

Horizon Europe Co-design 2021-2024

Fields marked with * are mandatory.

With a proposed budget of 100 billion euro from 2021 to 2027, the Horizon Europe framework programme represents the largest collaborative multinational research and innovation investment in Europe and is open to participants worldwide.

The European Parliament and the Council, the co-legislators have provisionally agreed on the Horizon Europe legislative package. Based on the agreement, a Strategic Plan will put forward the targeted impacts for the investment in research and innovation and the priorities for the first four years of implementation of Horizon Europe.

We invite you to contribute to co-designing and help shaping the future research and innovation investment by responding to this questionnaire. It takes approximately 20 minutes to respond. The results will inform the work on the first Strategic Plan of Horizon Europe. You can further engage by participating in the [Europe an Research and Innovation Days](#) on 24-25-26 September 2019 in Brussels.

It is recommended that prior to responding to the questions, you read the attached document: [Orientations](#) towards the first Strategic Plan implementing the research and innovation framework programme Horizon Europe.

Section B – Where should Horizon Europe play its greatest role?

If you want more information to help answer this section, please follow the link towards the [general orientations](#) part of the document. A [reading guide](#) is as well available.

- Climate Change is the biggest global challenge. Research on solutions, especially on how a European renewable energy system may deliver clean and affordable energy for all (SDG 7) is a main concern of Energi Norge. We contributes to European Climate and Energy policy priorities and highlights the research needs for hydropower to play an even stronger role in the green transition.

Section C - What kind of impacts should Horizon Europe target?

A strategic and targeted approach to European research and innovation investment is needed to maximise the impact of Horizon Europe in line with the sustainable, fair and prosperous future we want.

- Energi Norge is highly concerned with security of infrastructure and vital societal functions, and as our systems are highly digitized, cybersecurity is of utmost importance. The value of Hydropower dams for flood prevention needs research
- Utilizing and developing the existing hydropower system provides necessary energy storage and system balancing that enable a rapid and secure transition to renewable electricity production in Europe. This provides strengthened global competitiveness for European industry and manufacturers.

- Increasing the resilience of a society based on renewable energy and sustainable production is crucial. Through a strong and developed hydropower system we can secure the energy system, provide water management and climate adaptation, and secure and deliver on Europe's sustainability target

Section D - More in detail on the "Orientations" document

Please click on the part of Horizon Europe for which you would like to provide further general input regarding the targeted impacts from Horizon Europe.

- Health (cluster 1)
- Culture, creativity and inclusive society (cluster 2)
- Civil security for society (cluster 3)
- Digital, industry and space (cluster 4)
- Climate, energy and mobility (cluster 5)
- Food, bioeconomy, natural resources, agriculture and environment (cluster 6)
- Widening Participation and Strengthening the European Research Area
- Pillar 1 Excellent Science
- Pillar 3 Innovative Europe

Please provide here further general input regarding the targeted impacts from Horizon Europe.

Civil security for society (cluster 3)

4.2.3 Security and resilience of infrastructure and vital societal functions

Research should strengthen cybersecurity of energy production, especially for industrial control systems, including cyber security in the supply chain.

Digital, industry and space (cluster 4)

Manufacturing business of hydropower is large in Europe, and further research and development of production solutions will strengthen European competitive edge and secure jobs in a European renewable industry. The hydropower industry provides strengthened global competitiveness for European industry and manufacturers. Through a strong and developed hydropower system we will secure the energy system and establish Europe as a global leader for sustainable growth, industry development and technology innovation. The European power sector is undergoing an unprecedented transformation and innovation processes are playing a fundamental role in this process. Digital transformation within the energy sector will create new business models, converging different markets and bring new players into the market. Integrating energy issues under the cluster "Digital, industry and space" is therefore an essential step to accelerate cleanenergy transition, to prepare the sector towards a new digital paradigm leveraged by the required digital infrastructure.

Cluster 5 Climate, energy and mobility (cluster 5)

Cluster "Climate, energy and mobility" has among its targeted impacts new cross-sectoral energy/transport solutions enabling both the clean energy transition and the decarbonisation of transport. This should be elaborated further with new approaches to manage smart grids through

high penetration of electric vehicles and their integration with electric battery storage and renewables to achieve low carbon transport and ensure a cost-effective uninterrupted and affordable supply of energy. A low-carbon European economy will also include the coupling of electricity and heating and cooling systems, and of electricity and other alternative fuels for heavy-duty vehicles, maritime transport and aviation.

4.1 Advance climate science and solutions for a climate neutral and resilient society

4.2.2 – hydrogen

Hydrogen produced with renewable power does it possible to cut emissions in transport where batteries are not suitable and in industry in areas where direct electrification is not possible. Hydrogen and value chains based on hydrogen can also contribute to one socio-economically efficient utilization of large renewable power resources that are far from greater consumption.

4.3.1 Achieve global leadership in renewable energy

Hydropower is a well established renewable with great potential for being redesigned for the future. Many hydropower plants were designed and built at a time when flexibility needs in the system were lower than today. Many European hydropower plants are old and in need of reinvestments, representing an opportunity to redesign hydropower so that it enables more flexible operations fit for a future European energy system. Research is required to find best possible redesign solutions.

Potential research challengers: Hydropower is critical to develop a zero-emission energy system

- An effort should be made to increase the value of hydropower by better utilising the flexible storage facilities of reservoirs in the context of the European power systems.
- Digitalization of predictive maintenance and operation with use of machine learning
- Improved skill of seasonal to decadal forecasts will enable optimization of operations and planning of renewable energy, and potentially increase renewable production.

4.3.2 Develop flexible, zero greenhouse gas emission and citizen-centred energy systems and grid

It is essential to develop integrated, digitalised energy systems with a highly reliable energy supply, low emissions of greenhouse gases and effective integration of new technologies in energy production, consumption and storage. As carbon-neutral and increasingly decentralized electricity generation is deployed across Europe, smart grid technologies and digital technologies are unlocking new capabilities:

Potential research challengers: Digitalised and integrated energy systems:

- Develops the electricity grid of the future.
- Designing the future's flexible and robust electrical distribution grid at an acceptable cost.
- The systems must also accommodate new business models, more active customers and efficient system operation and maintenance.
- integrated development of the energy system, ICT security and vulnerability, electrical power issues, dynamic system modelling, social science-based perspectives