

Horizon Europe strategic plan (2021 – 2024)

Analysis

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Directorate-General for Research and Innovation

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(2021 – 2024)**

Analysis

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Horizon Europe, the ninth European Research and Innovation Framework programme (2021-2027), is one of the key instruments of the Union to steer and accelerate Europe's recovery, preparedness and resilience. In the context of a new European Research Area for research and innovation, it will strengthen our knowledge base through frontier research, spur breakthrough innovation and support the development and demonstration of innovative solutions, and it will help restore our industrial leadership and open strategic autonomy. Citizens and businesses expect the Union to lead on the transformation pathways in a transparent, effective and inclusive way. This journey will take place within Horizon Europe and its strategic plan will be the map for it.

This first Horizon Europe strategic plan defines the strategic orientations for our research and innovation investments over the period 2021-2024 and acts as a compass to stay on course with the political priorities of the Commission with a focus on a climate-neutral and green Europe, fit for the digital age, where the economy works for the people. The aim is to ensure an effective interface between EU policy priorities, and programme activities and ultimately, the research and innovation projects funded by Horizon Europe.

The key strategic orientations and impact areas are formulated on the basis of expected impacts, which have been defined, largely bottom-up, during the co-design process. The impacts define the wider effects on society, the economy and science to be targeted by research and innovation activities, but not the manner in which to achieve them. This is entirely up to the imagination and skill of the applicants.

The impacts are structured by the six clusters that make up Horizon Europe's second Pillar, 'Global Challenges and European Industrial Competitiveness' and are described, along with cross-cluster complementarities and intervention areas covered.

This analysis document informs on the evidenced based expertise that has been used to frame and feed the directions set by the first Horizon Europe strategic plan.

[Decision of the Council on establishing the specific programme implementing Horizon Europe – the Framework Programme for Research and Innovation

Article 4a4:

The Strategic Plan shall take into account an analysis covering at least the following elements:

- a) Political, socio-economic and environmental drivers which are relevant for the EU and Member States' policy priorities.*
- b) The contribution of research and innovation to the realisation of EU policy objectives, while capitalizing on studies, other scientific evidence and relevant initiatives at EU and national level, including institutionalised partnerships according to article 8(1)(c) of the [Framework Programme Regulation].*
- c) Evidence-base resulting from foresight activities, S&T and innovation indicators, international developments such as the implementation of the SDGs and feedback from implementation, including monitoring the implementation of specific measures with regard to widening participation and sharing excellence and participation of SMEs.*
- d) Priorities with the potential to be implemented in synergy with other EU programmes.*
- e) A description of the various approaches for stakeholder consultation and citizen engagement as part of the work to develop Work Programmes;*
- f) Complementarity and synergies with planning of the KICs of the EIT in accordance with Regulation 294/2008/EC.]*

- **Political, socio-economic and environmental drivers which are relevant for the EU and Member States' policy priorities.**

The emergence of societal challenges of global relevance, such as climate change, biodiversity loss, digitalisation or aging population, raises questions on how science and innovation systems should be organised and whether their current structures and dynamics are suitable for creating and disseminating the knowledge and solutions to such challenges. In their nature, global challenges are boundary-spanning: they demand a cooperative and interdisciplinary approach both in terms of research and governance, and require longer time-frames than normal planning activities. Furthermore, they require managing and embracing uncertainty rather than reducing it.

Horizon Europe investments between 2021 and 2024 will take place in a context where different global and long-term trends are influencing our lives and environment. The EU is facing such forces, including the COVID-19 pandemic, an ageing population, digital transformations, growing inequalities and evolving security threats.

Megatrends are long-term global driving forces that are already observable in the present and are likely to continue to have a significant influence for the next decades. The European Commission monitors 14 Global Megatrends¹ relevant for our future.

Among these megatrends, European Council stated that **climate change** poses an existential threat and requires enhanced ambition and greater climate action by the EU and at the global level². The scientific case for climate action has become increasingly overwhelming and shows that a business-as-usual scenario, with continued pollution and greenhouse gas emissions, largely driven by economic and population growth, will lead to a further increase in global warming, ocean acidification, desertification and changing climate patterns. This has immediate implications for food and nutrition security, rising sea levels and stronger storms affecting coastal areas, health issues, migration, and growing economic damage. The bio economy³ addresses the growing demand for food, feed, energy, fibre and other materials, and will help to reduce our dependence on non-renewable resources.

At the same time, the **Earth's biodiversity** and resilience show persistent declining trends. These trends are significantly driven by resource extraction and processing which account globally for half of total greenhouse gas and 90 % of biodiversity loss due to land use (United Nations, 2019). As mentioned by a report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the underlying causes of pandemics are the same global environmental changes that drive biodiversity loss and climate change. These include land-use change, agricultural

¹ https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en#latest-on-the%20megatrends%20hub-from-the-knowledgebase

² <https://www.consilium.europa.eu/media/41123/17-18-euco-final-conclusions-en.pdf>

³ https://ec.europa.eu/info/research-and-innovation/research-area/environment/bioeconomy_en

expansion and intensification, and wildlife trade and consumption⁴. In the same time, 40% of the marine environment are now severely altered globally⁵.

Advancements in genetics, nanotechnology, robotics and artificial intelligence, photonics, quantum and other **emerging technologies** and the synergies between them are accelerating. They are changing the nature and speed of new scientific discoveries and are challenging our understanding of what is possible. While they bring benefits, they also create new risks including by enabling new ways for criminals to operate. Hyper connectivity, the Internet of Things, augmented reality and collective intelligence systems, combined with falling costs of implementation of new technologies are transforming entire systems of production, management, and governance. The COVID-19 pandemic has further accelerated the trends towards the **digital transformation**: for instance online education, teleworking, e-commerce.

While the **twin green and digital transitions** and new technologies create opportunities for businesses (especially SMEs), workers and citizens to engage in economic and social activities, these transformative policies and technologies are also likely to change work, and may further increase existing gaps in access and use, resulting in risks of new digital and skills divides and greater inequality.

How was foresight used in the preparation of the strategic plan

The proposal for Horizon Europe was built *inter alia* on the basis of the interim evaluation of Horizon 2020⁶, economic analysis⁷ and foresight⁸ which explored global megatrends, their interactions with the Sustainable Development Goals, and the implications of different future scenarios for EU R&I policy and its future orientations. During the development of the strategic plan the findings and recommendations of the BOHEMIA study⁹ and of the report on “100 Radical Innovations for the Future” were examined in detail by the co-creation teams, in addition to other available thematic foresight reports, with a view to inform the specific policy objectives and targeted impacts of the orientations of document, which formed the basis for the strategic plan.

Drivers and the policy priorities

The COVID-19 pandemic highlights further the urgent need to address long-standing challenges that affect the fairness in society. Our climate and environment, economy and society are

⁴ <https://ipbes.net/pandemics>

⁵ IPBES, 2019, Global assessment report on biodiversity and ecosystem services, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany (<https://www.ipbes.net/global-assessment-report/biodiversity-ecosystem-services>) accessed 6 August 2019.

⁶ https://ec.europa.eu/info/publications/interim-evaluation-horizon-2020_en

⁷ <https://op.europa.eu/en/publication-detail/-/publication/0635b07f-07bb-11e7-8a35-01aa75ed71a1/language-en>

⁸ https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/support-eu-research-and-innovation-policy-making/foresight/activities/current/bohemia_en

⁹ *ibid*

experiencing profound changes that will fundamentally alter our current way of life. . The need to move towards a truly circular and sustainable bio economy¹⁰, which aligns the economy with the ecosphere, becomes more pertinent than ever. This is happening against a backdrop of rapid technological change that is redefining our economies and societies. Taken together, these challenges imply the need for three deep transitions along the axes of ecology, economy and society, going beyond the traditional focus on GDP growth.

The EU and its Member States have signed up to the **United Nations 2030 Agenda for Sustainable Development that consecrates 17 Sustainable Development Goals** (SDGs) with 169 targets to guide the transitions towards sustainable development. The SDGs reconciles economic with social and environmental challenges.

Competitive sustainability is at the heart of the European Green Deal, the new EU new growth strategy¹¹, reflected in a new Industrial Strategy for Europe¹² Moving towards EU competitive sustainability, which corresponds to a sustainable economic model, enabled by digital and clean technologies, can make Europe a transformational frontrunner in the twin green and digital transitions. **Leadership on environmental protection** and a strong, innovative industrial base should go hand in hand, to give the EU a competitive first-mover advantage. **A resilient economy**, allowing for policies focused towards the long-term, and a **just transition** for those most affected by the transformations are prerequisite for success and should complete our framework. **Environmental sustainability, productivity gains, fairness and macro-economic stability will be the four dimensions of our economic policy in the years to come.** These dimensions, which are closely interrelated and mutually reinforcing, should guide structural reforms, investments and responsible fiscal policies across all Member States. They will be crucial in implementing the SDGs.

In today's geopolitical context, putting the SDGs at the centre of the Union's policymaking and action also sends a strong message about Europe's commitment towards sustainability and **multilateralism**, with the United Nations at its core¹³.

Implications for EU research and innovation investments

As highlighted by the Global Sustainable Development Report 2019 *The Future is now*¹⁴, science and technology correspond to one of the most powerful levers to co-design, create and scale up the transformations needed to achieve the SDGs. In turn, those objectives and their complex

¹⁰ https://ec.europa.eu/info/research-and-innovation/research-area/environment/bioeconomy_en

¹¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0575&from=en>

¹² https://ec.europa.eu/info/sites/info/files/communication-eu-industrial-strategy-march-2020_en.pdf

¹³ https://eeas.europa.eu/topics/eu-global-strategy_en

¹⁴ https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf

interactions (trade-offs and co-benefits) constitute an opportunity to support the transition towards sustainability science¹⁵, in line with Commission's efforts to support a vibrant civil society and to promote and enhance democratic participation¹⁶.

Europe's scientific and technological expertise is a key asset for developing Europe's sustainable competitiveness while promoting its technological sovereignty, a key aspect of its open strategic autonomy, as defined in the European Council conclusions of 1 and 2 October 2020¹⁷.

This calls for a transformative, inclusive and forward-looking research, innovation and agenda, ensuring the interface with the EU policy priorities. It will contribute to understanding further how research and innovation can contribute to addressing the challenges we face by providing solutions for them, thus contributing to making our society more resilient in the long term.

The methodological approach retained aims at ensuring EU policy priorities are supported through research and innovation programming, and at highlighting the different possible contributions of Horizon Europe investments to the ecological and digital transitions, their social dimensions and Europe's resilient recovery after the crisis.

In line with the Commission communication on a *new ERA for research and innovation*¹⁸, the approach to research and innovation investments builds especially on the green and digital transitions by supporting innovation based competitiveness and fostering technological sovereignty in key strategic areas (e.g. data, Artificial Intelligence, and robotics, microelectronics, edge computing, quantum computing, 5G/6G, space technologies for satellites and launchers, batteries, renewable energy, hydrogen, zero-emission and smart mobility, raw materials, etc.) in line with the model of open strategic autonomy. The EU's long-term budget for 2021-2027, the large-scale recovery plan "Next Generation EU" will lay the foundations of a modern and more sustainable Europe, while promoting an inclusive recovery and social fairness. The Recovery and Resilience Facility, Cohesion policy, as well as the Technical Support Instrument, will contribute to more coordination encouraging Member States to invest in new technologies and in a number of flagship areas.

The approach aims at giving directionality to Horizon Europe, promoting larger synergies with other EU funding programmes and national priorities, providing inspiration to European civil society efforts, contributing to trust in science and technology and promoting entrepreneurship, ultimately aiming at wider, deeper and faster societal impact of research. In addition, this will be reinforced by the monitoring of the effectiveness of EU research and innovation investments in contributing to the

¹⁵ "Sustainability Science is research and education that results in new knowledge, technology, innovation and holistic understanding which will allow societies to better address global and local sustainability challenges". <https://en.unesco.org/sustainability-science/guidelines>

¹⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A790%3AFIN&qid=1607079662423>

¹⁷ <https://www.consilium.europa.eu/media/45910/021020-euco-final-conclusions.pdf>

¹⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0628&from=EN>

key scientific, societal and economic impacts set out for the first four years of the Framework Programme.

- The contribution of research and innovation to the realisation of EU policy objectives, while capitalizing on studies, other scientific evidence and relevant initiatives at EU and national level, including institutionalised partnerships according to article 8(1)(c) of the [Framework Programme Regulation].

A sound linkage between science, innovation and policy making for evidence-based policy design, and a multi-actor approach will foster the effective uptake, use, dissemination and deployment of research and innovation results to achieve the expected societal, economic and scientific expected impacts. As highlighted by the crisis caused by the COVID-19 pandemic, scientific advice based on sound and independent evidence, is needed to inform policy- and decision-making in all areas. In doing so scientific advice contributes to the better regulation agenda of the Commission, and increasing trust in and acceptance of policy and legislation by the public

Further relevant evidence-base elements are contained in the Science Research and Innovation Performance report of 2020

Horizon Europe pillar/part	Relevant EU policy objectives	Studies, other scientific evidence and relevant initiatives at EU level (including institutionalised partnerships)
Cluster 1	<p>Overarching EU goals and commitments</p> <ul style="list-style-type: none"> • EU Pillar of Social Rights, https://ec.europa.eu/commission/sites/beta-political/files/social-summit-european-pillar-social-rights-booklet_en.pdf, https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights/european-pillar-social-rights-20-principles_en • Political guidelines for the next Commission (2019-2024) - "A Union that strives for more: My agenda for Europe", <a 521="" 861"="" 908="" href="https://ec.europa.eu/commission/sites/beta- </td> <td data-bbox="> <p>Studies and other scientific evidences, including from EU-funded research</p> <ul style="list-style-type: none"> • In silico Clinical Trials: How Computer Simulation will Transform the Biomedical Industry, Viceconti, Marco & Henney, Adriano & Morley-Fletcher, Edwin. (2016). DOI: 10.13140/RG.2.1.2756.6164, https://www.researchgate.net/publication/289522507_in_silico_Clinical_Trials_How_Computer_Simulation_will_Transform_the_Biomedical_Industry • Setting research priorities in environment and health, Report of a meeting in Cascais, Portugal 27–28 April 2017; http://www.euro.who.int/_data/assets/pdf_file/0020/340733/Binder1.pdf?ua=1 • Explanatory note on scientific advice for the regulatory 	

	<p>political/files/political-guidelines-next-commission_en.pdf</p> <ul style="list-style-type: none"> • Commission Communication “A new ERA for Research and Innovation », COM/2020/628 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:628:FIN • Commission Communication “A Global Approach in Research, Education and Youth”, forthcoming 2021 • Commission proposal on the establishment of a Programme for the Union's action in the field of health –for the period 2021-2027 and repealing Regulation (EU) No 282/2014 (“EU4Health Programme”), COM/2020/405 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020PC0405 • Joint Communication of the European Commission and the High Representative of the Union for Foreign Affairs and Security Policy “Tackling COVID-19 disinformation - Getting the facts right”, JOIN/2020/8 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020JC0008 • Commission Communication “Europe's moment: Repair and Prepare for the Next Generation”, COM/2020/456 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590732521013&uri=CO 	<p>assessment of glyphosate in plant protection products, https://ec.europa.eu/research/sam/pdf/topics/explanatory_note_glyphosate.pdf#view=fit&pagemode=none</p> <ul style="list-style-type: none"> • Marine board papers on marine biotechnology, http://www.marineboard.eu/marinebiotech • Linking Oceans and Human Health: A Strategic Research Priority for Europe, http://marineboard.eu/publication/linking-oceans-and-human-health-strategic-research-priority-europe • Public perceptions of science, research and Innovation, Special Eurobarometer 419, Oct 2014, https://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_419_en.pdf • Current EU research activities on combined exposure to multiple chemicals, Env. Int. 120 (2018) 544–562, https://www.sciencedirect.com/science/article/pii/S0160412018308420 • Statement on Advancing the Assessment of Chemical Mixtures and their Risks for Human Health and the Environment, Env. Int. 134 (2020) 105267, https://pubmed.ncbi.nlm.nih.gov/31704565/ • Human biomonitoring as a tool to support chemicals regulation in the European Union, Int. J. of hygiene and env. health, Vol. 220, Part 2, Issue A (2017), 94-97, https://www.sciencedirect.com/science/article/pii/S1438463916303613?via%3Dihub • European Union research in support of environment and health: Building scientific evidence base for policy, Env. Int. 103 (2017) 51–60,
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	<p>M%3A2020%3A456%3AFIN</p> <ul style="list-style-type: none"> • Commission Staff Working Document “Identifying Europe's recovery needs”, SWD/2020/98 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590742540196&uri=SWD%3A2020%3A98%3AFIN • Commission Communication “The EU budget powering the recovery plan for Europe”, COM/2020/442 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A442%3AFIN • Commission Communication “On effective, accessible and resilient health systems” https://ec.europa.eu/health/sites/health/files/systems_performance_assessment/docs/com2014_215_final_en.pdf • Building a European Health Union: Reinforcing the EU's resilience for cross-border health threats, COM/2020/724 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0724 • Proposal for a EU Regulation on serious cross-border threats to health and repealing Decision No 1082/2013/EU, COM/2020/727 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020PC0727 	<p>https://www.sciencedirect.com/science/article/pii/S016041201631008X?via%3Dihub</p> <ul style="list-style-type: none"> • Factsheets on chemicals, policy briefs (upcoming), indicator leaflets, newsletters and citizens focus groups, https://www.hbm4eu.eu/result/, https://www.hbm4eu.eu/outreach-to-the-european-public/ • Evaluation of the Second European and Developing Countries Clinical Trials Partnership Programme (2014-2016), European Commission, Independent Experts Group Report, 2017, http://ec.europa.eu/research/evaluations/pdf/edctp2_evaluation_experts_report_2017.pdf • The Interim Evaluation of the Innovative Medicines Initiative 2 Joint Undertaking (2014-2016) operating under Horizon 2020, European Commission, Independent Experts Group Report, 2017, https://ec.europa.eu/research/health/pdf/imi2_interim_evaluation.pdf • EU Health Research and Innovation Policies and Actions, https://ec.europa.eu/research/health/index.cfm • Future of Rare Diseases Research 2017–2027: An IRDIRC Perspective, Clin Transl Sci (2018) 11, 21–27, https://ascpt.onlinelibrary.wiley.com/doi/full/10.1111/cts.12501 • The importance of international collaboration for rare diseases research: a European perspective, Gene Therapy, Vol. 24 (2017), pp 562–571, https://www.nature.com/articles/gt201729 • Increased momentum in antimicrobial resistance research, The Lancet, Vol. 388 (2016) p. 865, https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-
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	<ul style="list-style-type: none"> • Commission Communication “Pharmaceutical Strategy for Europe”, COM/2020/761 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0761 • Regulation of the European Parliament and of the Council on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, Regulation (EU) 2016/679, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02016R0679-20160504 • Regulation of the European Parliament and of the Council on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, Regulation (EU) 2018/1725, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018R1725 • Commission Communication “A European strategy for data”, COM/2020/66 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1582551099377&uri=CELEX:52020DC0066 • Regulation of the European Parliament and of the Council on electronic identification and trust services for electronic transactions in the 	<p>6736%2816%2931425-8.pdf</p> <p><u>EC websites and repositories</u></p> <ul style="list-style-type: none"> • Health research and innovation, EC website, https://ec.europa.eu/info/research-and-innovation/research-area/health-research-and-innovation_en • European Research Area, EC website, https://ec.europa.eu/info/research-and-innovation/strategy/era_en • European Health Union - Protecting the health of Europeans and collectively responding to cross-border health crises, EC website, https://ec.europa.eu/info/strategy/priorities-2019-2024/promoting-our-european-way-life/european-health-union_en • EU4Health 2021-2027 – a vision for a healthier European Union, EC website, https://ec.europa.eu/health/funding/eu4health_en • Coronavirus response – EU actions, EC website, https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response_en#euactions • Coronavirus Global Response, website, https://global-response.europa.eu/index_en • Public health, EC website, https://ec.europa.eu/health/home_en • State of Health in the EU, https://ec.europa.eu/health/state/summary_en • State of Health in the EU: Companion Report 2019, https://ec.europa.eu/health/sites/health/files/state/docs/2019_companion_en.pdf, https://ec.europa.eu/health/state/companion_report_en • Health at a Glance: Europe 2020, OECD/European Commission, https://ec.europa.eu/health/sites/health/files/state/docs/2020_healthatglance_rep_en.pdf, https://ec.europa.eu/health/state/glance_en • The European COVID-19 Data Platform and portal,
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- Ethics guidelines for trustworthy AI, High-Level Expert Group on AI, April 2019, <https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai>

<p>Cluster 5</p>	<ul style="list-style-type: none"> Commission Reflection Paper: Towards a sustainable Europe by 2030 COM(2019)22 of 30 January 2019 https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf <p><u>Key EU policy initiatives and legislation in the area of energy:</u></p> <p>Relevant for impact n 22,23,24.</p> <ul style="list-style-type: none"> Commission communication (2015): A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy COM(2015) 80 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0080&from=EN <p>Relevant for impact n 23</p> <ul style="list-style-type: none"> Commission communication: Accelerating 	<ul style="list-style-type: none"> Note by the International Maritime Organization to the UNFCCC Talanoa Dialogue: Adoption of the initial IMO strategy on reduction of GHG emissions from ships and existing IMO activity related to reducing GHG emissions in the shipping sector (MEPC 72/17/Add.1 Annex 11) http://www.imo.org/en/OurWork/Documents/Resolution%20MEPC.304(72)%20on%20Initial%20IMO%20Strategy%20on%20reduction%20of%20GHG%20emissions%20from%20ships.pdf IPCC (2018): <i>Global Warming of 1.5°C</i>, An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.), World

	<p>Clean Energy Innovation COM(2016) 763 https://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v6_0.pdf</p> <ul style="list-style-type: none"> • Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG • Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02012L0027-20201026 • Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings • Commission communication (2020): Powering a climate-neutral economy: An EU Strategy for Energy System Integration COM(2020) 299 final https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2020:299:FIN 	<p>Meteorological Organization, Geneva, Switzerland; https://www.ipcc.ch/sr15/</p>
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	<ul style="list-style-type: none"> • Commission communication : A hydrogen strategy for a climate-neutral Europe, EU COM(2020) 301 final https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0301 • Commission communication (2020): A Renovation Wave for Europe – Greening our buildings, creating jobs, improving lives"(COM(2020)662) https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1603122220757&uri=CELEX:52020DC0662 • European Commission (2020): An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future COM(2020) 741 final https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A741%3AFIN&qid=1605792629666 <p><u>Key EU policy initiatives and legislation in the area of climate:</u></p> <p>Relevant for impact n 21</p> <ul style="list-style-type: none"> • 28/11/2018 - COM (2018) 773 - A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. https://eur-lex.europa.eu/legal- 	
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[content/EN/TXT/?uri=CELEX:52018DC0773](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773)

- Commission communication to the European parliament, the council, the European economic and social committee and the committee of the regions Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people COM/2020/562 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0562>
- Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32003L0087>
- Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO2 emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011 (Text with EEA relevance.) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0631>

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| | <ul style="list-style-type: none">• Regulation (EU) 2019/1242 of the European Parliament and of the Council of 20 June 2019 setting CO2 emission performance standards for new heavy-duty vehicles and amending Regulations (EC) No 595/2009 and (EU) 2018/956 of the European Parliament and of the Council and Council Directive 96/53/EC https://eur-lex.europa.eu/eli/reg/2019/1242/oj• Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas reductions by Member States from 2021-2030 contributing to climate action to meet commitments under the Paris Agreement (also known as Effort Sharing Regulation) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018R0842• Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (Text with EEA relevance) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L .2018.156.01.00 01.01.ENG | |
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Key EU policy initiatives and legislation in the area of transport/mobility:

Relevant for impact n 25

- European Commission : Sustainable and Smart Mobility Strategy – putting European transport on track for the future {SWD(2020) 331 final}

<https://ec.europa.eu/transport/sites/transport/files/legislation/com20200789.pdf>

Relevant for impact n 25, 26

- European Commission (2018): On the road to automated mobility: An EU strategy for mobility of the future COM(2018) 283 final
https://ec.europa.eu/transport/sites/transport/files/3rd-mobility-pack/com20180283_en.pdf

- European Commission (2018): EUROPE ON THE MOVE. Sustainable mobility for Europe: Safe, connected, and clean COM(2018) 293 final https://eur-lex.europa.eu/resource.html?uri=cellar%3A0e8b694e-59b5-11e8-ab41-01aa75ed71a1.0003.02/DOC_1&format=PDF

Relevant for impact n 25, 26

- European Commission (2017): Towards clean, competitive and connected mobility: the contribution of Transport Research and

	<p>Innovation to the Mobility package 31/05/2017 - SWD(2017) 223 final https://ec.europa.eu/transport/sites/transport/files/swd20170223-transportresearchandinnovationtomobilitypackage.pdf</p> <ul style="list-style-type: none">• European Commission (2017): EUROPE ON THE MOVE. An agenda for a socially fair transition towards clean, competitive and connected mobility for all COM(2017) 283 final https://ec.europa.eu/transport/sites/transport/files/com20170283-europe-on-themove.pdf• Regulation (EU) 2019/1242 of the European Parliament and of the council of 20 June 2019 setting CO 2 emission performance standards for new heavy-duty vehicles and amending Regulations (EC) No 595/2009 and (EU) 2018/956 of the European Parliament and of the Council and Council Directive 96/53/EC. https://eur-lex.europa.eu/eli/reg/2019/1242/oj• Regulation (EU) 2019/631 of the European Parliament and of the council of 17 April 2019 setting CO2 emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No	
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443/2009 and (EU) No 510/2011. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0631>

- Commission communication (2016): A European strategy for low-emission mobility COM(2016) 501 final <https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-501-EN-F1-1.PDF>
- Commission delegated regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R0945>
- Commission implementing regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0947>
- STRIA roadmaps on smart mobility and services; transport infrastructure; vehicle design and manufacturing; connectivity and automation of transport; traffic management systems; low-emission alternative energy for transport; electrification: <https://ec.europa.eu/jrc/en/publication/str>

[ategic-transport-research-and-innovation-agenda-stria-roadmap-factsheets](#)

- The monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending directive 2009/16/E <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32015R0757>
- Marine Strategy Framework directive (2008/56/EC) and within international waters IMO MEPC.1/Circ.833 (underwater Noise). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0056>
- Non Road Mobile Machinery Regulation (EU) 2016/1628 regarding the monitoring of gaseous pollutant emissions from in-service internal combustion engines installed in non-road mobile machinery. https://ec.europa.eu/growth/sectors/automotive/environment-protection/non-road-mobile-machinery_en
- Directive 2008/50/EC concerning ambient air quality only applies to national maritime and inland ships. Fully addressing NOx and PM from international shipping

	<p>would require further legislation at European and global levels. https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32008L0050</p> <ul style="list-style-type: none"> • Sulphur directive (2016/802/EU) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L0802&rid=5 • Alternate Fuels Infrastructure Directive 2014/94/EU https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L009 • Directive 2010/65/EU concerning reporting formalities for ships arriving in and/or departing from ports. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:283:0001:0010:EN:PDF 	
<p>Cluster 6</p>	<p>Investments in R&I under Cluster 6 will support the political guidelines for the next European Commission 2019-2024. In particular, they will be key to meeting the objectives of the “European Green Deal”, while largely contributing to “An economy that works for people”, “A new push for European democracy” and “A Europe fit for the digital age”. https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-</p>	<p>The European Green Deal https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en</p> <ul style="list-style-type: none"> • Climate Action https://ec.europa.eu/clima/policies/eu-climate-action_en • Farm to Fork Strategy https://ec.europa.eu/food/farm2fork_en

	<p>commission_en.pdf</p> <p>The European Green Deal is at the heart of the Cluster 6. https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN</p> <p>The most relevant Green Deal initiatives covered are:</p> <ul style="list-style-type: none"> • Climate Action <ul style="list-style-type: none"> • European Climate Law https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1588581905912&uri=CELEX:52020PC0080 • European Climate Pact https://europa.eu/climate-pact/about_en • 2030 Climate Target Plan https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0562 • Commission communication on adaptation to climate change https://ec.europa.eu/clima/policies/adaptation/what_en • Commission communication Farm to Fork 	<ul style="list-style-type: none"> • EU Biodiversity Strategy https://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm • EU Circular Economy Action Plan https://ec.europa.eu/environment/circular-economy/ • Zero Pollution Ambition https://ec.europa.eu/environment/strategy/zero-pollution-action-plan_en • EU Industrial Strategy for Europe https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy_en <ul style="list-style-type: none"> • Common Agricultural Policy https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en <p>Additional documents:</p> <ul style="list-style-type: none"> • European Commission (2018). A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC077 • European Commission (2018). Reflection Paper: Towards a sustainable Europe by 2030 https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf • EEA (2020). State of the Environment Report — The European
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	<p>Strategy https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381</p> <ul style="list-style-type: none"> • Commission communication EU Biodiversity Strategy https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380 • Commission Circular Economy Action Plan https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN • Zero Pollution Ambition https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12588-EU-Action-Plan-Towards-a-Zero-Pollution-Ambition-for-air-water-and-soil • EU Industrial Strategy for Europe https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1593086905382&uri=CELEX%3A52020DC0102 <p>R&I will contribute also to the implementation of a Long-Term Vision for Rural Areas that will be developed under the umbrella of the Democracy and Demography priority. It will also embrace further relevant aspects for the future of rural</p>	<p>environment — state and outlook 2020 https://www.eea.europa.eu/soer/2020</p> <ul style="list-style-type: none"> • EEA (2019). Sustainability Transitions: policy and practice https://www.eea.europa.eu/highlights/how-to-accelerate-change-towards-sustainability • European Commission (2018). Raw materials scoreboard, European innovation partnership on raw materials; https://publications.europa.eu/en/publication-detail/-/publication/117c8d9b-e3d3-11e8-b690-01aa75ed71a1 • Global Ocean Science Report 2020 (UNESCO 2020) https://unesdoc.unesco.org/ark:/48223/pf0000375147 • Global Footprint Network (2019). The Ecological Footprint https://www.footprintnetwork.org/ • Stockholm Resilience Centre (2019). Planetary boundaries research https://www.stockholmresilience.org/research/planetary-boundaries.html • World Economic Forum (2019). The Global Risks Report 2019 http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf • WRI (2018). Creating Sustainable Food Future, A Menu of Solutions to Feed Nearly 10 Billion People by 2050 https://wrr-food.wri.org/table-contents-synthesis • FAO (2020) The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome. https://doi.org/10.4060/ca9229en
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	<p>areas including the implementation of the European Green Deal and the Conference on the future of Europe. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12525-Long-term-vision-for-rural-areas</p> <p>In addition, Cluster 6 will support:</p> <p>Common Agricultural Policy and organic farming legislation</p> <ul style="list-style-type: none"> • Legal texts on Common Agricultural Policy (CAP) strategic plans https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A392%3AFIN • Legal texts on financing, management and monitoring of the CAP https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A393%3AFIN • Legal texts on common organisation of the markets https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1530715098374&uri=CELEX%3A52018PC0394R%2801%29 • Impact assessments https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD%3A2018%3A30 	<ul style="list-style-type: none"> • Food from the Oceans, High Level Group of Scientific Advisors Scientific Opinion No. 3/2017 https://op.europa.eu/en/publication-detail/-/publication/0e91f9db-f4f2-11e7-be11-01aa75ed71a1/language-en/format-PDF/source-94584065 • European Commission (2018). Final Report of the High-Level Panel of the European Decarbonisation Pathways Initiative https://publications.europa.eu/en/publication-detail/-/publication/226dea40-04d3-11e9-adde-01aa75ed71a1 • Landrigan et al. (2017) The Lancet Commission on pollution and health, The Lancet, Vol. 386, No. 10006; https://www.thelancet.com/commissions/pollution-and-health • Report on the development of plant proteins in the EU: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0757 • Report from the Commission to the Council and the European Parliament on the development of plant proteins in the European Union (COM(2018) 757 final) https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/plants_and_plant_products/documents/report-plant-proteins-com2018-757-final_en.pdf • European research & innovation for food & nutrition security; https://publications.europa.eu/en/publication-detail/-/publication/709af455-c03d-11e6-a6db-01aa75ed71a1 • Future-proofing our food systems through research and
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	<p>1%3AFIN</p> <ul style="list-style-type: none"> Natural resources and environment - legal texts and factsheets https://ec.europa.eu/commission/publications/natural-resources-and-environment The future of organics; https://ec.europa.eu/info/food-farming-fisheries/farming/organic-farming/future-organics Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007; https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L .2018.150.01.0001.01.ENG Common Fisheries Policy https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02013R1380-20171120 Maritime Policy https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52007DC0575&from=EN EU Arctic Policy 	<p>innovation (2018); https://publications.europa.eu/en/publication-detail/-/publication/76d1b04c-aefa-11e7-837e-01aa75ed71a1/language-en/format-PDF/source-48314008</p> <ul style="list-style-type: none"> Recipe for change – an agenda for a climate-smart and sustainable food system for a healthy Europe : report of the FOOD 2030 expert group https://op.europa.eu/en/publication-detail/-/publication/d0c725de-6f7c-11e8-9483-01aa75ed71a1/language-en Food 2030 pathways for action - Research and innovation policy as a driver for sustainable, healthy and inclusive food systems https://ec.europa.eu/info/publications/food-2030-pathways-action-research-and-innovation-policy-driver-sustainable-healthy-and-inclusive-food-systems-all_en Good and Land Use Coalition : Growing Better: Ten Critical Transitions to Transform Food and Land Use; 2019 https://www.foodandlandusecoalition.org/global-report/ Crippa, M., De Wilde, B., Koopmans, R., Leyssens, J., Muncke, J., Ritschkoff A-C., Van Doorselaer, K., Velis, C. & Wagner, M. A circular economy for plastics – Insights from research and innovation to inform policy and funding decisions, 2019 (M. De Smet & M. Linder, Eds.). European Commission, Brussels, Belgium. https://op.europa.eu/en/publication-detail/-/publication/33251cf9-3b0b-11e9-8d04-01aa75ed71a1/language-en/format-PDF/source-87705298 IPES-Food (International Panel of Experts on Sustainable Food Systems), 2019, Towards A Common Food Policy for the EU; http://www.ipes-food.org/_img/upload/files/CFP_FullReport.pdf
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	<p>https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016JC0021&from=EN</p> <ul style="list-style-type: none"> • Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32002R0178 • Regulation (EU) 2019/1381 of the European Parliament and of the Council of 20 June 2019 on the transparency and sustainability of the EU risk assessment in the food chain https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R1381 • EU Bioeconomy Strategy https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf • EU Forest Strategy https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52013DC0659 • Blue Growth Strategy 	<ul style="list-style-type: none"> • Scientific Advice Mechanism (2019) Scoping review report: Towards an EU Sustainable Food System; https://ec.europa.eu/research/sam/pdf/meetings/hlg_sam_032019_scoping_report_sustainable-food.pdf#view=fit&pagemode=none • OECD (2020), Rural Well-being: Geography of Opportunities, OECD Rural Studies, OECD Publishing, Paris, https://doi.org/10.1787/d25cef80-en. • OECD (2020), Implications of coronavirus crisis for rural development. http://www.oecd.org/coronavirus/policy-responses/policy-implications-of-coronavirus-crisis-for-rural-development-6b9d189a/ • OECD (2018), Enhancing rural innovation, proceedings of the 11th OECD Rural development conference. https://www.oecd.org/regional/Proceedings.pdf
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	<p>https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=COM:2014:254:REV1&from=EN</p> <ul style="list-style-type: none"> • European Strategy for Marine and Maritime Research https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0534:FIN:EN:PDF • Marine Strategy Framework Directive https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN • Chemicals Strategy for Sustainability https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A667%3AFIN • EU Plastics Strategy https://ec.europa.eu/commission/news/eu-plastics-strategy-2018-nov-20_en https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0904 • Commission White Paper on Artificial Intelligence - A European approach to excellence and trust, COM/2020/65 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1603192201335&ur 	
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- Food 2030 initiative

<https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-319-F1-EN-MAIN.PDF>

- A strategic approach to EU agricultural research & innovation

<https://ec.europa.eu/programmes/horizon2020/en/news/final-paper-strategic-approach-eu-agricultural-research-and-innovation>

- All EU environmental legislation and policies targeting high level of protection for biodiversity, soil, water, air and marine resources, including the Nature Directives, the Pollinators Initiative and the EU Water Framework Directive, etc.

https://ec.europa.eu/environment/index_en

To achieve these goals, Cluster 6 will take advantage of the data, information and services provided by the European Space programme, in particular the parts on Copernicus and Galileo, where appropriate.

- Evidence-base resulting from foresight activities, S&T and innovation indicators, international developments such as the implementation of the SDGs and feedback from implementation, including monitoring the implementation of specific measures with regard to widening participation and sharing excellence and participation of SMEs.

This section complements the elements presented above regarding EU policy objectives, and scientific evidence, to give additional contributions resulting from foresight activities and relevant international developments.

Further relevant evidence-base elements are contained in *the Science Research and Innovation Performance* report of 2020¹⁹

Horizon Europe pillar/part	Evidence-base resulting from foresight activities	international developments such as the implementation of the SDGs and feedback
Cluster 1	<ul style="list-style-type: none"> • 100 Radical Innovation Breakthroughs for the future European Commission, 2019, https://ec.europa.eu/info/sites/info/files/research_and_innovation/knowledge_publications_tools_and_data/documents/ec_rtd_radical-innovation-breakthrough_052019.pdf • Beyond the Horizon: foresight in support of future EU research and innovation policy (BOHEMIA), https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/support-eu- 	International Developments & Reports <ul style="list-style-type: none"> • The Sustainable Development Goals Report 2020 & website, UN, https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf, https://unstats.un.org/sdgs/report/2020/ • Sustainable development in the European Union — Monitoring report on progress towards the SDGs in an EU context — 2020 edition, Eurostat, https://ec.europa.eu/eurostat/web/products-statistical-books/-/KS-02-20-202 , https://ec.europa.eu/eurostat/web/sdi • Research for Health: What has been achieved and what more needs to be done

¹⁹ <https://ec.europa.eu/research/srip/interactive/>

[research-and-innovation-policy-making/foresight/activities/current/bohemia_en](#),
<https://ec.europa.eu/research/foresight>

- BOHEMIA future scenario on Assisted living, https://ec.europa.eu/info/sites/info/files/assisted-living-targeted-scenario-1_2018_en.pdf
- BOHEMIA future scenario on Ubiquitous Expert Systems, https://ec.europa.eu/info/sites/info/files/ubiquitous-expert-systems-targeted-scenario-5_2018_en.pdf
- BOHEMIA future scenario on Defeating Communicable Diseases, https://ec.europa.eu/info/sites/info/files/defeating-communicable-diseases-targeted-scenario-6_2018_en.pdf
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- **Priorities with the potential to be implemented in synergy with other EU programmes.**

Synergies in the Multiannual Financial Framework Programmes and Next Generation EU

Research and innovation investments will contribute the transformations that we are seeking hand in hand with the other EU funding programmes. On the other hand, synergies with other EU programmes must ensure that:

- a) R&I priorities and activities are aligned with, and support, different policies and programmes;
- b) the best possible opportunities for research and innovation results should be exploited and assist the desired transformations.

This understanding should not be limited to European Union programmes and policies, although this is a key starting point for the European Commission. The requirement for synergies is set out in Article 7(7)²⁰ of the Regulation, with a non-exhaustive list of synergies with other Union funding programmes included in its Annex IV.

The annex sets out the synergies expected for each main EU spending programme. The chapeau text sets out more generally what the Commission is setting out to achieve:

“Synergies with other programmes are based on complementarity between programme design and objectives and on compatibility of financing rules and processes at implementation level.

The Strategic Planning shall ensure the alignment of priorities for the different Union funding programmes and ensure coherent funding options at different stages of the R&I cycle. Amongst other things, missions and partnerships shall benefit from synergies with other Union funding programmes and policies.

The deployment of research results and innovative solutions developed in the Programme shall be facilitated with the support of other Union funding programmes, in particular through dissemination and exploitation strategies, transfer of knowledge, complementary and cumulative funding sources and accompanying policy measures. Funding for R&I activities shall profit from harmonised rules that are designed to ensure Union added-value, to avoid overlaps with different Union programmes and to seek maximum efficiency and administrative simplification. “

Ensuring the alignment of priorities for the different Union policies and funding programmes has been a major priority of the Horizon Europe Strategic Planning process. The strategic plan has been developed using a process of co-creation, with different Commission services closely involved from the start. Building on the Strategic Plan, work programmes will be designed to produce the scientific base to support the EUs policies and programmes. This is apparent in many of the calls that will appear in the first Work Programme. It also ensures that there is coherence between the different programmes (for example in the different TRL levels supported in Horizon Europe and the Innovation Fund, or the different targets for support between Horizon Europe and the Life programme), ensuring that duplication or overlap is avoided.

The deployment of research results and innovative solutions developed in Horizon Europe by other EU funding programmes (sequential synergies) is the other key objective of the synergies policy. A

²⁰ <https://data.consilium.europa.eu/doc/document/ST-14239-2020-INIT/en/pdf>

number of initiatives have been taken or are underway to ensure that these synergies are developed in a number of areas:

- Co-creation of the strategic plan and Work Programme to build in research needs for all EU policy areas.
- Involvement in the preparation, and even governance, of the other programmes mentioned in Annex IV of Horizon Europe to ensure the appropriate uptake of R&I results – helped in some cases by one Executive Agency implementing Horizon Europe and other Programmes.
- Building synergies into partnerships and missions – partnerships and missions offer excellent opportunities to create synergies because of their emphasis on wider industrial and societal developments, rather than just Research and Innovation.
- Knowledge management (Dissemination and Exploitation, Feedback to Policy).
- Making EU policies research- and innovation-friendly (Innovation Principle, broad revision of EU State aid rules, Targeted amendment of the State Aid General Block Exemption Regulation, Industrial Strategy, etc).
- Further improvement of financial rules and procedures.

Finally, there has been an increase of the possibilities to support the science and research base with funds from other programmes, together with simplified rules. In particular:

- There is now the (voluntary) possibility for cohesion policy management authorities to transfer up to 5% of their cohesion policy allocation to Horizon Europe to support researchers with excellent projects. Horizon Europe rules will apply fully.
- Cohesion policy funds can now be used as the national contribution to European Partnerships.
- A number of developments will allow for simpler funding of projects with a Seal of Excellence if Managing Authorities choose to do this (again on a voluntary basis). This includes exemption from State Aid rules thanks to a changes in the General Block Exemption Regulations rules and the possibility to apply Horizon Europe funding rates and eligibility rules.

There are also simplified rules for the combination of funds, where there is a strategic interest to do this.

Synergies have existed in Horizon 2020 in a range of areas, including funding of research infrastructures and centres of excellence, use of different funds to ensure sequential synergies (building on research results), research projects with different parts funded by different programmes, seal of excellence etc. The extra effort in Horizon Europe is to ensure that these possibilities are built in from the start from the start of the programme.

- A description of the various approaches for stakeholder consultation and citizen engagement as part of the work to develop Work Programmes.

Consistently with Horizon Europe legal basis, and more specifically articles 4a(2) and 4a(4) of the [proposal for a decision of the Council on establishing the specific programme implementing Horizon Europe], the Commission has organised a co-design approach to help elaborate the Orientations towards Horizon Europe first strategic plan.

The co-design approach pursued by the Commission has aimed at two complementary objectives:

- enlarging the ownership of the programme opportunities to the maximum number of research and innovation stakeholders;
- leveraging on this extended ownership to optimise the effectiveness of the programming, notably through the participatory discussions on the targeted impacts.

The co-design approach has relied on a main methodological pattern: organising iterative discussions with stakeholders underpinned by the documentation needed by them to actively participate to the co-design activities.

Two main series of co-design activities have been designed and implemented:

- remote co-design activities aiming primarily at understanding stakeholders' views on the contribution of Horizon Europe to the EU policy priorities, notably through a limited list a targeted impacts. The interactions have been carried out through the Horizon Europe webpage, documentation and surveys have been published. A web consultation held between 28 June and 4 October 2019 on the first version of the Orientations. 6806 answers have been submitted;
 - A web consultation held from 28 October to 17 November 2019, on the updated version of the Orientations following the first web consultation and the discussions held during the European Research and Innovation Days; 200 answers have been submitted.
 - A web consultation held between 1 September 2020 until 18 September 2020. 1519 contributions have been submitted.
- face to face co-design activities:
 - aiming primarily at receiving stakeholders advice on the substance of the Orientations documents during the first edition of the European Research and Innovation Days (24-26 September 2019). 3800 visitors have participated:
 - 44 co-design sessions where key challenges for the relevant parts of Horizon Europe have been discussed with experts, EC staff and a limited number of stakeholders, for practical reasons (rooms with limited capacities);
 - 21 spaces in the Research and Innovation Days village where all visitors have been able to engage in informal discussions with each of the clusters representatives (from the Commission services) on every aspect of the Orientation documents.
 - set mainly to understand how to best achieve the expected impacts spelled out in the draft strategic plan during the second edition of the European Research and Innovation

Days (22-24 September 2020) . More than 30000 visitors have connected to this virtual event.

- Under the Horizon Europe hub, 11 co-design sessions organised by the 6 Horizon Europe clusters groups, as well as other relevant sessions organised under Horizon Europe hub (European Partnerships, Widening, Gender) and beyond (Association to Horizon Europe).

The substance of the face-to face interactions in 2019 have been summarized in a report, published back to back with the outcome of those discussions, the updated Orientations²¹ on 25 October 2019 launching the second web consultation in October/November 2019.

²¹https://ec.europa.eu/info/sites/info/files/research_and_innovation/strategy_on_research_and_innovation/documents/ec_rtd_he-orientations-towards-strategic-plan_102019.pdf

- **Complementarity and synergies with planning of the KICs of the EIT in accordance with Regulation 294/2008/EC.**

The European Institute of Innovation and Technology (EIT) is an EU body created in 2008²² in order to reinforce the innovation capacity in Europe through integration of education, business and research (knowledge triangle) with a strong focus on entrepreneurial talent and innovation skills. The EIT has been an integral part of the EU's Framework Programme for Research and Innovation since 2014.

The EIT has established itself gradually as a successful instrument addressing societal challenges. The EIT operates mainly through Knowledge and Innovation Communities (KICs), which are large-scale European partnerships between education and training, business and research organisations. There are currently eight KICs that operate in the areas of climate change, digital transformation, a sustainable energy system, food, health, raw materials, urban mobility and added-value manufacturing with the following mission and goals.

Reflecting the growing ambition of the EU on innovation and the necessity to deliver on it, the European Commission made a firm commitment, through the Horizon Europe proposal, to raise further Europe's innovation potential in order to be able to respond to the challenges of the future. The EIT's distinctive role in fostering innovation by bringing together business, education, research, public authorities and civil society is reinforced by its positioning in the Innovative Europe Pillar of the Horizon Europe proposal.

The Strategic Innovation Agenda (SIA) sets out the strategy and priorities for the EIT for the period 2021-2027²³. It represents the main policy document of the EIT over the next programming period and defines its objectives, key actions, expected results and resources needed. The SIA ensures the necessary alignment of the EIT with the Horizon Europe proposal. Delivering on Horizon Europe objectives will require close cooperation with, between the European Innovation Council (EIC) and the EIT. The EIT and the EIC are complementary. The distinctive focus of the EIT will be on human capital, entrepreneurial education, stronger regional outreach and support to business creation and development in specific thematic areas. The SIA also ensures appropriate synergies and complementarities between the EIT activities and other Union initiatives, policies and instruments.

While the strategic planning of Horizon Europe programme applies primarily to Pillar II of Horizon Europe, effective links need to be ensured with Pillars I and III to provide an integrated approach and to ensure better integration of the EIT in the overall Horizon Europe architecture. Therefore, to the extent possible the SIA should take into account the Strategic Planning of Horizon Europe to ensure coherence with the Framework Programme activities, as well as synergies with other relevant Union programmes and consistency with EU priorities and commitments, including those related to the European Green Deal or Digital transformation. This will be ensured through the annual exercise of preparing the EIT's Single Programming Document and the Commission Opinion thereon. Similarly,

²² Regulation (EC) No 294/2008 of the European Parliament and of the Council of 11 March 2008 establishing the European Institute of Innovation and Technology (OJ L 97, 9.4.2008, p. 1). Amended by Regulation (EU) No 1292/2013 of the European Parliament and of the Council of 11 December 2013 (OJ L 347, 11.12.2013, p. 174).

²³ Proposal for the Decision of the European Parliament and of the Council on the Strategic Innovation Agenda for the European Institute of Innovation and Technology (EIT) 2021-2027; COM(2019) 330 final

the EIT will ensure support to the Knowledge and Innovation Communities in aligning their strategic agendas and business plans with the Horizon Europe strategic planning, and provide incentives and guidance to KICs in developing coordination and joint activities with other relevant European Partnerships. It will also aim at increasing complementarity and synergies between the EIT activities and national and regional funding programmes and priorities.

The Horizon Europe strategic plan aims at ensuring coherence between the EIT activities and the rest of Horizon Europe. The EIT will contribute to the strategic coordinating process for European Partnerships. The EIT will continue to strengthen innovation ecosystems that help to tackle global challenges, by fostering the integration of the knowledge triangle in the thematic areas of activity of the KICs.

KICs and its linkages to Horizon Europe Key Strategic Orientations and Expected Impacts

- EIT Digital: Driving the deep tech digital transformation of key sectors of European society
- EIT Climate-KIC: Accelerating the transition to prosperous, inclusive climate resilient society with a circular, zero carbon economy
- EIT InnoEnergy: Becoming the leading engine in achieving the sustainably energy future in Europe
- EIT Health: Improving health and healthy lifestyles of European citizens
- EIT Raw Materials: Turning Europe’s dependence on raw materials into a strategic strengths
- EIT Food: Putting Europe at the center of a global revolution in food innovation, production and consumption
- EIT Manufacturing: Creating the globally competitive and sustainable manufacturing in Europe
- EIT Urban Mobility: Transforming cities into livable urban spaces for people and goods with smart, green and integrated transport

The KICs are autonomous partnerships of businesses, research institutes and higher education institutions (HEIs). The KICs are set up as legal entities under respective Member States’ laws, appoint a Chief Executive Officer to run their operations and have their own governance systems. The relations between the EIT and KICs are laid down in contractual agreements, which set out their respective rights and obligations, ensure an adequate level of coordination and outline the mechanism for monitoring and evaluating KIC activities and outcomes. The KICs report on their activities on a yearly basis to the EIT. Specifically, the KICs submit their annual Business Plans to the EIT as the basis for the award of the EIT grant.

Table 1: EIT KICs contribution to Horizon Europe key strategic orientation and expected impacts

Horizon Europe KEY STRATEGIC ORIENTATIONS (KSO)	Horizon Europe Impact Areas	EIT KICs contribution to the KSO and the relevant expected impacts
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KSO 1 Promoting an open strategic autonomy by leading the development of key digital and enabling technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations	A competitive and secure data-economy	EIT Digital
	Industrial leadership in key and emerging technologies that work for people	EIT Climate KIC EIT InnoEnergy EIT Digital EIT Raw Materials EIT Manufacturing
	Secure and cybersecure digital technology	EIT Digital
	High quality digital services for all	EIT Digital
KSO 2 Restoring Europe's ecosystems and biodiversity, and managing sustainably natural resources to ensure food security and a clean and healthy environment	Enhancing ecosystems and biodiversity on land and in waters	EIT Climate KIC EIT Food EIT InnoEnergy
	Clean and healthy air, water and soil	EIT Climate KIC EIT Food
	Sustainable food systems and nutrition security	EIT Food
KSO 3 Making Europe the first digitally led circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems	Climate change mitigation and adaptation	EIT Climate-KIC EIT InnoEnergy EIT Digital
	Affordable and clean energy	EIT InnoEnergy EIT Digital
	Smart and sustainable transport	EIT Urban Mobility EIT Digital
	Circular and clean economy	EIT Raw Materials EIT Climate-KIC EIT Food
KSO 4 Creating a more resilient, inclusive and democratic European society, prepared and responsive to threats and disasters, addressing inequalities and providing high-quality health care, and empowering all citizens to act in the green	A resilient EU prepared for emerging threats	EIT Climate-KIC EIT Health EIT Food EIT Digital
	A secure and open EU society	EIT Digital EIT Climate-KIC EIT InnoEnergy
	Good health and high-quality accessible healthcare	EIT Health EIT Food

and digital transitions	Inclusive growth and new job opportunities	All KICs
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The EIT has established itself gradually as a successful instrument addressing societal challenges. The EIT operates mainly through Knowledge and Innovation Communities (KICs), which are large-scale European partnerships between education and training, business and research organisations. There are currently eight KICs that operate in the areas of climate change, digital transformation, a sustainable energy system, food, health, raw materials, urban mobility and added-value manufacturing with the following mission and goals.

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- **EIT Health:** Improving health and healthy lifestyles of European citizens
- **EIT Raw Materials:** Turning Europe's dependence on raw materials into a strategic strengths
- **EIT Food:** Putting Europe at the center of a global revolution in food innovation, production and consumption
- **EIT Manufacturing:** Creating the globally competitive and sustainable manufacturing in Europe
- **EIT Urban Mobility:** Transforming cities into livable urban spaces for people and goods with smart, green and integrated transport

The growing ambition of the EU on innovation and the necessity to deliver on it, has been reflected in the Horizon Europe Programme. The EIT's ambition and distinctive role in fostering innovation by bringing together business, education, research, public authorities and civil society is reinforced by its positioning in the Innovative Europe Pillar of the Horizon Europe proposal. The Strategic Innovation Agenda (SIA) sets out the strategy and priorities for the EIT for the period 2021-2027²⁵. It will represent the main policy document of the EIT over the next programming period and defines its objectives, key actions, expected results and resources needed. The SIA ensures the necessary alignment of the EIT with the Horizon Europe proposal. Delivering on Horizon Europe objectives will

²⁴ Regulation (EC) No 294/2008 of the European Parliament and of the Council of 11 March 2008 establishing the European Institute of Innovation and Technology (OJ L 97, 9.4.2008, p. 1). Amended by Regulation (EU) No 1292/2013 of the European Parliament and of the Council of 11 December 2013 (OJ L 347, 11.12.2013, p. 174).

²⁵ Proposal for the Decision of the European Parliament and of the Council on the Strategic Innovation Agenda for the European Institute of Innovation and Technology (EIT) 2021-2027; COM(2019) 330 final

require close cooperation with, between the European Innovation Council (EIC and the EIT. The EIT and the EIC are complementary. The distinctive focus of the EIT will be on human capital, entrepreneurial education, stronger regional outreach and support to business creation and development in specific thematic areas. The SIA also ensures appropriate synergies and complementarities between the EIT activities and other Union initiatives, policies and instruments.

The Horizon Europe Strategic Plan aims at ensuring coherence between the EIT activities and the rest of Horizon Europe. The EIT will contribute to the strategic coordinating process for European Partnerships. The EIT will continue to strengthen innovation ecosystems that help to tackle global challenges, by fostering the integration of the knowledge triangle in the thematic areas of activity of the KICs.

KICs and its linkages to Horizon Europe Key Strategic Orientations and Expected Impacts

The KICs are autonomous partnerships of businesses, research institutes and higher education institutions (HEIs). The KICs are set up as legal entities under respective Member States' laws, appoint a Chief Executive Officer to run their operations and have their own governance systems. The relations between the EIT and KICs are laid down in contractual agreements, which set out their respective rights and obligations, ensure an adequate level of coordination and outline the mechanism for monitoring and evaluating KIC activities and outcomes. The KICs report on their activities on a yearly basis to the EIT. Specifically, the KICs submit their annual Business Plans to the EIT as the basis for the award of the EIT grant.

EIT and the KICs offer an excellent complement to Horizon Europe pillar II actions, in particular when it comes to addressing innovation at systemic level, along the entire value-chain from education to the market. The established cooperation between the businesses, education and research organisations and the integration of the knowledge triangle actors in these areas, especially the integration of the education dimension into the innovation web facilitate the creation of novel solutions and technologies for the green and digital transition.

- EIT Innovation projects may enable piloting of products, services or new business models, and may provide an accelerated access to European markets, and facilitate access to and dialogue with (new) customers. These innovation activities create ventures or launch products and services and are carried out by EIT pan-European partners and a portfolio of fast-growing startups that are ready to scale commercially – scaleups.
- EIT KICs provide an excellent environment for small companies (e.g. that are part of or may come out of Horizon Europe projects) to validate and scale-up their value proposition. The activities help make European industries more competitive, sustainable and growing, providing high-value jobs and contributing to economic growth, in particular SMEs. The companies gain the ability to grow and reach a critical mass to develop innovative products and services and to tap into international value chains and international markets.
- EIT KIC education programs and training modules can be curated/developed in a way that fit Horizon Europe, so that students, entrepreneurs, and the European workforce are trained and equipped with the skills and competences suited for the future needs of industries that are modernised and digitally transformed.

In encouraging multi-actors approaches and to be more effective in achieving impact, the activities and the project proposals of the Pillar II of Horizon Europe shall synergize with relevant initiatives of the EIT and KICs. The innovation ecosystems created and nurtured by the EIT KICs can in particular 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 under the relevant destinations and topics of the Pillar II of Horizon Europe, the activities and project proposals should be also encouraged to explore other forms and means of service provisions of the EIT KICs, in particular those that can be complementary to the envisaged activities.

Table 1 below provides details on linkages, collaborations and synergies of EIT KICs with Horizon Europe Key Strategic Orientations and their potential contribution to the expected impacts under individual clusters.

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Horizon Europe KEY STRATEGIC ORIENTATIONS (KSO)	Horizon Europe Impact Areas	EIT KICs contribution to the KSO and the relevant expected impacts
KSO 1 Promoting an open strategic autonomy by leading the development of key digital and enabling technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations	A competitive and secure data-economy	EIT Digital
	Industrial leadership in key and emerging technologies that work for people	EIT Climate KIC EIT InnoEnergy EIT Digital EIT Raw Materials EIT Manufacturing
	Secure and cybersecure digital technology	EIT Digital
	High quality digital services for all	EIT Digital
KSO 2 Restoring Europe’s ecosystems and biodiversity, and managing sustainably natural resources to ensure food security and a clean and healthy environment	Enhancing ecosystems and biodiversity on land and in waters	EIT Climate KIC EIT Food EIT InnoEnergy
	Clean and healthy air, water and soil	EIT Climate KIC EIT Food
	Sustainable food systems and nutrition security	EIT Food
KSO 3 Making Europe the first digitally led circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems	Climate change mitigation and adaptation	EIT Climate-KIC EIT InnoEnergy EIT Digital
	Affordable and clean energy	EIT InnoEnergy EIT Digital
	Smart and sustainable transport	EIT Urban Mobility EIT Digital
	Circular and clean economy	EIT Raw Materials EIT Climate-KIC EIT Food
KSO 4 Creating a more resilient, inclusive and democratic European society , prepared and responsive to threats and disasters, addressing inequalities and providing high-quality health	A resilient EU prepared for emerging threats	EIT Climate-KIC EIT Health EIT Food EIT Digital

care, and empowering all citizens to act in the green and digital transitions	A secure and open EU society	EIT Digital EIT Climate-KIC EIT InnoEnergy
	Good health and high-quality accessible healthcare	EIT Health EIT Food
	Inclusive growth and new job opportunities	All KICs

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This document informs on the policy priorities and evidence-based information, data and analyses that have been harnessed to co-design Horizon Europe strategic plan (2021-2024).

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