European Data Strategy has the ambition to make the EU the leading role model for a society empowered by data, for the benefit of all. It outlines a future in which the way that data is collected and used, places the individual first, in accordance with European values, fundamental rights and rules. It also emphasizes that citizens will only trust and embrace much needed data-driven innovations – in food systems and beyond - if they are confident that any personal data sharing in the EU is compliant with strict data protection rules and respectful of their data sovereignty⁵⁴⁶. Current centralised platforms for big and social data management in food systems tend to consolidate the dominance of existing incumbent actors. They allow limited control over the data by citizens (e.g. food purchasing data, data from

545 https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en

546 Compliance with strict data protection rules and data sovereignty are referred to as “data rights” in the title

wearables on activity and health, online behaviour regarding diet and food, data from personalised nutrition solutions), and enable lock-ins by limiting data portability.

Proposals will build on recent research and innovation⁵⁴⁷ about new architectures for managing online identity, personal and other data as an alternative to current dominant models. They will pilot new approaches to digital solutions in food systems and nutrition, which enhance personal data protection and data sovereignty, and which achieve a fairer distribution of wealth and benefits. The pilots will test and fine-tune new approaches that address the lack of sovereignty of European citizens on food and nutrition related data, and allow them to decide what is done with their data (purchasing data, data on dietary behaviour, nutritional health data, physical activity data). This data also includes the data that is generated by smart connected devices used by citizens. The tools and concepts of the pilots can include consent management tools, personal information management apps (including fully centralized solutions building on blockchain), as well as personal data cooperatives or trusts acting as novel neutral intermediaries in the personal data economy.

Proposals and their pilots should demonstrate the feasibility of achieving a more acceptable trade-off between the need for data-driven innovation in food and nutrition and the need for personal data protection and data sovereignty. They should be focused on **2 key areas of digital transformation and data driven innovation** in food systems (such as online food retail, home delivery of food, personalised nutrition, digital tracking of food and nutrition related consumer behaviour, food advertising) whose future development is likely to have significant impact on reaching the objectives and targets of the EU's Farm-to-Fork Strategy, on EU's Climate ambition for 2030 and 2050 and will contribute to a just transition⁵⁴⁸. Proposals should explain and map how the pilots will achieve co-benefits relevant to the four Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities. Gender aspects should be considered, where relevant.

Proposals shall provide support to third parties to develop and implement the pilots. This support to third parties can only be provided in the form of grants. As a reference, 50% of the EU funding can be allocated to financial support to the third parties, through grant amounts that are in the EUR 150 000 to 300 000 range. Proposals will focus their support for the pilots on third party projects from outstanding academic research groups, start-ups and SMEs, so that multiple third parties can be funded in parallel contributing to the same key area of digital transformation and data driven innovation, using short research cycles targeting the most promising ideas. Each of the selected third parties projects will pursue its own pilot and objectives, while the proposal will provide the programme logic and vision, the necessary technical support, as well as coaching and mentoring, in order that the collection of third party projects and pilots contributes towards a significant advancement and impact in the key area. The focus will be on advanced research that can be brought quickly to the market; apps and services that innovate without a research component are not covered by this model.

547 For example: Horizon 2020 projects DECODE and LEDGER developed distributed and open platforms for citizen-friendly data governance (using technologies including blockchain, distributed ledger) and promoted open disruptive innovation.

548 See EU Green Deal

Proposals shall make explicit their capacity to attract top talent, to bring about disruptive innovation in line with EU policy objectives, to engage with a broad range of with food system actors and stakeholders as well as with communities and citizens, to deliver a solid value-adding services package to the third party projects, as well as their expertise and capacity in managing the full life-cycle of the open calls transparently. They should explore synergies with other research and innovation actions, supported at regional, national or European level, to increase the overall impact.

Proposals will ensure that any data produced during the project will comply with the FAIR principles. In addition, proposals will adopt an open access and open data approach whereby research outcomes and data will be freely shared. Where possible they will make data available for broader communal use (as part of “data commons for food and nutrition”) and seek integration of the data and value-added services on those data through federated infrastructure such as the European Open Science Cloud.

HORIZON-CL6-2022-GOVERNANCE-01-10: Upscaling (real-time) sensor data for EU-wide monitoring of production and agri-environmental conditions

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Eligibility conditions</i>	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy and the Headline ambitions of a Digital Age and Economy that works for all, the successful proposals will support smart-farming and agri-environmental monitoring. They will therefore contribute a) to the enhancement of the sustainability performance and competitiveness in agriculture through further deployment of digital and data technologies as key enablers, and b) to make agriculture benefit from further deployment and exploitation of Environmental Observation data and products through research and innovation related to sensors and sensor data.

Project results are expected to contribute to all of the following expected outcomes:

- Strengthening capacities for smart farming, and thus to enhance the environmental and economic performance of the agricultural sector.
- Strengthening capacities for agri-environmental (climate) monitoring, particularly of soil and crop conditions.
- Provision of inputs to the work of the Horizon Europe candidate partnership “Agriculture of Data” and the Soil Mission.

Scope: Sensors are increasingly used to enhance agricultural production e.g. through the assessment of environmental and crop conditions as well as through livestock monitoring. The information value of data collected through sensors can be increased through the analysis of the data in combination with other data sets. Reference data may, e.g. be formed by data sets generated by sensors at other places or by satellite and earth observation data or other data sets reflecting on environmental conditions. Data generated locally through sensors is often more precise, in comparison to “global/ EU-wide/ national/ or regional data sets”.

The interpretation of local data sets benefits through such supra-regional data sets allowing e.g. for comparison of crop conditions e.g. as basis for developing approaches to adapt agricultural production to climate change or for market analyses. In addition, there is the possibility to upscale the more detailed through sensors locally generated information through the application of data technologies, allowing to generate a data, information and knowledge base. That base can serve as input for analyses to serve the agricultural sector as well as environmental, climate, and wider policy monitoring purposes.

Of particular interest in agricultural production are approaches of real-time data generation and processing allowing for instance to better tailor certain production steps, combine different production steps or operate Internets of Things (IoT). Edge computing can play a key role to facilitate and enhance such sensor-based analyses and production approaches.

Proposals should cover all of the following aspects:

- Development of innovative approaches to use in-situ data collected through sensors used in agricultural production as input to the application of data technologies.
- Development of approaches to analyse the data in real time through processing at the source (edge computing) associated with analytics (including AI) in combination with e.g. earth observation data.
- Development of innovative approaches to benchmark and tailor agricultural production through sensor data sharing at regional level including the development of business models.

- Development of approaches to generate EU-wide data sets through the upscaling of data collected through sensor used in agricultural production (in combination with other data sets, such as satellite data).
- Demonstration of how sensor-generated data can be further capitalised for the development of the agricultural sector, other sectors and the public good (including policy-making and implementation).

Based on a stock-taking analysis, proposals must (also) focus on crops currently covered less by (private sector) sensor developments. Approaches towards livestock monitoring and/or approaches towards monitoring of agri-environmental conditions through livestock data should be considered. Proposals have to reflect on different bio-geographic conditions in Europe.

Proposals are expected to demonstrate how governance and management structures allowing for a steady adaptation of the projects work programme (like a rolling plan) to the most recent developments and innovations in the public and private domain are set up.

Proposals are expected to reflect on possibilities to interlink (interim) project results or parts of them to the functioning of the forthcoming Common European Agricultural Data Space and/or the Common European Data Space for Research and Innovation, the European Open Science Cloud in cooperation with the European Commission. The potential of IoT technologies is to be considered.

The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.”

Strengthening agricultural knowledge and innovation systems

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-GOVERNANCE-01-11: Thematic networks to compile and share knowledge ready for practice

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 9.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the Green Deal, CAP and Farm to Fork objectives and targets, the successful proposal will focus on knowledge sharing in a language that is easy to

understand and is targeted to farmers and foresters. Primary producers have a particular need for impartial and tailored knowledge on the management choices related to the needs, challenges or opportunities they experience. This speeds up innovation and the uptake of results, and is key to improve sustainability. It adds value to the knowledge and cost-effectiveness of innovative practices and techniques in and across primary production sectors, food systems, bioeconomy and biodiversity. This will lead to more informed and engaged stakeholders and users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS⁵⁴⁹).

Despite the continued funding of scientific projects, innovative ideas and methods from practice are not captured and spread, and often research findings are not integrated into agricultural and forestry practice. Proposals, acting at EU level to remedy this situation, are essential because national and sectoral AKISs are insufficiently connected and organised to fully meet the challenge of intensifying thematic cooperation between researchers, advisors and farmers/foresters. This exchange of knowledge will foster economically viable and sustainable agriculture and forestry and build trust between the main AKIS actors.

Project results are expected to contribute to the following outcomes:

- The cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁵⁵⁰, as well as European Green Deal and Farm to Fork objectives;
- The collection and distribution of easily accessible practice-oriented knowledge on the thematic area chosen, in particular the existing best practices and research findings that are ready to be put into practice, but not sufficiently known or used by practitioners.
- Conserve practical knowledge for the long term - beyond the project period – in particular by using the main trusted dissemination channels that farmers/foresters consult most often.
- Increase the flow of practical information between farmers/foresters in the EU in a geographically balanced way, creating spill-overs and taking account of the differences between territories. In order to better reach and capture knowledge from the targeted farmers/foresters, the networks may organise 'cross-fertilisation' through sub-networks covering, for example, a region, a language or a production system;
- Achieve greater user acceptance of collected solutions and a more intensive dissemination of existing knowledge, by connecting actors, policies, projects and instruments to speed up innovation and promote the faster and wider co-creation and transposition of innovative solutions into practice.

Scope: Proposals should address the following activities:

⁵⁴⁹ AKIS means the organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields (Agricultural Knowledge and Innovation

⁵⁵⁰ Art 5 of the post 2020 CAP regulation

- Summarise, share and present - in a language that is easy to understand and is targeted to farmers and foresters – the existing best practices and research findings that are ready to be put into practice, but not sufficiently known or used by practitioners. The specific themes of the networks can be chosen in a 'bottom-up' way on the condition that they tackle the most urgent farmers' or foresters' needs.
- Compile a comprehensive description of the state of current farming practices on the chosen theme to explain the added-value of the proposal and the relevance of the theme. Proposals shall focus on the cost/benefit aspects of the practices collected and summarized, and clarify how the project avoids duplication with ongoing or completed projects and networks.
- Deliver an extensive range of useful, applicable and appealing end-user material for farmers and foresters. This info should be easy to access and understand, making use of audio-visual material wherever possible, including also materials serving education and training;
- This range of material should feed into the existing dissemination channels most consulted by farmers and foresters in the countries.
- As many “practice abstracts” in the common EIP-AGRI format as possible, as well as other type of materials should be provided to the European Innovation Partnership (EIP-AGRI) 'Agricultural Productivity and Sustainability', as well as to national/regional/local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-22);
- Besides giving the details on the EIP Operational Groups which are strongly recommended to be involved⁵⁵¹, wherever possible and relevant to the chosen theme, provide also details on how further synergies will be built with future EIP Operational Groups and interactive innovation groups operating in the context of the EIP-AGRI.
- Proposals should fall under the concept of the 'multi-actor approach'⁵⁵², with a consortium based on a balanced mix of actors with complementary knowledge clearly activating farmers/foresters, farmers' groups and advisors; and run for minimum 3 years.

HORIZON-CL6-2022-GOVERNANCE-01-12: Broaden EIP Operational Group outcomes across borders by means of Thematic networks, compiling and sharing knowledge ready for practice

Specific conditions	
<i>Expected EU contribution per</i>	The EU estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting

⁵⁵¹ According to the requirements of the multi-actor approach

⁵⁵² See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

<i>project</i>	different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 4.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the Green Deal, CAP and Farm to Fork objectives and targets, the successful proposal will focus on knowledge sharing in a language that is easy to understand and is targeted to farmers and foresters. Primary producers have a particular need for impartial and tailored knowledge on the management choices related to the needs, challenges or opportunities they experience. This speeds up innovation and the uptake of results, and is key to improve sustainability. It adds value to the knowledge and cost-effectiveness of innovative practices and techniques in and across primary production sectors, food systems, bioeconomy and biodiversity. This will lead to more informed and engaged stakeholders and users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS).

Despite the continued funding of scientific projects, innovative ideas and methods from practice are not captured and spread, and often research findings are not integrated into agricultural and forestry practice. The proposals, acting at EU level to remedy this, are essential because national and sectoral agricultural knowledge and innovation systems (AKISs) are insufficiently connected and organised to fully meet the challenge of intensifying thematic cooperation between researchers, advisors and farmers/foresters. This exchange of knowledge will foster economically viable and sustainable agriculture and forestry and build trust between the main AKIS actors. It will scale up local solutions up to the EU level and may even influence policy design wherever useful.

Project results are expected to contribute to the following outcomes:

1. The cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁵⁵³, as well as contributing to the European Green deal and Farm to Fork objectives. Examples are climate issues, pesticide use, water use and pollution, short supply chains linking to the consumer, farm viability, animal welfare, generational renewal, etc.
2. The collection and distribution of easily accessible practice-oriented knowledge on the thematic area chosen, in particular the existing best practices and research findings that are ready to be put into practice, but not sufficiently known or used by practitioners.
3. Conserve practical knowledge for the long term - beyond the project period – in particular by using the main trusted dissemination channels which farmers/foresters consult most often, delivering as much audio-visual material and as many “practice abstracts” in the common EIP-AGRI format as possible, including also education and training materials;

⁵⁵³ Art 5 CAP post 2020 proposal

4. Increase the flow of practical information between farmers/foresters in the EU in a geographically balanced way, creating spill-overs and taking account of the differences between territories. In order to better reach and capture knowledge from the targeted farmers/foresters, the networks may organise 'cross-fertilisation' through sub-networks covering, for example, a region, a language or a production system;
5. Achieve greater user acceptance of collected solutions and a more intensive dissemination of existing knowledge, by connecting actors, policies, projects and instruments to speed up innovation and promote the faster and wider co-creation and transposition of innovative solutions into practice.

Scope: Proposals should address the following activities:

- Build on the experience and outcomes of at least 5 EIP-AGRI Operational Groups of at least 3 Member States and choose a common theme related to the themes of the 5 Operational Group projects. Collect, summarise, share and translate the existing knowledge from science and practice, resulting from the EIP operational Groups and beyond, in an easy-to-understand language for practitioners, while tackling the most urgent needs of farmers and foresters.
- Compile a comprehensive description of the state of current farming practices on the chosen theme to explain the added value of the proposal and the relevance of the theme. Proposals shall focus on the cost/benefit aspects of the practices collected and summarized, and clarify how the project avoids duplication with ongoing or completed projects and networks.
- Deliver an extensive range of useful, applicable and appealing end-user material for farmers and foresters. This info should be easy to access and understand, and feed into the existing dissemination channels most consulted by farmers and foresters in the countries.
- All materials should also be provided to the European Innovation Partnership (EIP-AGRI) 'Agricultural Productivity and Sustainability' in the common 'practice abstract' format, as well as to national/regional/local AKIS channels and to the EU wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-22);
- Besides giving the details on the EIP Operational Groups which are strongly recommended to involve⁵⁵⁴, wherever possible and relevant to the chosen theme, provide also details on how further synergies will be built with future EIP Operational Groups and interactive innovation groups operating in the context of the EIP-AGRI.

⁵⁵⁴ According to the requirements of the multi-actor approach

- Proposals should fall under the concept of the 'multi-actor approach'⁵⁵⁵, with a consortium based on a balanced mix of actors with complementary knowledge clearly activating farmers/foresters, farmers' groups and advisors and run for minimum 3 years.

HORIZON-CL6-2022-GOVERNANCE-01-13: Improving preparation of multi-actor projects to enable the relevant actors to work in a co-creative way

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 5.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the Green Deal, Common Agricultural Policy (CAP) and Farm to Fork objectives and targets, the successful proposal will focus on improving preparation of multi-actor projects to enable the relevant actors to work in a co-creative way. The expected outcome of this topic is to develop sound, coherent and well-prepared multi-actor projects, enabling project coordinators to use the complementary knowledge of partners to find ready-to-use solutions. Member States' authorities and AKIS actors need insights and tools to improve the interaction, connections and drafting skills in the stage before putting down the multi-actor project proposals. This will lead to better informed and engaged stakeholders and users of innovative project results leading to more effective Agriculture Knowledge and Innovation Systems (AKIS) and related platforms.

Project results are expected to contribute to the following outcomes:

1. Improve the drafting of multi-actor projects⁵⁵⁶ and in particular the involvement of relevant actors with complementary knowledge in a balanced way
2. The policy objectives linked to Cluster 6, such as for instance agroecology, climate, pesticide reduction, reduction of water use etc, as well as the European Green Deal, the Farm to Fork Strategy and the CAP, the Biodiversity Strategy and the wider bioeconomy research and policies,.
3. The CAP cross-cutting objective of modernising the sector by fostering and sharing knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their

⁵⁵⁵ See definition of the 'multi-actor approach' on page 14-16 of the introduction to this Work Programme part.

⁵⁵⁶ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

uptake⁵⁵⁷. It will provide overall knowledge to the CAP supported projects related to knowledge creation, organisation and sharing.

4. The outcomes will be connecting actors, policies, projects and instruments to speed up innovation, in particular:

(a) create added value by better linking research, education, advisors and farming practice and encourage the wider use of available knowledge and innovation;

(b) connect innovation actors and projects at all levels; resulting in faster and wider co-creation and transposition of innovative solutions into practice and communicate to the scientific community the research needs of practice.

Scope: Proposals shall:

- Develop ways to improve in particular the preparation of Horizon Europe multi-actor projects to better include at an early stage the needed variety of relevant practice actors in a balanced way and useful information for the topic, with the view of co-creation between all actors as from the start of the project. Make use of potential capacities of national/regional AKIS and AKIS coordination bodies to this effect. In particular, test out the effect of providing seed funding to fund the preparation phase as happens successfully in EIP Operational Groups⁵⁵⁸ to improve the overall multi-actor quality of projects.
- Find ways to improve the connection and interaction between Horizon Europe Multi-actor projects and EIP OG innovation projects on specific topics before the very start of the multi-actor project, thus improving the interaction between the local/regional/national level and the EU level. Explore what are multi-actor consortia experiences and questions are related to the preparation phase, to better understand which hurdles should be solved to ultimately result in more integration of EIP-AGRI Operational Groups in Horizon Europe Multi-actor projects and a better uptake of the results of EU multi-actor projects at national/regional/local level. This should help sharing knowledge across the EU at all levels and between the projects from different funding sources.
- Resulting from experience gained during the project, develop guidelines and pathways, maybe at institutional level, to improve the overall quality of the preparation phase of multi-actor projects. As soon as possible, find effective and efficient ways to profit from the initiatives of the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-22), boosting women-led innovation in farming and rural areas (HORIZON-CL6-2022-COMMUNITIES-01-02) and the project interlinking national AKISs (HORIZON-CL6-2021-GOVERNANCE-01-23). Use the knowledge and innovation experts in the SCAR-AKIS Strategic Working Group to discuss the project strategy and progress in the various stages of the project.

⁵⁵⁷ Art 5 CAP post 2020 proposal

⁵⁵⁸ Art 114 and 71 (1)(a) of the CAP post 2020 proposal

- Cover all 27 EU Member States in the project. Make use in all those countries of experts who understand and are able to make an accurate interpretation of the national/regional contexts of practitioners and its impact on improving preparation of multi-actor projects.

The projects should run for 5 years and result in guidance on how to improve preparation of multi-actor projects to enable the relevant actors to work in a co-creative way. They should fall under the concept of the multi-actor approach⁵⁵⁹, including partners of multi-actor consortia, of EIP Operational Groups, policy makers and AKIS bodies and AKIS actors in Member States. Outcomes should be presented to policy makers at all levels, with a view to adapt policies and governance where needed. The results of the projects should also be disseminated to all those who may start up multi-actor projects or EIP-AGRI Operational Groups.

HORIZON-CL6-2022-GOVERNANCE-01-14: Developing EU advisory networks on water use

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 8.00 million.
<i>Type of Action</i>	Coordination and Support Actions

Expected Outcome: In support of the Green Deal, Common Agricultural Policy (CAP) and Farm to Fork objectives and targets, the successful proposal will focus on advisor exchanges across the EU to increase the speed of knowledge creation and sharing, capacity building, of demonstration of innovative solutions, as well as helping to bring them into practice, which accelerates the needed transitions. Agricultural Knowledge and Innovation Systems (AKIS) in which advisors are fully integrated are key drivers to speed up innovation and the uptake of research results by farmers.

Transformative changes such as the ones required within the Green Deal are dynamic processes that require appropriate governance of AKIS actors. Advisors are key actors strongly guiding and with a big influence over producers' decisions. A novelty in the post-2020 CAP plans⁵⁶⁰ is that advisors now must be integrated within the Member States' AKIS, and that the scope of their actions has become much broader. They must now be able to cover economic, environmental and social domains, as well as be informed on up-to-date science and technology. They should be able to translate this knowledge into opportunities, and use and adapt those to specific local circumstances. This specific topic focuses on the important role advisors can play related to climate change effects on water shortage, water pollution and

⁵⁵⁹ See definition of the 'multi-actor approach' in the introduction to this Work Programme part
⁵⁶⁰ Art 13(2) of the post 2020 CAP regulation

avoiding salty soils, a quickly upcoming issue in the more sustainable agriculture of the future.

Project results are expected to contribute to the following outcomes:

1. The most urgent policy objectives linked to Cluster 6, as well as the European Green Deal, and in particular the Farm to Fork Strategy and the CAP, with a view to increase farmer viability, help raise awareness and tackle societal challenges in helping the reduction of water pollution and use;
2. The CAP cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁵⁶¹. This topic will help to fill gaps on emerging advisory topics, which is useful in particular in relation with the new obligation for Member States to integrate advisors within their AKIS and cover a much broader scope than in the former period. It will provide overall support related to knowledge creation, organisation and sharing.
3. Development of interaction with regional policy makers and of a potential EU network to discuss institutional barriers to practical water-related issues, such as bottlenecks, lock-ins, political inertia, ambiguous regulations, inequality between Member States and power imbalances;
4. Production of supporting services and materials to facilitate the upscaling of prevention of water shortage and pollution, such as water audit schemes, novel water retention practices, communication and education materials, water knowledge networks and peer-to-peer counselling, master classes, advice modules, effective business models for farm management on dry soils, etc
5. The outcomes should speed up introduction, spreading and bringing into practice of innovative solutions related to avoiding water shortage and pollution overall, in particular by:
 - a. creating added value by better linking research, education, advisors and farming practice and encouraging the wider use of available knowledge across the EU;
 - b. learning from innovation actors and projects, resulting in faster sharing and implementation of ready-to-use innovative solutions, spreading them into practice and communicating to the scientific community the bottom-up research needs of practice;

Scope: Proposals should address the following activities:

- Connect advisors having a broad and extensive network of farmers across all EU Member States in an EU advisory network dedicated to avoid water shortage and pollution, with a view to sharing experiences on how to best tackle the issues, building

⁵⁶¹ Art 5 CAP post 2020 proposal

on of the outcomes of the EIP-AGRI “Focus Group on Water and Agriculture”⁵⁶², the EIP-AGRI Workshop: “Connecting innovative projects: Water & Agriculture”⁵⁶³, and the H2020 “Thematic network to improve water management”⁵⁶⁴

- Share effective and novel approaches among the EU advisory network on water use, which are sustainable in terms of economic, environmental and social aspects.
- Take strong account of cost-benefit elements. Collect and document good examples in this regard, connecting with farmers, intermediates and consumers in Member States to be able to take into account financial aspects and local conditions. Select the best practices, learn about the key-success factors, possible quick wins and make them available for (local) exploitation, to ensure financial win-wins for producers, citizens and water companies.
- Integrate the advisors of the EU water use network into their MS AKIS as much as possible. They should encourage as innovation brokers innovative projects on water use solutions in EIP Operational Groups. They should give hands-on training to farmers and local advisors, lead national thematic and learning networks on the subject, deliver and implement action plans to reduce farmers’ water use and pollution, inspire new and incoming farmers or farms at the cross-roads of intergenerational renewal, connect with education and ensure broad communication, support peer-to-peer consulting, develop on-farm demonstrations and YouTube demo films, and provide specific back-office support for generalist advisors within the national/regional AKIS.
- Explore if the activities of the EU advisory network on short supply chains can be up scaled at the level of a number of Member States under a cooperative format. Wherever possible, develop digital advisory tools for common use across the EU. Seek if common tools can be created to incentivise the implementation of the learnings from this project.
- Include all 27 EU Member States in the EU advisory network, using local AKIS connections which can more accurately interpret the national/regional contexts to help develop the best solutions for that Member State or region. Use the support of the knowledge and innovation experts of the SCAR-AKIS Strategic Working Group to discuss project strategy and progress in the various stages of the project. Projects should run at least 5 years. They should fall under the concept of the multi-actor approach⁵⁶⁵.

Call - Innovative governance, environmental observations and digital solutions in support of the Green Deal

HORIZON-CL6-2022-GOVERNANCE-02-two-stage

⁵⁶² <https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-focus-group-water-and-agriculture-final>

⁵⁶³ <https://ec.europa.eu/eip/agriculture/en/event/eip-agri-workshop-connecting-innovative-projects>

⁵⁶⁴ <https://ec.europa.eu/eip/agriculture/en/news/thematic-network-improve-water-management-fertilized-crops>

⁵⁶⁵ See definition of the 'multi-actor approach' in the introduction to this Work Programme part

Conditions for the Call

Indicative budget(s)⁵⁶⁶

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million) ⁵⁶⁷	Number of projects expected to be funded
		2022		
Opening: 28 Oct 2021 Deadline(s): 15 Feb 2022 (First Stage), 06 Sep 2022 (Second Stage)				
HORIZON-CL6-2022-GOVERNANCE-02-01-two-stage	RIA	10.00	Around 3.00	3
HORIZON-CL6-2022-GOVERNANCE-02-02-two-stage	RIA	12.00	Around 6.00	2
HORIZON-CL6-2022-GOVERNANCE-02-03-two-stage	RIA	15.00	Around 7.50	2
Overall indicative budget		37.00		

General conditions relating to this call

<i>Documents</i>	The documents are described in General Annex E.
<i>Admissibility conditions</i>	The conditions are described in General Annex A.
<i>Eligibility conditions</i>	The conditions are described in General Annex B.
<i>Award criteria</i>	The criteria are described in General Annex D.
<i>Legal and financial set-up of the Grant</i>	The rules are described in General Annex G.

⁵⁶⁶ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

⁵⁶⁷ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

<i>Agreements</i>	
<i>Financial and operational capacity and exclusion</i>	The criteria are described in General Annex C.
<i>Procedure</i>	The procedure is described in General Annex F.

Innovating with governance models and supporting policies

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-GOVERNANCE-02-01-two-stage: Water governance, economic and financial sustainability of water systems

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 10.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In support of the European Green Deal and EU water-related policies, successful proposals will contribute to innovative governance and sound decision making in water policy, in particular the Destination 7 impact “Innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, social engagement and innovation”.

Projects results are expected to contribute to all of the following expected outcomes:

- Improve policy implementation for securing sustainable water use across sectors, while insuring transparency and inclusiveness
- Promote a better integrated planning approach across water-using sectors
- Help to link water management to the economic and social development sectors.
- Support coordination between water policies and other relevant policies and coordination of planning measures across relevant EU and national instruments for sustainable water use

- Empower citizens by increasing their motivation and capacity to influence effective water governance decisions.
- Help society to implement through governance, the technological, economic, political, and social measures that will set a course toward the achievement of a desirable, more sustainable and secure water future.
- Support the implementation of the European Green Deal and the Sustainable Development Goals, notably SDG 6 “Ensure availability and sustainable management of water and sanitation for all”

Scope: Changing the way water is used, managed and shared with people, our environment and our economy, addressing trade-offs and ensuring policy coherence, and helping shape the appropriate institutional environment to deal with the complexity of multiple water challenges and the design of the water systems of the future, requires effective development and implementation of sound water management and governance strategies. The governance and institutional set up must be designed to respect the needs of the natural aquatic environment in terms of water quantity (water allocation) and quality, reconcile the competing demands of the economy over water resources and drive the transition in water using sectors towards operation within the sustainability limits.

Water problems are commonly the results of governance problems. Technical solutions often exist, but clarity is often lacking as to who does what, at which level and how. Implementing appropriate governance schemes or designing new multi-level governance and institutional settings for the implementation of sound water management, will help to achieve sustainable use of natural resources, as well as prevent pollution and protect biodiversity.

This topic aims to validate innovative multi-level water governance practices among various stakeholders to strengthen policy integration, coherence and coordination and assess their impacts on economy, social well-being and environment.

Actions should assess current governance approaches and organisational models in different river basins to optimise water governance and integrate it with other sectors, such as energy, agriculture, land use and urbanisation, and to overcome fragmentation in public policy formulation and decision-making. They should also aim to understand how different operational governance contexts at various levels, influence the effective realisation of sustainable water management in practice and explore the interaction among governance approaches at different spatial and temporal scales with a view to understanding potential conflicts and strengthening synergies.

Research should also address ways to value water and develop appropriate tariffs and pricing policies to ensure both access to water and sufficient funds for systematic renewal of water service infrastructure, as well as ecosystems restoration.

Innovative mechanisms should be developed to promote stakeholder engagement and involvement of public participation in defining and developing methods for collaborative approaches, as well as to promote social innovation, effective communication platforms,

encourage exchange of know-how, expertise, eliminate frustration, minimize risks of distortion, and increase citizens' responsibility.

The role of appropriate economic policy instruments, financing and business models (investments, risk management, water pricing, cost-benefits...) in governance towards ensuring long term financial sustainability and increasing investments in the water sector, should be also assessed.

Actions to effectively implement appropriate governance approaches in practice, taking into consideration research insights, and to support the implementation of relevant governance indicators, such as, those developed by OECD, including the assessment of their performance, should be also supported.

In general, the participation of academia, research organisations, utilities, industry and regulators is strongly advised, as well as civil society engagement whenever necessary, also aiming to broaden the dissemination and exploitation routes and to better assess the innovation potential of developed solutions and strategies.

Digital and data technologies as key enablers

Proposals are invited against the following topic(s):

HORIZON-CL6-2022-GOVERNANCE-02-02-two-stage: Potential of drones as multi-purpose vehicle – risks and added values

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 12.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the Farm to Fork Strategy and the Headline ambitions of a Digital Age and Economy that works for all, the successful proposals will support the effective and efficient deployment of drones, including in the field of environmental monitoring. They will therefore contribute a) to the enhancement of the sustainability performance and competitiveness in agriculture, forestry and rural areas through further deployment of digital and data technologies as key enablers, and b) to the development of innovative governance models enabling sustainability and resilience, notably to achieve better informed decision-making processes through research and innovation in the field of drones.

Projects results are expected to contribute to all of the following expected outcomes:

- Strengthened capacities for sustainable smart farming, forestry and rural communities through exploiting the potential of drones and other remotely piloted aircraft systems.
- Strengthened the capacities for plant, plant-health, livestock, livestock-health, and agri-environmental monitoring (including tree health) through the use of drones and other remotely piloted aircraft systems.
- Reduced risk of the use of drones and other remotely piloted aircraft systems.

Scope: The increased use of drones for sectoral and societal purposes can be observed in the EU. Also in the field of agricultural production, drones are used in the EU, whereby to different extents across Member States because of environmental, socio-economic and also regulatory framing conditions. While the use of drones can bring advantages to agricultural production, e.g. to collect data on crop conditions, it also goes along with risks emanating from the use of the unmanned vehicle itself, or the activity it is carrying out. For several reasons, e.g. a lack of cost-effectiveness, the potential of drones is not fully exploited by the agricultural sector in the EU. When exploring the opportunities to increase the use of drones, the consideration of aspects related to the safe use and the interests of the society at large, which might be negatively affected by the use of drones, is of outermost importance. To the same time, drones can also deliver services of common interests, which have the potential to be well linked to the agricultural use of drones, for instance, the collection of environmental information in agricultural landscapes, such as about landscape features, water quality or soil quality in and around utilised agricultural area. Exploring possibilities to use as multi-purpose vehicle in rural areas, e.g. for reasons of cost-effectiveness is of interest.

Proposals should cover all of the following aspects:

- Stock-taking of innovation in the use of drones as multi-purpose vehicle in agricultural production, forestry and the development of rural communities globally, the advantage and disadvantages of different approaches, and perform comparative analyses with the situation of the use of drones in the EU.
- Development of innovative approaches to use drones and other remotely piloted aircraft systems as multi-purpose vehicle in agriculture, e.g. for production assessment, cover-crop seeding, pest and disease detection, harvesting planning as well as innovative approaches to use drones as multi-purpose vehicle linking agricultural and wider environmental observation interests (including the assessment of landscape features, forests, water quality, and soil carbon) and for rural services.
- Assessment of the potential of the use of drones and other remotely piloted aircraft systems in the agricultural sector and socio-economic and environmental effects under consideration of different regulatory scenarios.

- Development of business models to the use of drones and other remotely piloted aircraft systems in agriculture, which may include agriculture-/forestry-/ community development interlinkages.
- Development of innovative approaches to assess and reduce the risks related to the use of drones in the agricultural sector, especially in the context of spraying.

Projects are expected to take into consideration the results of other related Horizon 2020/ Europe projects, such as AW-Drones⁵⁶⁸ and ROMI⁵⁶⁹, as well as of other relevant projects and initiatives.

Proposals may involve financial support to third parties e.g. to academic researchers, hi-tech startups, SMEs, rural communities and other multidisciplinary actors, to, for instance, develop, test or validate developed assessment approaches or collect or prepare data sets or provide other contributions to achieve the project objectives. A maximum of € 60 000 per third party might be granted. Conditions for third parties support are set out in Part B of the General Annexes. Consortia need to define the selection process of organisations, for which financial support will be granted. Maximum 20% of the EU funding can be allocated to this purpose. The financial support to third parties can only be provided in the form of grants.

HORIZON-CL6-2022-GOVERNANCE-02-03-two-stage: Assessing the impacts of digital technologies in agriculture – Cost, benefits, and potential for sustainability gains

Specific conditions	
<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of around EUR 7.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 15.00 million.
<i>Type of Action</i>	Research and Innovation Actions

Expected Outcome: In line with the Farm to Fork Strategy and the Headline ambitions of a Digital Age and Economy that works for all, the successful proposals will support the development of capacities for assessing and demonstrating environmental and socio-economic effects of digital technologies in agriculture. They will therefore contribute to the enhancement of the sustainability performance and competitiveness in agriculture through further deployment of digital and data technologies as key enablers through research and innovation in the field of the assessment of impacts of digital technologies in agriculture.

Projects results are expected to contribute to all of the following expected outcomes:

⁵⁶⁸ Funded under Horizon2020 call MG-2-3-2018.
⁵⁶⁹ Funded under Horizon2020 call SFS-05-2017.

- Awareness and informed decisions based on the demonstration of the costs and benefits of the use of digital technologies for the agricultural sector.
- Facilitated uptake of digital technologies by farmers, including through decision-making support and the analysis of farmers' motivations.
- Strengthen the capacities of farmers' advisors in the field of digital technologies.
- Strengthening the capacities to design, implement, monitor and evaluate policy measures in the fields of agriculture, environment and climate, as basis for better tailored, more effective and efficient policy measures in the fields of digitalisation in agriculture, and sustainability.

Scope: Digital technologies in agriculture and their potential to increase farms' economic and sustainability performance, facilitate work and enhance working conditions has received huge attention in the political sphere in recent years. - Agriculture has to play a key role in achieving environmental and climate ambitions in the EU, and digital technologies offer opportunities to increase the sustainability performance of the agricultural sector. However, there is still a huge "gap" between the portfolio of digital technologies offer at the market and the actual uptake and use by farmers in the EU. Moreover, while the potential of digital technologies to better tailor agricultural production is widely acknowledged, there is little knowledge about the actual reduction of negative environmental and climate effects due to their application.

Studies show that among key uptake barriers hindering the farmers to make use of digital technologies are a) a lack of knowledge about those tools in general, as well as their costs and benefits, b) a lack of overview of the strengths and weaknesses of certain tools in the huge portfolio offered on markets and the suitability to address farm-specific needs, and a lack of believe in the added value of digital technologies for the management of a farm. An additional barrier to the uptake of digital technologies by farmers presents the effort needed to become familiar with new tools. For many farmers the real demonstration of effects as well as "hard figures" of production effects are important to be convinced to apply a certain method/ technology, but also cultural aspects play a role in the perception of digital technologies.

The effectiveness of digital technologies as it regards sustainability gains between laboratory conditions and the environmental and socio-economic reality vary.

Independent assessments⁵⁷⁰ of the effects of the use of the range of digital technologies tools under ideal and real-life conditions are essential for policy development, monitoring and evaluation. – For many environmental parameters, the final impacts of farming can only be assessed with a huge time lag/ delay or are hardly measurable at all. The more important it is, to have figures, which impacts certain farming practices may have.

570

In addition, policy-makers and administrations are challenged by estimating rates for supporting the use of digital technologies in agriculture as well as the effects of employment structures in rural areas.

Against this background, independent quantitative and qualitative assessments of the multiple costs and benefits and potential sustainability gains of digital technologies are essential. It is also important to make those assessment results of possible effects of digital technologies feasible, assessable and usable, particularly for farmers, their advisors, and policy-makers, as it may form a stepping stone to facilitate the uptake of digital technologies in the sector and will facilitate the design of tailored policy measures.

Proposals should cover all of the following aspects:

- Demonstration of the costs and benefits for farmers/farms of the use of digital technologies for individual production steps (e.g. in per ha calculations and livestock surveillance) as well as for following a “whole-farm approach” which is applied, e.g. in the use of some Farm Management Systems under real testing conditions and with quantitative and qualitative assessments.
- Representativeness of analyses and developed assessment approaches for the EU and several types of farms and farmers under consideration of different business models, e.g. cooperative purchase of equipment, use of contractor services etc.
- Stock-taking of results of former or still ongoing Horizon2020 projects falling directly or indirectly under the scope of this theme, e.g. Smart-AKIS⁵⁷¹, to capitalise those findings and draw lessons learnt.
- Provision of innovative decision-making support on the selection and use of digital technologies.
- Generation of information and knowledge for the design of policy measures.
- Recommendations, under which conditions/ in which way digital technologies deliver best results for a farmer and on business models for financing/ for financing their use.
- Generation of innovative tools making the results of the projects easily accessible and usable for the different target groups (at least farmers and advisors), e.g. cost calculators.
- Facilitated qualitative and quantitative assessment of the (positive and negative) environmental effects (e.g. reduction of inputs/ emissions) of the use of digital technologies in agriculture.

Projects are expected to foster the development of capacities for assessing the contribution of agriculture to sustainability ambitions through the development of assessment approaches, analyses, and knowledge generation on the impacts – the costs, benefits and potential

⁵⁷¹ The Thematic network Smart-AKIS was funded under call Horizon2020 ISIB-02-2015, see <https://cordis.europa.eu/project/id/696294>.

sustainability gains and losses - through the application of digital technologies. Projects are expected to make a significant contribution to establish a basis for the development, implementation and evaluation of sustainability-related policies at regional, national and EU level and reaching related objectives, including Green Deal ambitions, CAP, the White Paper on Artificial Intelligence, and Sustainable Finance.

Proposals should cover all of the following aspects:

- Testing of digital technologies in agriculture under real production conditions.
- Consideration of farmers' / producers' / contractors' behaviour.
- Representativeness of analyses and developed assessment approaches for the EU and associated countries for several types of farms and farmers.
- Links to relevant EU policy monitoring and evaluations and statistical systems.
- Exploration of the potential of digital technologies use in agriculture as means for independent monitoring.
- Recommendations under which conditions/ in which way digital technologies deliver best sustainability performance

Tools developed within the project(s) are to be linkable to Agricultural Knowledge and Innovation Systems in Member States.

A multi-actor approach⁵⁷² is to be followed, involving at least scientists and representatives of the agricultural sector. They are encouraged to envisage collaboration with Digital Innovation Hubs⁵⁷³ supported under the Digital Europe Programme is regarded as beneficial for the overall results of the projects.

If involving machinery companies, selected projects have to build their work on digital technologies and machinery from at least three companies and brands.

The Joint Research Centre (JRC) may participate as member of the consortium but is not eligible for funding.”

⁵⁷² See definition of the multi-actor approach in the introduction to this Work Programme part.

⁵⁷³ For more information on Digital Innovation Hubs, please see <https://ec.europa.eu/digital-single-market/en/digital-innovation-hubs>.

Other actions not subject to calls for proposals

Grant to identified beneficiary according to Financial Regulation Article 195(e)

1. Dedicated support for the IPBES secretariat

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is a science-policy interface on biodiversity and ecosystem services that aims to build capacity for and strengthen the use of science in policymaking. The Commission will pay a contribution on behalf of the EU to the IPBES secretariat with the aim of supporting the IPBES mechanism to further develop work on capacity and knowledge foundations, to communicate and evaluate the Platform's activities, deliverables and findings, including policy tools, and to synthesize, review, assess and critically evaluate relevant information and knowledge on biodiversity and ecosystem services, generated by governments, academia, scientific organizations, nongovernmental organizations and indigenous and local communities from the EU and worldwide. This action must start in 2022 to guarantee the EU's continuous support to the IPBES secretariat.

Legal entities:

IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) secretariat, UN Campus, Platz der Vereinten Nationen 1, D-53113 Bonn, Germany

Form of Funding: Grants not subject to calls for proposals

Type of Action: Grant to identified beneficiary according to Financial Regulation Article 195 - Coordination and support action

Indicative timetable: First Quarter 2022

Indicative budget: EUR 5.00 million from the 2022 budget (Dedicated support for the IPBES secretariat)

Indirect Management

1. Circular City Centre (C3)

Cities have great potential to be cradles and catalysts for circular developments which can address many of the linear problems in EU cities today, and make cities more regenerative, resilient, clean and liveable. However, many cities are finding substantial barriers to advance in their transition to a circular economy. A recently published OECD report on the circular economy in cities and regions⁵⁷⁴ noted amongst other that “a vast majority of the 51 surveyed cities and regions reported challenges related to insufficient funding (73%), as well as financial risks (69%), lack of critical scale for business and investments (59%), and lack of private sector engagement (43%)”.

⁵⁷⁴ <https://www.oecd-ilibrary.org/sites/10ac6ae4-en/index.html?itemId=/content/publication/10ac6ae4-en>

The Urban Agenda Partnership on the Circular Economy came to similar findings. In its Circular Economy Final Action Plan⁵⁷⁵, in the section on Better Funding, it noted that “the lack of available funding, including for project preparation and investment, as an important barrier for the circular economy transition in cities”.

The InnovFin Advisory study on Access-to-finance conditions for projects supporting Circular Economy⁵⁷⁶ highlighted the need for circular economy investment advisory service destined to support circular economy projects with respect to access to finance and technical, circular economy focused project preparation.

The objective of this action is to fund the Circular Economy Technical Assistance Facility (CETAF) to be deployed through the European Investment Bank (EIB) advisory services under the InvestEU Advisory Hub, aimed at supporting investment projects and programmes substantially contributing to the circular economy transition in cities and regions across Europe. The CETAF, which shall follow the example of the ELENA (European Local ENergy Assistance) facility in the energy efficiency and renewable energy sectors, will provide technical assistance (TA) grants for the preparation and development of projects in key sectors for the circular economy at local and regional level. More specifically, CETAF will focus on innovative activities and projects in key sectors that use the most resources and/or generate most waste and where the potential for circularity is high, as outlined in the new Circular Economy Action Plan⁵⁷⁷. Eligible activities and projects shall include the piloting, scale up and commercialization of innovative circular technologies, products, materials and business models. Conversely, activities and projects in sectors with no or only minor impact on the circular economy transition in cities and regions as well as activities and projects focussing exclusively or mainly on energy efficiency, renewable energy generation (fuels, heat or power) or energy recovery from waste are not in the scope of the action.

The CETAF is expected to catalyse investment in circular economy projects and programmes in cities and regions. The expected outcome of this action is technically and economically viable as well as bankable investment projects and programmes with a minimum total investment volume of EUR 20 million.⁵⁷⁸ A minimum ratio/leverage factor between the total investment amount and the amount of the TA grant shall be defined as well as a minimum own contribution from project promoters to the overall cost of project preparation and development. Eligible recipients of TA grants are both public and private entities.

The facility will cooperate closely with and act in complementarity to the Circular Cities and Regions Initiative (CCRI)⁵⁷⁹ and the related projects⁵⁸⁰ and to the parallel action proposed for the Circular City Centre (C3), also implemented by the EIB advisory services, by supporting

⁵⁷⁵ https://ec.europa.eu/futurium/en/system/files/ged/ua_ce_final_action_plan_part_i.pdf (section 2.3.1)

⁵⁷⁶ https://www.eib.org/attachments/pj/access_to_finance_study_on_circular_economy_en.pdf

⁵⁷⁷ <https://ec.europa.eu/environment/circular-economy/>

⁵⁷⁸ The Circular Cities and Regions Initiative Project Development Assistance (CCRI-PDA) will focus on small and medium-sized circular economy investments of up to 20 million.

⁵⁷⁹ <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

⁵⁸⁰ Including the HORIZON-CL6-CIR-2021-00-00: Circular Cities and Regions Initiative’s Project Development Assistance (CCRI-PDA) and the HORIZON-CL6-CIR-2021-00-00 – Circular Cities and Regions Initiative (CCRI)’s circular systemic solutions.

project promoters to bridge the gap between their circular economy strategies/plans and concrete investment programmes and projects. In particular, the cooperation with the CCRI will be based *inter alia* on the exchange of information, knowledge and experiences on the implementation of the CETAF and CCRI activities and on the participation of CETAF representatives in CCRI events, and vice-versa.

The EIB has long-time experience in providing financing and technical assistance for sustainable urban and regional investment projects and programmes with both climate and circular economy relevance. Related TA mandates successfully implemented by the EIB include the EU funded URBIS⁵⁸¹, ELENA and JASPERS⁵⁸² facilities. The EIB has also been a driving force in different platforms dedicated to the promotion of the CE, with particular focus on cities. As an example, the EIB, with support from the European Investment Advisory Hub, took a lead role in the design, preparation and implementation of the Circular City Funding Guide⁵⁸³.

Given the increased policy focus on scaling and speeding up the circular transition in the EU, and the important role of cities and regions will have in such a transition, the EIB is in a good position to provide a significant contribution through technical assistance in this field. The CETAF would enable the EIB to further support EU policy priorities such as the European Green Deal⁵⁸⁴, the new EU Circular Economy Action Plan⁵⁸⁵ and the EU Bioeconomy Strategy⁵⁸⁶ by supporting concrete investments in circular economy solutions at local and regional scale.

The indicative start of the action is Q2 2021 following the conclusion of an advisory agreement with the EIB Group for the implementation of the Invest EU Advisory Hub. The envisaged horizon for use of the funds under this action is 2027.

Legal entities:

European Investment Bank, 98-100, Boulevard K. Adenauer, L-2950 Luxembourg, Grand Duchy of Luxembourg

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative timetable: 2nd quarter 2021

Indicative budget: EUR 5.00 million from the 2021 budget (European Investment Bank (EIB) Circular City Centre (C3))

581 <https://eiah.eib.org/about/initiative-urbis.htm>

582 <https://jaspers.eib.org/>

583 <https://www.circularcityfundingguide.eu/>

584 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

585 <https://ec.europa.eu/environment/circular-economy/>

586 <https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy&lib=strategy>

2. Circular Economy Technical Assistance Facility (CETAF) for local and regional circular economy investments

Cities have great potential to be cradles and catalysts for circular developments which can address many of the linear problems in EU cities today, and make cities more regenerative, resilient, clean and liveable. However, many cities are finding substantial barriers to advance in their transition to a circular economy. A recently published OECD report on the circular economy in cities and regions⁵⁸⁷ noted amongst other that “a vast majority of the 51 surveyed cities and regions reported challenges related to insufficient funding (73%), as well as financial risks (69%), lack of critical scale for business and investments (59%), and lack of private sector engagement (43%)”.

The Urban Agenda Partnership on the Circular Economy came to similar findings. In its Circular Economy Final Action Plan⁵⁸⁸, in the section on Better Funding, it noted that “the lack of available funding, including for project preparation and investment, as an important barrier for the circular economy transition in cities”.

The InnovFin Advisory study on Access-to-finance conditions for projects supporting Circular Economy⁵⁸⁹ highlighted the need for circular economy investment advisory service destined to support circular economy projects with respect to access to finance and technical, circular economy focused project preparation.

The objective of this action is to fund the Circular Economy Technical Assistance Facility (CETAF) to be deployed through the European Investment Bank (EIB) advisory services under the InvestEU Advisory Hub, aimed at supporting investment projects and programmes substantially contributing to the circular economy transition in cities and regions across Europe. The CETAF, which shall follow the example of the ELENA (European Local ENergy Assistance) facility in the energy efficiency and renewable energy sectors, will provide technical assistance (TA) grants for the preparation and development of projects in key sectors for the circular economy at local and regional level. More specifically, CETAF will focus on innovative activities and projects in key sectors that use the most resources and/or generate most waste and where the potential for circularity is high, as outlined in the new Circular Economy Action Plan⁵⁹⁰. Eligible activities and projects shall include the piloting, scale up and commercialization of innovative circular technologies, products, materials and business models. Conversely, activities and projects in sectors with no or only minor impact on the circular economy transition in cities and regions as well as activities and projects focussing exclusively or mainly on energy efficiency, renewable energy generation (fuels, heat or power) or energy recovery from waste are not in the scope of the action.

The CETAF is expected to catalyse investment in circular economy projects and programmes in cities and regions. The expected outcome of this action is technically and economically viable as well as bankable investment projects and programmes with a minimum total

⁵⁸⁷ <https://www.oecd-ilibrary.org/sites/10ac6ae4-en/index.html?itemId=/content/publication/10ac6ae4-en>

⁵⁸⁸ https://ec.europa.eu/futurium/en/system/files/ged/ua_ce_final_action_plan_part_i.pdf (section 2.3.1)

⁵⁸⁹ https://www.eib.org/attachments/pj/access_to_finance_study_on_circular_economy_en.pdf

⁵⁹⁰ <https://ec.europa.eu/environment/circular-economy/>

investment volume of EUR 20 million.⁵⁹¹ A minimum ratio/leverage factor between the total investment amount and the amount of the TA grant shall be defined as well as a minimum own contribution from project promoters to the overall cost of project preparation and development. Eligible recipients of TA grants are both public and private entities.

The facility will cooperate closely with and act in complementarity to the Circular Cities and Regions Initiative (CCRI)⁵⁹² and the related projects⁵⁹³ and to the parallel action proposed for the Circular City Centre (C3), also implemented by the EIB advisory services, by supporting project promoters to bridge the gap between their circular economy strategies/plans and concrete investment programmes and projects. In particular, the cooperation with the CCRI will be based *inter alia* on the exchange of information, knowledge and experiences on the implementation of the CETAF and CCRI activities and on the participation of CETAF representatives in CCRI events, and vice-versa.

The EIB has long-time experience in providing financing and technical assistance for sustainable urban and regional investment projects and programmes with both climate and circular economy relevance. Related TA mandates successfully implemented by the EIB include the EU funded URBIS⁵⁹⁴, ELENA and JASPERS⁵⁹⁵ facilities. The EIB has also been a driving force in different platforms dedicated to the promotion of the CE, with particular focus on cities. As an example, the EIB, with support from the European Investment Advisory Hub, took a lead role in the design, preparation and implementation of the Circular City Funding Guide⁵⁹⁶.

Given the increased policy focus on scaling and speeding up the circular transition in the EU, and the important role of cities and regions will have in such a transition, the EIB is in a good position to provide a significant contribution through technical assistance in this field. The CETAF would enable the EIB to further support EU policy priorities such as the European Green Deal⁵⁹⁷, the new EU Circular Economy Action Plan⁵⁹⁸ and the EU Bioeconomy Strategy⁵⁹⁹ by supporting concrete investments in circular economy solutions at local and regional scale.

The indicative start of the action is Q2 2021 following the conclusion of an advisory agreement with the EIB Group for the implementation of the Invest EU Advisory Hub. The envisaged horizon for use of the funds under this action is 2027.

Legal entities:

⁵⁹¹ The Circular Cities and Regions Initiative Project Development Assistance (CCRI-PDA) will focus on small and medium-sized circular economy investments of up to 20 million.

⁵⁹² <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

⁵⁹³ Including the HORIZON-CL6-CIR-2021-00-00: Circular Cities and Regions Initiative's Project Development Assistance (CCRI-PDA) and the HORIZON-CL6-CIR-2021-00-00 – Circular Cities and Regions Initiative (CCRI)'s circular systemic solutions.

⁵⁹⁴ <https://eiah.eib.org/about/initiative-urbis.htm>

⁵⁹⁵ <https://jaspers.eib.org/>

⁵⁹⁶ <https://www.circularcityfundingguide.eu/>

⁵⁹⁷ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁵⁹⁸ <https://ec.europa.eu/environment/circular-economy/>

⁵⁹⁹ <https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy&lib=strategy>

European Investment Bank, 98-100, Boulevard K. Adenauer, L-2950 Luxembourg, Grand Duchy of Luxembourg

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative timetable: 2nd quarter 2021

Indicative budget: EUR 10.00 million from the 2021 budget

3. Organisation for Economic Co-operation and Development (OECD)’s ‘Programme on the Circular Economy in Cities and Regions’

The Programme will cooperate closely with and contribute to the implementation of the Circular Cities and Regions Initiative (CCRI)⁶⁰⁰ by providing cities and regions with circular economy diagnostic and solutions, in particular on the governance of the circular economy, which includes regulatory, capacity, information aspects, amongst others. The Programme will contribute to the identification of policy recommendations and targeted actions to implement circular economy initiatives at territorial level, promote multi-stakeholder dialogues and disseminate results and best practice. In particular, the cooperation with the CCRI will be based *inter alia* on the exchange of information, knowledge and experiences on the implementation of the Programme and CCRI activities, including the participation of the Programme’s representatives in CCRI events, and vice-versa.

The OECD Programme on the Circular Economy in Cities and Regions⁶⁰¹ supports cities and regions in their transition towards a circular economy, through:

- Learning: engaging in multi-stakeholder policy dialogues with cities and regions to identify challenges and opportunities, providing socio-economic and environmental analysis and tailored policy recommendations. To date, a number of policy dialogues have been carried out, such as in Glasgow (United Kingdom), Granada (Spain), Groningen (Netherlands), Umeå (Sweden), Valladolid (Spain) and Ireland, including more than 300 stakeholders.
- Sharing: favouring peer-to-peer learning, best practice and lessons from circular economy experiences within and outside Europe. A global coalition of more than 100 cities and regions are engaged in the overall dynamics of the Programme, including by contributing to the OECD Roundtable on the Circular Economy in Cities and Regions, a networking platform to favour experience exchanges across stakeholders, and to Webinars on the Circular Economy in Cities and Regions. Moreover, a new Report on the Circular Economy in Cities and regions collects practices, challenges and solutions across 51 cities and regions from OECD countries.

⁶⁰⁰ <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

⁶⁰¹ <http://www.oecd.org/regional/>

- **Measuring:** providing a self-assessment measurement framework for decision making and evaluation of circular economy strategies.⁶⁰² The Programme developed a Checklist for Action to support the implementation of the policy recommendations, with more specific guidance and milestones and a Scoreboard on the Governance of the Circular Economy for governments to self-assess existing enabling conditions for a circular economy, identify challenges and set priorities towards a more effective, efficient and just circular-economy transition.

This action would enable the OECD to support through fundamental services for circular economy policies at the local and regional scale EU policy priorities such as the European Green Deal⁶⁰³, the new EU Circular Economy Action Plan⁶⁰⁴ and the EU Bioeconomy Strategy⁶⁰⁵.

Legal entities:

Organisation for Economic Co-operation and Development (OECD), 2, rue André Pascal, 75016 Paris, France

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative budget: EUR 1.00 million from the 2021 budget

Public Procurements

1. Indicators and methods for measuring the transition to climate-neutral circularity, its benefits, challenges and trade-offs

Objective

A commonly accepted and sufficiently inclusive definition of circularity and measurement methods can support the transition to a more circular economy in multiple ways. Among other things, it can facilitate the development and access to finance, credit risk assessment, and the transferability and replicability of projects and investments across regions and jurisdictions. The introduction of robust indicator frameworks that quantify progress towards circularity is however challenging, with countries and businesses showing widely different approaches and degrees of advancement. The practice of measuring, assessing and taking informed decisions based on the climate, environmental and social impacts of business activities, products and services is not yet widespread and well-established. Methods are gradually emerging. The Commission developed the Product and Organisation Environmental Footprint method, allowing to calculate environmental impacts, including greenhouse gas emissions, throughout the value chain. Harmonized European standards for life cycle assessments can provide the

⁶⁰² <https://www.oecd.org/regional/cities/circular-economy-cities.htm>

⁶⁰³ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁶⁰⁴ <https://ec.europa.eu/environment/circular-economy/>

⁶⁰⁵ <https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy&lib=strategy>

basis for environmental product declarations (EPD), and national LCA-databases (e.g. Ökobaudat) and evaluation systems (e.g. BNB) exist in some Member States. A common method can visualise the advantages and trade-offs of a circular economy and provide knowledge needed to understand the opportunities a circular economy gives compared to a linear economy. It can provide the tools to manage response actions and mitigating measures.

Projects shall enhance the knowledge base for policy makers to design, implement and monitor policies and instruments for transition to a circular economy. This enhancement should focus on the following elements:

- Definitions, scope and taxonomy of circular economy, criteria and benchmarks for defining the level and progression towards circularity reflecting current and future technology developments, taking into account the work on sustainable finance and taxonomy;
- Assessment of the potential and impacts of circular economy transition on climate mitigation (e.g. greenhouse gas emissions reduction), zero pollution and ecosystem protection as well as competitiveness, job creation and raw material security objectives. This includes analysis of material and consumption flows broken down to sector level for sectors with the highest material flows and impacts. Modelling of different scenarios of transition should be done. The assessments should in first instance focus on the key product value chains mentioned in the Circular Economy Action Plan 2020, i.e. electronics including ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, and food, water and nutrients. This work should take into account existing⁶⁰⁶ and ongoing work within the European Commission and the EEA;
- Further development of indicators and methods at product, service and organisation level for measuring resource use, including consumption and material footprints and risks (including a weighting by their life-cycle environmental footprint) to account for optimisation of material consumption and environmental impacts associated with production and consumption patterns;
- Assessment of capital flows and investment needs in the circular economy and analysis of barriers and risks that prevent circular economy financing;
- Assessment of regulatory barriers at regional, national and EU level, and of policy measures to overcome them;
- Policy tools including incentives and their applicability at different governance levels to trigger and foster effective transition processes.

All elements will be analysed at EU, national and regional level. Ongoing work within the European Commission, and ESTAT on updating the Circular Economy Monitoring Framework, including consumption and material footprints (including a weighting by their

⁶⁰⁶ Cf. Monitoring Framework of indicators for the circular economy; <https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework>.

life-cycle environmental footprint), as well as relevant existing international and European standards, should be taken into account. The ultimate outcome is knowledge and a toolbox that will subsequently enable decision-makers in public institutions and businesses to formulate targets and measure progress, set up institutions and policies necessary for transition processes at different scales. The projects' consortia may consider links with related activities including the EU Bioeconomy Monitoring System and/or contribute to the European Commission's Knowledge Centre for Bioeconomy hosted by JRC. Projects are also strongly encouraged to organise joint activities, ensure synergies and undertake clustering activities with projects under C5-D1-CSR-04-2021, "Modelling the role of the circular economy for climate change mitigation" and relevant H2020 projects, in particular under CE-SC5-25-2020, "Understanding the transition to circular economy and its implications on the environment, economy and society".

Expected results

- Robust indicators and methods for measuring transition to climate-neutral circularity, its benefits, challenges and trade-offs, including definitions, criteria and benchmarks for assessing the progress towards circularity, consistent with existing or currently developed standards in this field
- An enhanced knowledge base and toolbox for policy makers, enabling them to design and compare, implement and monitor policies and instruments for a circular transition
- Systemic insight into the opportunities, challenges and risks, and instruments of circularity
- Facilitated implementation of the EU taxonomy for sustainable finance

Form of Funding: Procurements

Type of Action: Public procurement

Indicative timetable: 3rd quarter of 2021

Indicative budget: EUR 1.00 million from the 2021 budget

2. Circular value chain analysis focusing on intra- and inter-value chain collaboration

Objective

Businesses are often reluctant to engage in collaborative partnerships and to share business-related information with others, which would be necessary in order to develop circular economy business models and projects. This is due to real and perceived risks of exposing sensitive business information as well as inadequate knowledge about circular economy opportunities, and the lack of capacity to identify and implement specific actions, and to limited incentives for cooperation within existing linear value chains. Understanding the risks of information sharing and complexity of international value chains is important when developing policies for a resource efficient and circular economy. In addition to the positive

impacts on knowledge creation, setting up collaborative partnerships and networks to prepare innovative circular economy initiatives can align business interests and improve the definition of roles and responsibilities between the various partners.

Digital technologies can track the journeys of products, components and materials and make the resulting data securely accessible to authorised actors. The European data space for smart circular applications will provide the architecture and governance system to drive applications and services such as product passports, resource mapping and consumer information. As part of the governance of the sectoral actions, the Commission will cooperate closely with stakeholders in key value chains to identify barriers to the expansion of markets for circular products, and ways to address those barriers. In synergy with the objectives laid out in the Industrial Strategy, the Commission will enable greater circularity in industry by promoting the use of digital technologies for tracking, tracing and mapping of resources; promoting the uptake of green technologies through a system of solid verification by registering the EU Environmental Technology Verification scheme as an EU certification mark. The new SME Strategy will foster circular industrial collaboration among SMEs, building on training, advice under the Enterprise Europe Network on cluster collaboration, and on knowledge transfer via the European Resource Efficiency Knowledge Centre.

Projects should analyse existing and potential circular value chains to identify patterns in intra-value chain and inter-value chains interactions and collaboration between all relevant actors and mapping material flows. The projects are expected to describe and categorise these interactions and collaborations, and provide insight into the opportunities and challenges as well as conditions of success. The role of trust between different actors, the importance of a sufficient level of knowledge and data sharing, the role of digital technologies and the importance of incentives on regional, national, European and/or global level are key topics that should be addressed. Results need to be included in existing Commission knowledge bases such as the EC JRC RMIS. Circular economy requires transparency about associated materials and financial flows of the product and its components during their entire life cycles. Projects should also help improve the methodology for the analysis of circular value chains, and develop advanced instruments for this purpose, focusing on intra- and inter-value chain collaboration and including the mapping of material flows. Recommendations for policy makers to design, implement and monitor policies and instruments for a circular transition should be presented in the form of a toolbox.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

Expected results

- Setup of collaborative partnerships and networks to develop innovative circular economy solutions
- An enhanced knowledge base for policy makers to design, implement and monitor policies and instruments for a circular transition, with a particular focus on trust-building and the role of advanced digital technologies in responsible data management

- Systemic insight into the opportunities, challenges and instruments of circularity regarding all elements of intra and inter-business value chains
- Identification and analysis of instruments to trigger changes in the behaviour of economic operators
- Development of advanced instruments for the analysis of circular value chains, focusing on intra- and inter-value chain collaboration and including the mapping of material flows

Form of Funding: Procurements

Type of Action: Public procurement

Indicative timetable: 2nd quarter of 2022

Indicative budget: EUR 1.00 million from the 2022 budget

3. Development of life-cycle information

Objective

Life-cycle assessment is a key element of the evaluation of the environmental performance of products and production processes. If properly applied it is a powerful decision-making tool for economic operators and policy makers. Wide application of this tool is prevented by the lack of scientifically robust life-cycle data, especially in the sectors where technologies, materials, production processes, value chains and business models evolve fast, often driven by EU policies. Several recent EU policy initiatives emphasise the need for a life-cycle approach in managing the environmental performance of products, technologies and companies.

The objective of this public procurement is to develop scientifically robust life-cycle data for the rapidly innovating sectors of bioeconomy, renewable energy and construction. These data will be publicly available for application by economic actors and policy makers, and underpin relevant policies at EU, national and regional level.

Expected results

The contractor is expected to develop aggregated and disaggregated life cycle datasets and to provide additional support to the users in the form of a helpdesk and dedicated online training activities. The development of the datasets shall include methodological adaptations of existing datasets and creation of new datasets for sectors and value chains currently not available in existing LCA databases. The resulting datasets shall be fully compliant with the latest version of the guide for Environmental Footprint compliant datasets⁶⁰⁷. The possibility of developing different versions of some datasets in order to comply with sector-specific needs shall also be taken into account. The level of granularity of datasets is set at national and sectoral level as a default with the possibility to deviate if justified on the basis of the analysis of variance of life cycle impacts. The contractor shall keep data updated for the

⁶⁰⁷ Available at : <https://ec.europa.eu/jrc/en/publication/guide-ef-compliant-data-sets>

duration of contract. Data shall be made publicly available through the European Platform for LCA⁶⁰⁸.

The expected impact of this public procurement action is that LCA will become easier to apply and affordable for all potential users. Consequently, it will be applied more frequently in industrial and policy setup. Life-cycle information on materials, products and technologies will spread along value chains in business-to-business and business-to-consumer interactions. New policy initiatives will use LCA, and specifically the PEF and OEF, to set environmental performance benchmarks and standards. The broad application of PEF/OEF in policies and decision-making will lead to improved environmental management and reduced environmental impacts, and a new competitive edge to EU companies and industries on the global market.

Form of Funding: Procurements

Type of Action: Public procurement

Indicative timetable: 4th quarter of 2021

Indicative budget: EUR 5.00 million from the 2021 budget

4. Support the transition towards circular economy at local and regional scale

The circular economy concept should be a central component in local and regional economies, which have a suitable scale for closing resources loops, creating sustainable circular ecosystems and designing participatory community-based innovation schemes. An increasing number of cities, regions, industries and businesses are engaged in testing and improving circularity in their territories, economic sectors, value chains and services. Nevertheless, the concrete implementation of systemic solutions for the territorial deployment of the circular economy still needs to be demonstrated and replicated in other areas. In particular, a major challenge is to apply effectively the circular economy concept in urban and regional policy areas beyond traditional resource recovery in waste and water sectors.

The Circular Cities and Regions Initiative (CCRI) is part of the European Circular Economy Action Plan and aims to support circular solutions for the transition towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale. The CCRI's activities aim to contribute to the implementation of the European Green Deal⁶⁰⁹, the Circular Economy Action Plan⁶¹⁰ and the Bioeconomy Strategy.⁶¹¹

The objective of this other action is to strengthen the coordination and support service for the implementation of the CCRI. It will also ensure the cooperation among the CCRI's projects covered under the Green Deal Call and Horizon Europe and relevant initiatives and stakeholders. This other action will complement the Horizon 2020 SC2 WP 2020 Other

⁶⁰⁸ <https://eplca.jrc.ec.europa.eu/>

⁶⁰⁹ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁶¹⁰ https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

⁶¹¹ <https://ec.europa.eu/research/environment/index.cfm?pg=circular>

Action 2 and the 2020 Green Deal Call Other Action 7, being all used to implement the activities of the coordination and support service for the implementation of the CCRI via the framework contract established under Horizon 2020 SC2 WP 2020 Other Action 2.

Form of Funding: Procurements

Type of Action: Public procurement

Indicative budget: EUR 2.50 million from the 2021 budget

5. Strategic analysis and support for enhanced research cooperation in agriculture and food systems

A public procurement (tender procedure) analysing the feasibility, options and opportunities of research and innovation cooperation for European agriculture and food systems was launched in 2021. The action is support networking, the development and exchange of knowledge, mutual learning and mentoring, interaction and cooperation through facilitated working groups and workshops. The required service is in the area of policy and portfolio analysis and knowledge sharing, and support for strategic and collaborative working groups of member states as well as experts and stakeholders groups. It is delivered in the form of a service contract.

Form of Funding: Procurements

Type of Action: Public procurement

Indicative budget: EUR million from the 2022 budget

6. Studies, conferences, events and outreach activities

A number of specific contracts will be signed under existing framework contracts in order:

- (i) to support the dissemination and exploitation of project results;
- (ii) to contribute to the definition of future challenge priorities;
- (iii) to carry out specific evaluations of programme parts
- (iv) to organise conferences, events and outreach activities.

Should existing framework contracts prove unsuitable or insufficient to support the abovementioned activities, one or more calls for tender may be launched as appropriate. Subject matter of the contracts envisaged: studies, technical assistance, conferences, events and outreach activities.

Form of Funding: Procurements

Type of Action: Public procurement

Indicative budget: EUR 0.10 million from the 2021 budget and EUR 0.10 million from the 2022 budget

Subscription Actions

1. GEO subscription 2021-2022

An annual contribution to the 2021 and 2022 activities of the GEO Secretariat, as a subscription to a body of which they are a member, according to Article 180(3) of the Financial Regulation applicable to the general budget of the European Communities.

As a full member of GEO the Commission will pay a contribution on behalf of the EU to the GEO Trust Fund, which is the budgetary structure agreed by the GEO members to fund the GEO secretariat (hosted by the World Meteorological Organisation in Geneva, Switzerland), to ensure the implementation of the Global Earth Observation System of Systems (GEOSS) according to its annual work plan and the continuity of the leadership and participation of the EU in GEO.

This activity, directly aiming at supporting the development and implementation of an evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to the Executive Agencies and will be implemented by the Commission services.

Type of Action: Subscription action

Indicative budget: EUR 1.20 million from the 2021 budget and EUR 1.20 million from the 2022 budget

Scientific and technical services by the Joint Research Centre

1. Leveraging European data-sharing and exploitation practices within GEOSS (Global Earth Observation System of Systems)

The European Strategy for Data (COM(2020)66 final) and the upcoming ePrivacy Regulation and Data Act outline an ambitious agenda for the establishment of a single market for data in Europe. In compliance with this legal framework, it is proposed that the JRC, building on its experience on data handling, supports DG R&I in its contribution to GEO, the Group on Earth Observation helping to export the European good practices and ethical guidelines on data exchange and exploitation to the international Earth Observation community within GEO for a better leadership of Europe in the domain of EO data sharing and uptake. It will contribute as well to increase the European contribution to GEOSS via Destination Earth and the European Green Deal data space.

Building on a multitude of emerging technologies, data sources, standards, licenses and actors, multiple data ecosystems are already emerging in Europe. These new developments require coordination between those initiatives and in depth adaptations of GEOSS with a view to the delivery of Earth Observation (EO) services and products in the different GEO

Engagement priorities and in particular, the ones related to the Paris Agreement. The provision of such services should be coordinated between regional GEOs and in particular EuroGEO, the European contribution to GEO, and AOGEO, the Asia-Oceania regional GEO initiative.

The developments will take advantage of the European Open Science Cloud facility and other infrastructures, and of the most recent technological evolutions such as IoT, edge computing, data interoperability, data-sharing tools and enablers, architectures and governance mechanisms to sustain GEOSS in the long term, and coordination between the European Horizon 2020 projects such as e-shape, the various initiatives and flagships of the 2020-2022 GEO Work Programme and the European Space Agency (ESA) GEO portal enhancements.

This activity is directly aimed at supporting the development and implementation of an evidence base for R&I policies and supporting various groups of stakeholders, including via the European Commission Knowledge Centre on Earth Observation and the Destination Earth initiative. The improvement brought to the GEOSS infrastructure will contribute to leverage into GEOSS services, data of the Copernicus programme, and applications developed through Horizon 2020 EO projects such as e-shape, including through promoting the use of existing applications and in developing new ones in the area of climate services.

The administrative arrangement for technical and scientific services with the JRC will cover the cost of the technical coordination and support of the uptake of European data-sharing and exploitation solution within the GEOSS infrastructure. It will also cover the provision of expertise to the GEO governance for activities relevant to the evolution of GEOSS, including participation in the work of the different GEO governance bodies. The development and testing of Earth Observation information systems developed through Horizon 2020, such as the GEOSS infrastructure, fa

lls under the mandate of the JRC, which is to deliver Commission's in-house science services.

Indicative duration: 36 months

Form of Funding: Direct action grants

Type of Action: Direct action grant for scientific and technical services by the Joint Research Centre

Indicative budget: EUR 2.60 million from the 2021 budget

Expert contract actions

Budget⁶¹²

	Budget line(s)	2021 Budget (EUR million)	2022 Budget (EUR million)
Calls			
HORIZON-CL6-2021-BIODIV-01		218.50	20.00
	<i>from</i> <i>01.020260</i>	218.50	20.00
HORIZON-CL6-2022-BIODIV-01			90.00
	<i>from</i> <i>01.020260</i>		90.00
HORIZON-CL6-2022-BIODIV-02-two-stage			46.00
	<i>from</i> <i>01.020260</i>		46.00
HORIZON-CL6-2021-FARM2FORK-01		175.00	
	<i>from</i> <i>01.020260</i>	175.00	
HORIZON-CL6-2022-FARM2FORK-01			167.00
	<i>from</i> <i>01.020260</i>		167.00
HORIZON-CL6-2022-FARM2FORK-02-two-stage			62.00
	<i>from</i> <i>01.020260</i>		62.00
HORIZON-CL6-2021-CircBio-01		93.00	
	<i>from</i> <i>01.020260</i>	93.00	
HORIZON-CL6-2022-CircBio-01			66.00
	<i>from</i>		66.00

⁶¹² The budget figures given in this table are rounded to two decimal places.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

	01.020260		
HORIZON-CL6-2022-CircBio-02-two-stage			71.00
	from 01.020260		71.00
HORIZON-CL6-2021-ZEROPOLLUTION-01		65.00	
	from 01.020260	65.00	
HORIZON-CL6-2022-ZEROPOLLUTION-01			51.00
	from 01.020260		51.00
HORIZON-CL6-2021-CLIMATE-01		108.00	10.00
	from 01.020260	108.00	10.00
HORIZON-CL6-2022-CLIMATE-01			75.00
	from 01.020260		75.00
HORIZON-CL6-2021-COMMUNITIES-01		52.00	
	from 01.020260	52.00	
HORIZON-CL6-2022-COMMUNITIES-01			42.00
	from 01.020260		42.00
HORIZON-CL6-2022-COMMUNITIES-02-two-stage			33.00
	from 01.020260		33.00
HORIZON-CL6-2021-GOVERNANCE-01		183.50	
	from 01.020260	183.50	
HORIZON-CL6-2022-GOVERNANCE-01			133.00
	from 01.020260		133.00

Horizon Europe - Work Programme 2021-2022
Food, Bioeconomy Natural Resources, Agriculture and Environment

HORIZON-CL6-2022-GOVERNANCE-02-two-stage			37.00
	<i>from</i> <i>01.020260</i>		37.00
Other actions			
Grant to identified beneficiary according to Financial Regulation Article 195			5.00
	<i>from</i> <i>01.020260</i>		5.00
Indirectly managed action		16.00	
	<i>from</i> <i>01.020260</i>	16.00	
Public procurement		8.60	1.10
	<i>from</i> <i>01.020260</i>	8.60	1.10
Subscription action		1.20	1.20
	<i>from</i> <i>01.020260</i>	1.20	1.20
Direct action grant for scientific and technical services by the Joint Research Centre		2.60	
	<i>from</i> <i>01.020260</i>	2.60	
Estimated total budget		923.40	910.30