

Horizon EUROPE - Specific Programme

proposal for a Decision of the Council [ST_8550/19_INIT]

PILLAR II - Global Challenges and European Industrial Competitiveness

CLUSTER 6 - Food, Bioeconomy, Natural Resources, Agriculture and Environment

The EU is confronted by many challenges, some of which are also global challenges. The scale and complexity of the problems are vast, need to be tackled jointly and matched by adequate, properly trained and skilled human resources, by the appropriate amount of financial resources and a proportionate effort in order to find solutions. These are precisely the areas where the EU must work together; smart, flexible and joined-up for the benefit and well-being of all our citizens.

Greater impact can be obtained through aligning actions with other nations and regions of the world within international cooperation along the lines indicated by the United Nations 2030 Agenda for Sustainable Development and the Sustainable Development Goals and the Paris climate agreement. Based on mutual benefit, partners from across the world will be invited to join EU efforts as an integral part of research and innovation for sustainable development.

Research and innovation are key drivers of sustainable and inclusive growth and technological and industrial competitiveness. They will contribute to finding solutions to today's problems, and the problems of tomorrow, in order to reverse as quickly as possible, the negative and dangerous trend that currently links economic development with the growing use of natural resources and growing social challenges. This will turn the challenges into new business opportunities and into rapid benefits for society.

The EU will benefit as user and producer of knowledge, technologies and industries showcasing how modern industrialised, sustainable, inclusive, creative, resilient, open and democratic society and economy can function and develop. The growing economic-environmental-social examples of the sustainable economy of the future will be fostered and boosted, be they for: health and well-being for all; or resilient, creative and inclusive societies; or societies strengthened by civil security; or available clean energy and mobility; or a digitised economy and society; or a transdisciplinary and creative industry; or space-related, marine or land-based solutions; or a well-functioning bioeconomy, including food and nutrition solutions; sustainable use of natural resources, protection of the environment, climate change mitigation and adaptation, all generating wealth in Europe and offering higher quality jobs. Industrial transformation will be crucial, as well as developing EU innovative industrial value chains.

New technologies affect virtually all policy areas. For each separate technology there is often a combination of social and economic opportunities, opportunities for efficiency and quality and improvement of the government, consequences for employment and education, but also possible risks for safety, privacy and ethics. Technology policy therefore necessarily requires an integral weighing of interests, and cross-sectoral cooperation and strategy formulation.

Research and innovation under this pillar of Horizon Europe is grouped into integrated, non-siloed broad clusters of activities. Rather than addressing sectors, the investments aim at systemic changes for our society and economy along a sustainability vector. These will only be achieved if all actors, both private and public, engage in co-designing and co-creating research and innovation; bringing together end-users, scientists, technologists, producers, innovators, businesses, educators, policy-makers, citizens and civil society organisations. Therefore, none of the clusters is intended for only one set of actors and all activities will be implemented primarily by collaborative research and innovation projects selected on the basis of competitive calls for proposals.

In addition to addressing global challenges, activities in the clusters will also develop and apply, key enabling and emerging technologies (either or not digital-based) as part of a common strategy to promote the EU's industrial and social leadership. Where appropriate this will use EU space-enabled data and services. All TRL levels up to 8 will be covered in this pillar of Horizon Europe without prejudice to Union competition law.

Actions will generate new knowledge and develop technological and non-technological solutions, bring technology from lab to market and to develop applications including pilot lines and demonstrators, and include measures to stimulate market uptake and to boost private sector commitment and incentives to standardisation activities within the Union. Technologies require critical mass of European researchers and industry to establish world leading eco-systems, that include state of the art technology infrastructures e.g. for testing. Synergies with other parts of Horizon Europe and the EIT, as well as other programmes will be maximised.

The clusters will boost the quick introduction of first-of-its-kind innovation in the EU through a broad range of embedded activities, including communication, dissemination and exploitation, standardisation as well as support to non-technological innovation and innovative delivery mechanisms, helping create innovation friendly societal, regulatory and market conditions such as the innovation deals. Pipelines of innovative solutions originating from research and innovation actions will be established and targeted to public and private investors as well as other relevant EU and national or regional programmes. Synergies will be developed with the third pillar of Horizon Europe in that perspective.

Gender equality is a crucial factor in order to obtain sustainable economic growth. It is therefore important to integrate a gender perspective in all global challenges.

Cluster 6: 'Food, Bioeconomy, Natural Resources, Agriculture and Environment'

6.1 Rationale

The EU Pillar of Social Rights asserts that everyone has the right to timely access to affordable, preventive and curative health care that is safe and of good quality. This underlines the EU's commitment to the UN's Sustainable Development Goals calling for universal health coverage for all and at all ages by 2030, leaving no one behind, and ending preventable deaths.

A healthy population is vital for a stable, sustainable and inclusive society, and improvements in health are crucial in reducing poverty, in dealing with an ageing European society, in fostering social progress and prosperity, and in increasing economic growth. According to the OECD a 10% improvement in life expectancy is associated with a rise in economic growth of 0.3-0.4% a year. Life expectancy in the EU increased by 12 years since its establishment as a result of tremendous improvements achieved in the quality of life, environment, education, health and care of its people. In 2015, overall life expectancy at birth was 80.6 years in the EU compared to 71.4 years globally. In the past years, it increased in the EU on average by 3 months annually. Besides these improvements social and gender-specific differences in life expectancy can be observed between specific groups and across European countries.

Health research and innovation have played a significant part in this achievement but also in improving productivity and quality in the health and care industry. However, the EU continues to face novel, newly emerging or persisting challenges that are threatening citizens and public health, the sustainability of its health care and social protection systems, as well as the competitiveness of its health and care industry. Major health challenges in the EU include: accessibility and affordability of health and care; the lack of effective health promotion and disease prevention; the rise of non-communicable diseases; the increased cases of cancer; the increase of mental illness; the spread of antimicrobial drug resistance and the emergence of infectious epidemics; increased environmental pollution; the persistence of health inequalities among and within countries disproportionately affecting people that are disadvantaged or in vulnerable stages of life; the detection, understanding, control, prevention and mitigation of health risks, including poverty-related aspects, in a rapidly changing social, urban, rural and natural environment; demographic change, including ageing-related issues, and the increasing costs for European health care systems; and the increasing pressure on the European health and care industry to remain competitive in and by developing health innovation vis-a-vis emerging global players. In addition, vaccine hesitancy may decrease immunisation coverage among certain population groups.

These health challenges are complex, interlinked and global in nature and require multidisciplinary, technical and non-technical, cross-sectorial and transnational collaborations. Research and innovation activities will build close linkages between discovery, clinical, translational epidemiological, ethical, environmental and socio-economic research as well as with regulatory sciences. They will address areas of unmet clinical needs such as for example rare or hard to treat diseases (cancers, such as paediatric and lung cancer). They will harness the combined skills of academia, practitioners, regulatory bodies and industry and foster their collaboration with health services, social services, patients, policy-makers and citizens in order to leverage on public funding and ensure the uptake of

results in clinical practice as well as in health care systems taking into account the competencies of Member States regarding the organisation and financing of their health systems. Full advantage will be taken of genomic and other multiomics frontier research, as well as the progressive introduction of personalised medicine approaches, relevant for addressing a variety of non-communicable diseases and the digitalisation in health and care.

Research and innovation will foster strategic collaboration at EU and international level in order to pool the expertise, capacities and resources needed to create scope, speed and economies of scale, as well as to exploit synergies, avoid duplication of effort and share the expected benefits and financial risks involved. Synergies in health research and innovation in Horizon Europe shall be promoted, in particular with the Health Strand within the European Social Fund Plus.

Digital health solutions have created many opportunities to solve the problems of care services and to address other emerging issues of ageing society. Full advantage should be taken of the opportunities that digitalisation in health and care can provide without jeopardising the right to privacy and data protection. Digital devices and software have been developed to diagnose, treat and facilitate patients' self-management of illness, including chronic diseases. Digital technologies are also increasingly used in medical training and education and for patients and other healthcare consumers to access, share and create health information.

The research and innovation activities of this global challenge will develop the knowledge base, exploit existing knowledge and technologies, consolidate and create the research and innovation capacity and develop the solutions needed for a more effective promotion of health and the integrated prevention, diagnosis, monitoring, treatment, rehabilitation and cure of diseases and (long-term and palliative) care. Results of research will be translated as recommendations for action and communicated with the relevant stakeholders. Improving health outcomes will in turn result in increased well-being and life expectancy, healthy active lives, improved quality of life and productivity, more healthy life years and sustainability of health and care systems. In line with articles 14 and 15 of the Regulation and the Charter for Human Rights and Fundamental Principles, ethics, protection of human dignity, gender and ethnical aspects and the needs of disadvantaged and vulnerable people will receive special attention.

Addressing major health challenges will support the EU's commitment to the United Nation's 2030 Agenda for Sustainable Development and those in the context of other UN organisations and international initiatives, including the global strategies and plans of action of the World Health Organization (WHO). It will contribute to the EU's policy goals and strategies, notably to the EU Pillar of Social Rights, the EU Digital Single Market, the EU Directive on cross-border healthcare, and the European One Health Action Plan against antimicrobial resistance (AMR), and to the implementation of the relevant EU regulatory frameworks.

Activities will contribute directly to the following Sustainable Development Goal (SDGs) in particular: **SDG 3** – Good Health and Well-Being for People; **SDG13** – Climate Action.

6.2 Areas of Intervention

6.2.1 Environmental Observation

The capacity to observe the environment²¹, including space-based, in-situ-based (air, sea, land) observation, and citizen observations underpins research and innovation for the sustainable use and monitoring of food and natural resources, biomonitoring and environmental monitoring. Improved spatio-temporal coverage and sampling intervals at reduced cost, as well as big data access and integration from multiple sources provide new ways to monitor, understand and predict the Earth system. Research and innovation is needed to develop methods and technologies to improve quality as well as facilitate access and use of data

BROAD LINES:

- User driven and systemic approaches including open data, to environmental data and information for complex modelling and predictive systems, business opportunities from exploitation and valorisation of existing and new data;
- Further development of products and services portfolio for environmental observations;
- Biodiversity status, ecosystem protection, climate change mitigation and adaptation, food security, agriculture and forestry, land use and land use change, urban and peri-urban development, natural resources management, sea and ocean resources management and conservation, maritime security, long term environmental trends, changes in seasonal variability, ambient air and atmospheric changes and other relevant domains;
- User oriented applications, to be delivered through the EuroGEOSS initiative, including their up scaling, to contribute to the preservation and management of European natural resources (including exploration of raw materials) and ecosystems services and their related value chain;
- Implementation of the Global Earth Observation System of Systems of the GEO (Group on Earth Observations) initiative.

6.2.2 Biodiversity and Natural Resources

Improved understanding, preservation and management of biodiversity and ecosystems, the multiple services they provide (in a context of combatting climate change and mitigating its impacts) and planetary 'boundaries' as well as solutions harnessing nature's power and complexity is needed to address societal challenges, to enhance sustainability and to attain the EU objective of 'Living well within the limits of our planet' by 2050 as laid down in the 7th EU Environmental Action Programme. Due account must be taken of potential upstream impacts throughout whole value chains. International cooperation and contribution to international efforts and initiatives, such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), are essential to achieve the objectives in this area. There is a need to better understand the governance of the transition to sustainability in the economic, social and natural system, from the local to the global level.

BROAD LINES:

- The state and value of biodiversity, terrestrial, freshwater and marine ecosystems, natural capital and ecosystem services, including agro-ecosystems and the microbiome;
- Holistic and systemic approaches within a socio-ecological framework for the links between biodiversity, ecosystems and ecosystems services and their causality relationships with drivers of

change, across different scales and economic activities, including the socio economic aspects and governance of transition processes to sustainability; y

- Modelling of trends and integrated scenarios for biodiversity, ecosystem services and good quality of life at different scales and horizons; the potential contribution of biotopes and ecosystems as carbon sinks under various climate change scenarios; potential conflicts of interests in utilization of natural resources and services;
- Ecotoxicology of compounds and new pollutants, their interactions, including combination effects, and environmental behaviour, and altered biochemical loops under changing climate, restoration of degraded areas;
- Mainstreaming biodiversity and ecosystem services in decision-making frameworks and accounting systems of governments and businesses, as well as quantification of ecological, economic and societal benefits;
- Adaptable and multi-functional nature-based solutions, addressing challenges in urban and peri-urban areas, rural and coastal and mountain areas related to climate change, natural disasters, biodiversity loss, ecosystem degradation, pollution, social cohesion and citizens' health and well-being;
- Multi-actor living labs approaches engaging authorities, stakeholders, business and civil society in co-designing and co-creating systemic solutions for the preservation, restoration and sustainable use of natural capital, and the governance of the transition to sustainability and sustainable management options in economic activities throughout whole value loops in different environmental, economic and social conditions.

6.2.3 Agriculture, Forestry and Rural Areas

Resilient and sustainable agriculture and forestry provide economic, environmental and social benefits and is a prerequisite for continued food security. They feed into dynamic value chains, manage land and natural resources as well as deliver a range of vital public goods including carbon sequestration, biodiversity preservation, pollination and public health. Integrated and place-based approaches are needed to promote the multiple functions of agro- and forest (eco)systems taking into account the changing context for primary production, notably in relation to climate change and environment, resource availability, demography and consumption patterns. Quality and safety of agricultural products shall be ensured to enhance consumer confidence. Plant health and animal health and welfare shall also be ensured. It is also necessary to address the spatial, socio-economic and cultural dimension of agriculture and forestry activities and mobilise the potential of rural and coastal areas.

BROAD LINES:

- Methods, technologies and tools for sustainable, resilient and productive agriculture and forestry, including adaptation to climate change;
- Sustainable management and efficient use of natural resources (e.g. soils, water, nutrients and biodiversity including genetic resources) in agriculture and forestry; alternatives to non-renewable resources and adoption of circular economy principles, including through the reuse and recycling of waste and by-products;
- Climate and environmental impact of activities in the primary sector; potential of agriculture and forestry as carbon sinks and for mitigation of greenhouse gas emissions including negative emission approaches; increasing adaptability of primary production to climate change;

- Integrated approaches to tackling plant pests and diseases; control of contagious and zoonotic animal diseases and animal welfare; prevention strategies, control and diagnostic and alternatives to the use of contentious pesticides, antibiotics and other substances also to tackle resistance;
- Antimicrobial resistance and threats from biological and agrochemical hazards, including pesticides, as well as chemical contaminants tackling the links between plant, animal, ecosystems and public health from One-Health and Global-Health perspectives;
- The use and delivery of ecosystem services in agriculture and forestry systems applying ecological approaches and testing nature-based solutions from farm to landscape levels for an environmentally friendly agriculture; support to organic farming;
- Agricultural and forestry systems from farm to landscape levels; the use and delivery of ecosystem services in primary production, e.g. through agro-ecology or through enhancing the role of forests in the prevention of floods and soil erosion;
- Innovations in farming at the interfaces between agriculture, aquaculture, forestry and in urban and peri-urban areas;
- New methods, technologies and tools for sustainable forest management and sustainable use of forest biomass;
- Support to EU plant protein production for food, feed and environmental services;
- Sustainable land use, rural development and territorial linkages; capitalising on the social, cultural, economic and environmental assets of rural areas for new services, business models, value chains and public goods;
- Digital innovations in farming, forestry and across value chains and rural areas through the use of data and development of infrastructures, technologies (such as AI, robotics, precision farming and remote sensing) and governance models;
- Agricultural and forestry knowledge and innovation systems and their interconnection at various scales; advice, building skills, participatory approaches and information sharing;
- Fostering international partnerships for sustainable agriculture for food and nutrition security.

6.2.4 Seas, Oceans and Inland Waters

The natural capital and ecosystem services of seas, in particular of semi-closed European seas, oceans, inland waters and wider coastal areas offer significant socio-economic and welfare benefits. This potential is at risk because of the severe pressure from human and natural stressors such as pollution, overfishing, climate change, sea-level rise, other water-use and extreme weather events. To prevent seas, oceans from reaching a point of no return, and to restore a good status of inland waters; it is necessary to strengthen our knowledge and understanding in order to protect, restore and sustainably manage marine, inland and coastal ecosystems and prevent pollution, in a context of an improved and responsible governance framework. This will also include research to sustainably unlock the vast and unexploited economic potential of seas, oceans and inland waters aiming at producing more safe food, bio-based ingredients and raw material without increasing pressures on them, as well as the potential of aquaculture in all forms to alleviate pressure on land, freshwater and ocean resources. There is a need for partnering approaches, including sea basin and macro-regional strategies, extending beyond the EU (e.g. in the Atlantic, the Mediterranean, the Baltic, the North Sea, the Black Sea, the Caribbean Sea and the Indian Ocean); and for contributing to International Ocean Governance commitments, initiatives like the United Nations Decade of Ocean Science for Sustainable Development and

commitments linked to the conservation of marine biological diversity in areas beyond national jurisdiction.

BROAD LINES:

- Sustainable fisheries and aquaculture in all forms, including alternative sources of protein with increased food security, food sovereignty and climate resilience; monitoring and management tools;
- Strengthened resilience of marine and inland water ecosystems, including coral reefs thereby ensuring seas, ocean and river health, combating and mitigating the effects of natural and anthropic pressures like contaminants and marine litter (including plastics), eutrophication, invasive species, physical damage to the sea floor, overexploitation, including overfishing, underwater noise, acidification, seas, oceans and rivers warming, sea level rise, considering the intersection between land and sea, the cumulative impact of these issues and fostering a circular approach and a better understanding of ocean-human interactions;
- Governance at global and regional levels to ensure conservation and sustainable use of the resources of seas, oceans and inland waters;
- Technologies for the digital ocean (seafloor, water column and water surface) connecting services and communities in land-based, atmosphere, climate, space and weather related activities, and promoted through the Blue Cloud as part of the European Open Science Cloud;
- Monitoring, risk-based assessment and predictive/forecasting capacities including sea-level rise and other natural hazards e.g. storms surges, tsunamis as well as cumulative impact of human activities;
- Improve understanding of the hydrological cycle and regimes, hydromorphology at different scales and develop monitoring and predictive capacities for water availability and demand, floods and droughts, pollution and other pressures on water resources and aquatic environment. Exploit digital technologies to improve water resource monitoring and management; y
- Develop innovative solutions including societal governance, economic instruments and financing models, for smart water allocation addressing conflicts in water use, including exploiting the value in water, control of water pollutants, including plastics and microplastics and other emerging pollutants preferably at source, tackling other pressures on water resources, as well as water reuse, and protection and restoration of water ecosystems to good ecological status;
- Sustainable blue value-chains, including the sustainable use of fresh water resources, the multiple-use of marine space and growth of the renewable energy sector from seas and oceans, including sustainable use of micro- and macro- algae;
- Integrated approaches to sustainable management of inland and coastal waters which will contribute to environmental protection and adaptation to climate change;
- Nature-based solutions derived from marine, coastal and inland water ecosystem dynamics, biodiversity and multiple ecosystem services, which will enable systemic approaches to sustainably use the resources of seas, in particular of semi-closed European seas, and oceans and of inland waters, contribute to environmental protection and restoration, coastal management, and adaptation to climate change;
- Blue innovation including in the blue and digital economies, across coastline areas, coastal cities and ports in order to strengthen resilience of coastal areas and increase citizens' benefits;
- Better understanding of the role of seas and oceans in climate change mitigation and adaptation

6.2.5 Food Systems

The combined effects of population growth, evolution of diets, resource scarcity and overexploitation, environmental degradation, climate change and migration create unprecedented challenges which require food system transformation (FOOD 2030).²² Current food production and consumption are largely unsustainable while we are confronted with the double burden of malnutrition, characterised by the coexistence of undernutrition, obesity and other diet imbalances and metabolic disorders. Future food systems need to deliver on food security, and ensure sufficient safe, healthy and quality food for all, underpinned by resource efficiency, sustainability (including the reduction of GHG emissions, pollution, water and energy consumption as well as waste production), transparency, linking land and sea, reducing food waste, enhancing food production from inland waters, seas and oceans and encompassing the entire 'food value chain' from producers to consumers – and back again - ensuring resilience. This needs to go hand in hand with development of the food safety system of the future and the design, development and delivery of tools, technologies and digital solutions that provide significant benefits for consumers and improve the competitiveness and sustainability of the food value chain. Furthermore, there is a need to foster behavioural changes in food consumption and production patterns, taking into account cultural and social aspects, as well as to engage primary producers, industry (including SMEs), retailers, food service sectors, consumers, and public services.

BROAD LINES:

- Evidence-based sustainable and healthy diets for people's well-being across their lifespan, including dietary patterns, improved nutritional quality of food and advances in understanding the impact of nutrition on health and well-being;
- Personalised nutrition especially for vulnerable groups, to mitigate the risk factors for diet-related and non-communicable diseases;
- Consumers' behaviour, lifestyle and motivations, including social and cultural aspects of food, promoting social innovation and societal engagement for better health and environmental sustainability throughout the entire food value chain, including retail patterns;
- Modern food safety and authenticity systems, including traceability, improving food quality and enhancing consumer confidence in the food system;
- Food system mitigation of and adaptation to climate change, including the exploration of the potential and use of the microbiome, of food crop diversity, and of alternative to animal proteins;
- Environmentally sustainable, circular, resource efficient and resilient food systems, from land and sea, towards safe drinking water and maritime issues, zero food waste throughout the entire food system, through reuse of food and biomass, recycling of food waste, new food packaging, demand for tailored and local food;
- Novel approaches, including digital tools and food systems for place-based innovation and empowerment of communities, fostering fair trade and pricing along the value chain, inclusiveness and sustainability through partnerships between industry (including SMEs and smallholders), local authorities, researchers and society.

6.2.6 Bio-based Innovation Systems in the EU Bioeconomy

Innovation in the bioeconomy lays the foundations for the transition away from a fossil-based economy. Bio-based innovation is an important segment and enabler of the overall bioeconomy

and encompasses the sustainable sourcing, industrial processing and conversion of biomass from land and sea into bio-based materials and products. Sustainability includes all its dimensions: ecological, social, economic and cultural aspects). It also capitalises on the potential of living resources, life sciences, digitalisation and biotechnologies for new discoveries, products, services and processes. Bio-based innovation, including (bio)processes and technologies, can bring new economic activities and employment to regions and cities, contribute to revitalising rural and coastal economies and communities and strengthen the circularity of the bioeconomy.

BROAD LINES:

- Sustainable biomass sourcing, logistics and production systems, focusing on high-value applications and uses, social and environmental sustainability, impact on climate and biodiversity, circularity and overall resource efficiency, including water;
- Life sciences and their convergence with digital technologies for understanding, prospecting and sustainably using biological resources;
- Bio-based value chains, bio-based materials, including bio-inspired materials, chemicals, products, services and processes with novel qualities, functionalities and improved sustainability (including reducing emissions of greenhouse gases), fostering the development of (small and large scale) advanced biorefineries using a wider range of biomass; replacing current production of unsustainable products by outperforming biobased solutions for innovative market applications;
- Biotechnology, including cross sectoral cutting-edge biotechnology, for application in competitive, sustainable and novel industrial processes, environmental services and consumer products (Health biotechnology applications will be addressed by the Health cluster under this pillar);
- Circularity of the bio-based sector within the bioeconomy through technological, systemic, social and business model innovation to radically increase the value generated per unit of biological resource, keeping the value of such resources in the economy for longer, preserving and enhancing natural capital, designing out waste and pollution, supporting the principle of the cascading use of sustainable biomass through research and innovation and taking into account the waste hierarchy;
- Inclusive bioeconomy patterns with different actors participating in the creation of value, maximising societal impact and public engagement;
- Increased understanding of the boundaries, metrics and indicators of the bioeconomy and its synergies and trade-offs with a healthy environment, and trade-offs between food and other applications.

6.2.7 Circular Systems

Circular production and consumption systems will provide benefits to the European economy and global environment by reducing use and dependency on resources, decreasing greenhouse gas emissions and other negative environmental impacts and increasing the competitiveness of enterprises, and to European citizens by creating new job opportunities and reducing pressures on the environment and climate. Beyond industrial transformation, the transition to a low-emission, resource efficient, bio-based and circular economy, avoiding the use of hazardous substances will also need a broader system shift that requires systemic eco-innovative solutions, new business models, markets and investments, enabling infrastructure, social innovation changes in consumer behaviour, and governance models stimulating multi-stakeholder collaboration through the whole value chain to ensure that the intended system change achieves better economic, environmental and social outcomes²⁴. Opening for international cooperation will be important for comparability, generating and sharing knowledge and avoiding duplication of

efforts, e.g. through international initiatives such as the International Resource Panel. Also, attention will be given to the social context of new knowledge and technology in this area and for its uptake and acceptance in society.

BROAD LINES:

- Systemic transition to a resource-efficient, bio-based and circular economy, with new paradigms in consumer interaction, new business models for resource efficiency and environmental performance; products and services stimulating resource efficiency and elimination or substitution of hazardous substances during the whole lifecycle; systems for sharing, reuse, repair, remanufacturing, recycling and composting; economic, social, behavioural, regulatory and financial conditions and incentives for such transitions;
- Metrics and indicators, based on a systemic approach, for measuring the circular economy and life cycle performance and enhancing social responsibility; governance systems which accelerate expansion of the circular economy, the bioeconomy and resource efficiency while creating markets for secondary materials; multi-stakeholder and cross-value chain collaboration; instruments for investment in the circular economy and bioeconomy;
- Solutions for sustainable and regenerative development of cities, peri-urban areas and regions, integrating the circular economy transformation with nature-based solutions, technological, digital, social, cultural and territorial governance innovations;
- Eco-innovation for prevention and remediation of environmental pollution from and exposure to hazardous substances and chemicals of emerging concern; looking also at the interface between chemicals, products and waste, and at sustainable solutions for primary and secondary raw materials production;
- Circular use of water resources, including reduction of water demand, prevention of losses, water reuse, recycling and valorisation of wastewater. Innovative solutions for the challenges for the water-food-energy nexus addressing impacts of agricultural and energy water use and enabling synergistic solutions.
- Sustainable subsurface management integrating geo-resources (energy, water, raw materials) and environmental conditions (natural hazards, anthropogenic impacts) across all relevant clusters, streamlining the positive contribution to a circular economy through pan-European geological knowledge and contributing towards an orchestrated science-based response to the Paris Agreement and to several UN Sustainable Development Goals.
- Develop and improve solutions and infrastructures for facilitating access to drinking, irrigation and sanitation water, involving inter alia desalination, in order to enable more efficient, energy and CO₂ friendly, as well as, circular use of water.