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Evidence Framework on monitoring and evaluation of Horizon Europe

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List of Acronyms

CPS	Call Passport System
DOI	Digital Object Identifier
EDF	European Defence Fund
EIC	European Innovation Council
EIT	European Institute of Innovation and Technology
EMI	Expert Management Internal system
ERA	European Research Area
ERC	European Research Council
FP	Framework Programme
FTE	Full-time Equivalent
FWCI	Field Weighted Citation Index
GDP	Gross Domestic Product
H2020	Horizon 2020
HE	Horizon Europe
IPRs	Intellectual Property Rights
JRC	Joint Research Centre
KIC	Knowledge and Innovation Community
KIP	Key Impact Pathways
MNCS	Mean Normalized Citation Score
MSCA	Marie Skłodowska-Curie Actions
PDM	Participant Data Management system
R&I	Research & Innovation
SDG	Sustainable Development Goal
SEP	Submission & Evaluation of Proposals
SSH	Social Sciences and Humanities
SME	Small and Medium Enterprise
SO	Specific Objective
SPP	Strategic Planning and Programming
TFEU	Treaty of the Functioning of the European Union
TRL	Technology Readiness Level
UN	United Nations
WP	Work Programme

1. INTRODUCTION

This Staff Working Document describes the evidence framework for the monitoring and evaluation of the Horizon Europe programme, the EU Framework Programme for research & innovation (R&I) for 2021-2027. It responds to the requirements set out in the Communication on the performance framework for the EU budget under the 2021-2027 MFF for each programme to have a monitoring and evaluation framework documented.

R&I activities play a key role in steering the present and shaping the future of Europe. They can help make people's lives better by improving *inter alia* healthcare, environment, climate and digital services, and they contribute to solving present and unforeseen global challenges. At the same time, by delivering new products and services, R&I activities contribute to Europe's competitiveness on a global scale, boost growth and create jobs. R&I also clearly demonstrated how they could help build a more resilient Europe and the EU strategic autonomy.

Therefore, EU investment in R&I through multi-annual Framework Programmes remains key. The Framework Programmes for R&I are based on Articles 173(3), 182(1), 183 and the second paragraph of Article 188 of the Treaty on the Functioning of the European Union ('TFEU')[1] and on an area of (shared) parallel competence to which the subsidiarity and proportionality principles clearly apply.

Horizon Europe, the 9th EU Framework Programme for R&I, has a budget of EUR 95.5 billion for the period 2021-2027. It succeeds Horizon 2020 which covered the previous MFF 2014- 2020.

Given the economic and societal challenges that Europe is facing, it is essential to maximize the EU's budget effectiveness, to deliver tangible results and impacts on the ground and to better communicate them. However, measuring the tangible impacts of research and innovation investments remains challenging. R&I activities are risky endeavours that build on knowledge that cumulates over decades.

The interim evaluation of Horizon 2020 showed that the indicators system used for assessing the results and impact of Horizon2020 – while complex – did not allow telling the story of the diversity of impacts of the programme as a whole. A more systemic approach was needed.

A High Level Group, chaired by Pascal Lamy, former Commissioner for Trade (1999-2004), on maximising the impact of EU R&I programmes recommended[2] in 2017 that the post-2020 EU R&I programme captures and communicates the impact better, through a comprehensive and centralised programme monitoring and evaluation system. As a response, a new **framework, more impact-oriented,** was set-up for monitoring and evaluating Horizon Europe. This framework goes beyond tracking input and outputs (such as amounts of funding provided, number of publications, etc.). It goes towards measuring impact and is enshrined in the Horizon Europe legislation *(key impact pathways*[3]*)*. This framework also aims at making the monitoring data available to the public, in close to real-time, through a user-friendly interactive visualisation tool: the Horizon dashboard.

2. SETTING UP AN EVIDENCE FRAMEWORK FOR THE MONITORING AND EVALUATION OF HORIZON EUROPE

The evidence framework for the monitoring and evaluation of Horizon Europe was set up in line with the monitoring and evaluation provisions of the Horizon Europe Regulation[4]. It draws from

[1] The Euratom proposal is based on Article 7 of the Treaty establishing the European Atomic and Energy Community

[2] LAB-FAB-APP: Investing in the European future we want: Report of the independent High Level Group, led by Pascal Lamy, on maximising the impact of EU research and innovation programmes, 2017.

[3] Article 50 of Regulation (EU) 2021/695 of the European Parliament and the Council and Annex V thereto.

[4] Regulation (EU) 2021/695 establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination, and repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013, (OJ L 170, 12.5.2021, p. 1).

the lessons learnt from the Horizon 2020 mid-term evaluation and is built in accordance with the European Commission Better Regulation guidelines.

2.1. Legal Provisions

The provisions for the monitoring and evaluation of Horizon Europe are set out in Articles 50 and 52 Horizon Europe Regulation and notably in Annex V thereto.

- Article 50 requires the continuous monitoring of the management and implementation of the R&I Framework Programme, the Specific Programme implementing Horizon Europe-and the activities of the European Institute of Innovation and Technology (EIT).
- Article 52 provides for the programme evaluation framework
- Annex V of the Regulation provides details on the Key Impact Pathways Indicators (KIPs) defined to monitor the Programme's progress towards its general and specific objectives. It also indicates that in addition and beyond key impact pathways indicators, data on the optimised delivery of the Programme for strengthening the European Research Area (ERA), fostering the excellence-based participations from all Member States in the Programme as well as facilitating collaborative links in European R&I are collected and reported in close to real-time as part of implementation and management data, referred to in Article 50.
- Article 7 defines common principles for the implementation of the Programme

The monitoring obligations are complemented with Council decision (EU) 2021/764 (EU) 2021/764[5] establishing the specific programme implementing Horizon Europe and describing its operational objectives. Details are provided in Annex A to this SWD.

2.2. Lessons learnt from Horizon 2020 on monitoring and evaluation

Since 1984, the EU investments in the successive Framework Programmes for R&I has contributed to key scientific advancements and discoveries for the benefits of the EU citizens and the economy. These impacts have partly been documented in evaluation exercises and dedicated studies. These evaluations were usually focussed on specific parts of the programme or on specific instruments – with their own methodologies - whereas expert panels were typically asked to perform a meta-evaluation of the whole programme based on these inputs.

Overall Framework Programmes' assessments faced common methodological challenges and limitations for impact analysis due to the lack of structured monitoring systems linked to clear objectives and intervention logic. They often faced difficulties in capturing longer term and wider effects, in particular on the society or on the economy. This was partly due to the early timing of most evaluations but also to the limited data available beyond ad-hoc surveys, interviews or case studies. It was also sometimes difficult to disentangle, for a given result, what could be attributed to the Framework Programme and what was due to other initiatives.

For Horizon 2020, the monitoring system of the Framework Programme underwent noticeable improvements. For the first time, a set of Key Performance Indicators and a list of cross-cutting topics (Art.31 of Horizon 2020 Regulation[6]) were introduced. In order to report in the interim evaluation of Horizon 2020 on the progress made towards the objectives of the programme, those indicators have been complemented by ad-hoc quantitative and qualitative analyses. An attempt was also made to classify and report on the expected impacts of the programme according to a set of three non-exclusive categories: scientific impact, economic/innovation impact and societal impact. The evaluation also reported on the longer-term impact of the previous Framework

[5] Council Decision (EU) 2021/764 of 10 May 2021 establishing the Specific Programme implementing Horizon Europe – the Framework Programme for Research and Innovation, and repealing Decision 2013/743/EU, (OJ L 167I , 12.5.2021, p. 1).

[6] Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC, (OJ L 347, 20.12.2013, p. 104).

Programme, notably based on counterfactual analysis of research outputs and econometric modelling on jobs and growth.

Overall, the interim evaluation of Horizon 2020 identified a need to further improve the monitoring and evaluation framework to track and assess the impact of the Framework Programme in the short, medium and longer terms according to its wider set of objectives.

2.3. Purpose of the evidence framework

The revamped evidence framework for the monitoring and evaluation of Horizon Europe was designed with the overall objective to **deliver value into the policy cycle**, through:

- **Evidence to design (planning)**: data and indicators to support the design stage of the programme components, and in particular the multiannual strategic plans and work programmes, and to identify and frame the impacts targeted through the investments done with the Framework Programme (see section 4).
- **Evidence to inform (monitoring)**: data and indicators allowing for rapid policy adjustments to maximise the impact of the EU investments and better align to the strategic priorities of the Union. This includes data and indicators to systematically track the progress of Horizon Europe during its implementation and to monitor its inputs, activities, outputs and results/outcomes. At the same time, this evidence will form one of the main sources that informs the evaluation of Horizon Europe (see sections 5 and 6).
- **Evidence to improve (evaluation and learning)**: evidence on inputs, activities, outputs, results/outcomes and impact of Horizon Europe, but also on additional data collected through different sources including, interviews, surveys and case studies. This will allow a more encompassing and in-depth retrospective assessment of whether Horizon Europe achieved its objectives and how, based on the criteria of effectiveness, efficiency, relevance, coherence and EU added value[7] (see section 7).

The new framework aims to support the measurement of the programme‘s performance and its progress against its general, specific and operational objectives (effectiveness and EU added value) as well as to assess its relevance, coherence and efficiency of implementation. It allows for a continuous learning process that will provide regular insights to policy makers and to the wider public regarding the effects and diversity of benefits the Framework Programme for R&I is bringing. It is expected to **help maximise the scientific, economic and societal impact of the Framework Programme for R&I,** by shedding light on its performance during and after its implementation.

It encompasses indicators and data that will:

– help measure progress towards the programme’s objectives;
– help monitor the implementation and performance of the programme and provide an early warning on potential deviations;
– allow to communicate and inform about the performance and
– allow for deeper performance analyses in the interim and ex post evaluations of the EU programme, the result of which will assist policy makers in designing evidence-based policies and taking informed decisions promptly even on emerging priorities.

[7] See EU Better regulation toolbox

The purpose of this Staff Working Document is to present the evidence framework for the monitoring and evaluation of the Horizon Europe programme (see Figure 1[8]) by describing the intervention logic, explaining the evidence that will be used for designing, informing and improving the programme, including a comprehensive set of data and indicators, and describing the data management approach. The elements of this framework are separately described in sections below.

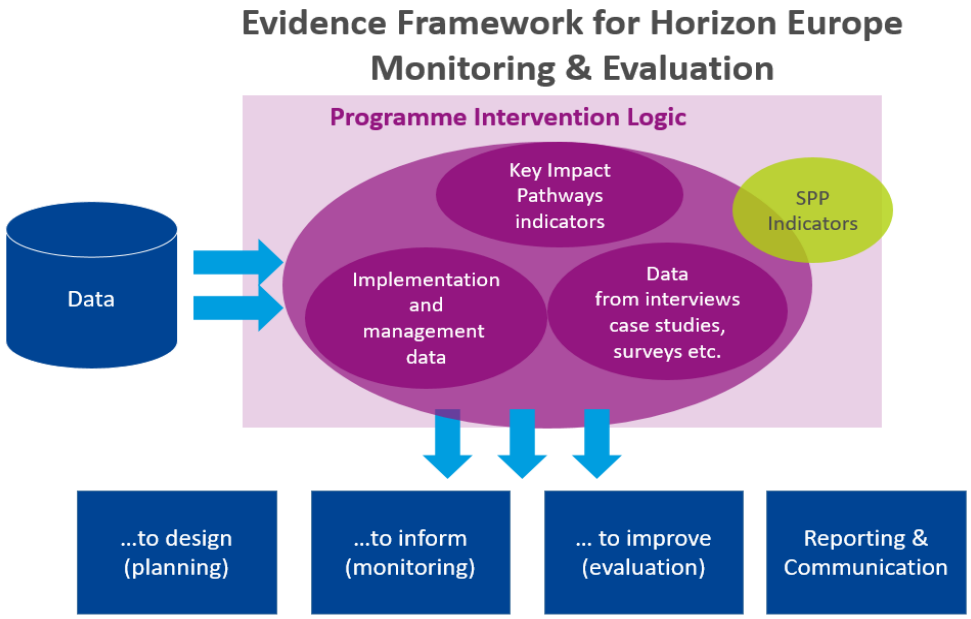


Figure 1: Horizon Europe Monitoring and Evaluation

3. HORIZON EUROPE INTERVENTION LOGIC

This chapter explains the intervention logic underpinning the Horizon Europe programme. The intervention logic was updated since the Impact Assessment to reflect the final text of the Horizon Europe Regulation.

3.1. Horizon Europe Objectives

The Horizon 2020 interim evaluation and Horizon Europe Impact assessment identified four key R&I challenges that should be tackled through future R&I programmes:

(1) The creation and diffusion of high-quality new knowledge and innovation in Europe should be improved.
(2) The need to reinforce the impact of R&I to deliver on EU priorities.
(3) The lack of rapid uptake of innovative solutions in the EU.
(4) The need to strengthen the European Research Area (ERA).

[8] SPP: Strategic planning & programming

General objective of Horizon Europe:
Article 3 (1) Horizon Europe Regulation

"to deliver **scientific, technological, economic and societal impact** from the Union's investments in R&I so as to strengthen the scientific and technological bases of the Union and foster the competitiveness of the Union in all Member States including in its industry, to deliver on the Union strategic priorities and to contribute to the realisation of Union objectives and policies, to tackle global challenges, including the SDGs by following the principles of the 2030 Agenda and the Paris Agreement, and to strengthen the ERA. The Programme shall thus maximise Union added value by focusing on objectives and activities that cannot be effectively realised by Member States acting alone, but in cooperation."

Based on these identified **R&I challenges**, Horizon Europe was set to promote scientific excellence, generate new knowledge and technologies, address EU priorities and global challenges and provide the appropriate environment to turn great ideas into products and services that will bring sustainable growth to the economy and create jobs.

The identified R&I challenges shaped the definition of the **general objective** of the Framework Programme and of its **specific objectives** as laid down in the Horizon Europe Regulation (EU) 2021/695).

The **operational objectives** were laid down in Article 2 of the Council Decision (EU) 2021/764 establishing the Specific Programme implementing Horizon Europe, whose achievements would contribute to the specific and general objectives of the programme. Figure 3 below presents a graphic visualisation of the intervention logic for Horizon Europe. Its main components are described in the sections hereafter.

3.1.1. Specific objectives

In order to achieve its expected scientific, technological, economic and societal impacts, Horizon Europe has four specific objectives described in Article 3(2) of Horizon Europe Regulation. The three first objectives are impact objectives while the fourth one focusses on the daily implementation of the programme, contributing to the three first objectives:

(1) Scientific objective: to develop, promote and advance **scientific excellence**, to support the creation and diffusion of high-quality new fundamental and applied knowledge, of skills, technologies and solutions, to support training and mobility of researchers, to attract talent at all levels and contribute to the full engagement of the Union's talent pool in actions supported under the Programme;
(2) Societal objective: to generate knowledge, strengthen the impact of R&I in developing, supporting and implementing Union policies and support the access to and uptake of innovative solutions in European industry, in particular SMEs, and in society to **address global challenges, including climate change and the SDG**s;
(3) Economic/Technological objective: to foster all forms of **innovation**, facilitate technological development, demonstration and knowledge and technology transfer, strengthen deployment and exploitation of innovative solutions;
(4) Optimise the Programme's delivery: with a view to strengthening and **increasing the impact and attractiveness of the ERA**, to **foster excellence-based participation** from all Member States, including low R&I performing countries, in the Programme and **to facilitate collaborative link**s in European R&I.

3.1.2. Operational objectives

Council Decision (EU) 2021/7064 established the **Specific Programme implementing Horizon Europe**. It defines the detailed rules for the implementation of the Horizon Europe Programme, fixes its duration and provides for the means deemed necessary (see Article 182(3) of the TFEU).

It specifies the 16 operational objectives of Horizon Europe, whose achievement would contribute to delivering on the specific and general objectives of the programme. Figure 2 below provides an overview of the primary link between the operational objectives and the four specific objectives (SOs) of the programme. However, any of the operational objectives can contribute to delivering more than one specific objectives. In particular, the achievement of the operational objectives linked to SO.4 will help deliver on the first 3 specific objectives.

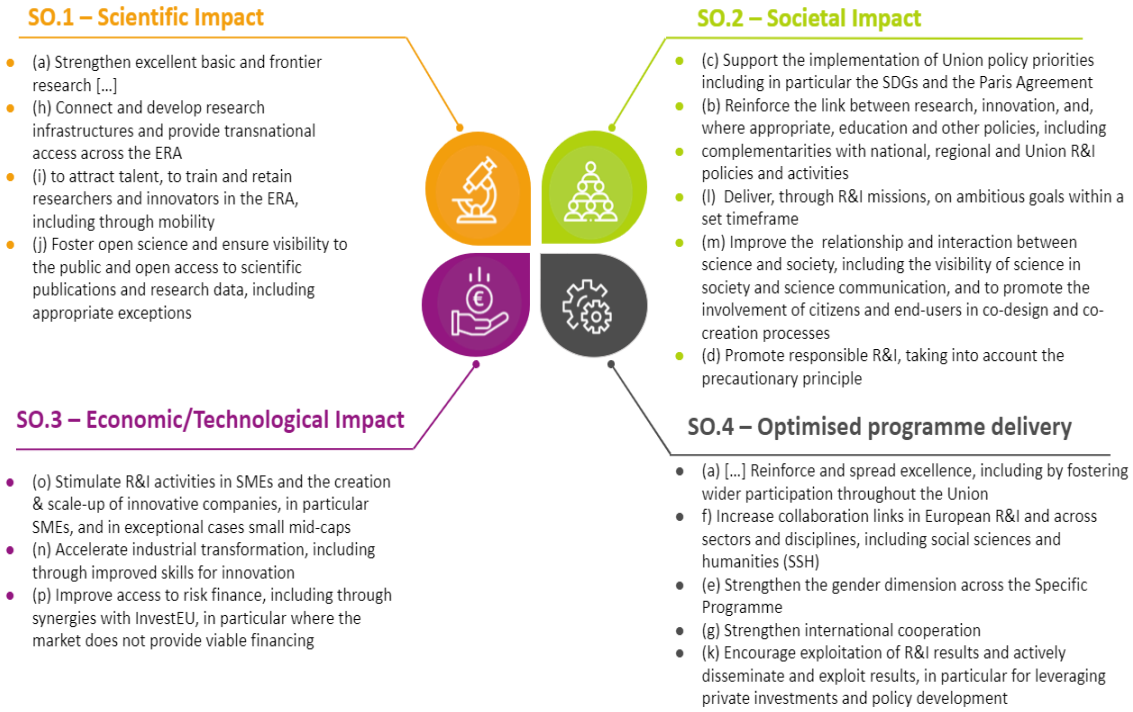


Figure 2: Primary link between operational objectives and specific objectives

HORIZON EUROPE INTERVENTION LOGIC

GENERAL OBJECTIVE: to deliver scientific, technological, economic and societal impact from the Union's investments in R&I so as to strengthen the scientific and technological bases of the Union and foster the competitiveness of the Union in all Member States including in its industry, to deliver on the Union strategic priorities and to contribute to the realisation of Union objectives and policies, to tackle global challenges, including the SDGs by following the principles of the 2030 Agenda and the Paris Agreement, and to strengthen the ERA.

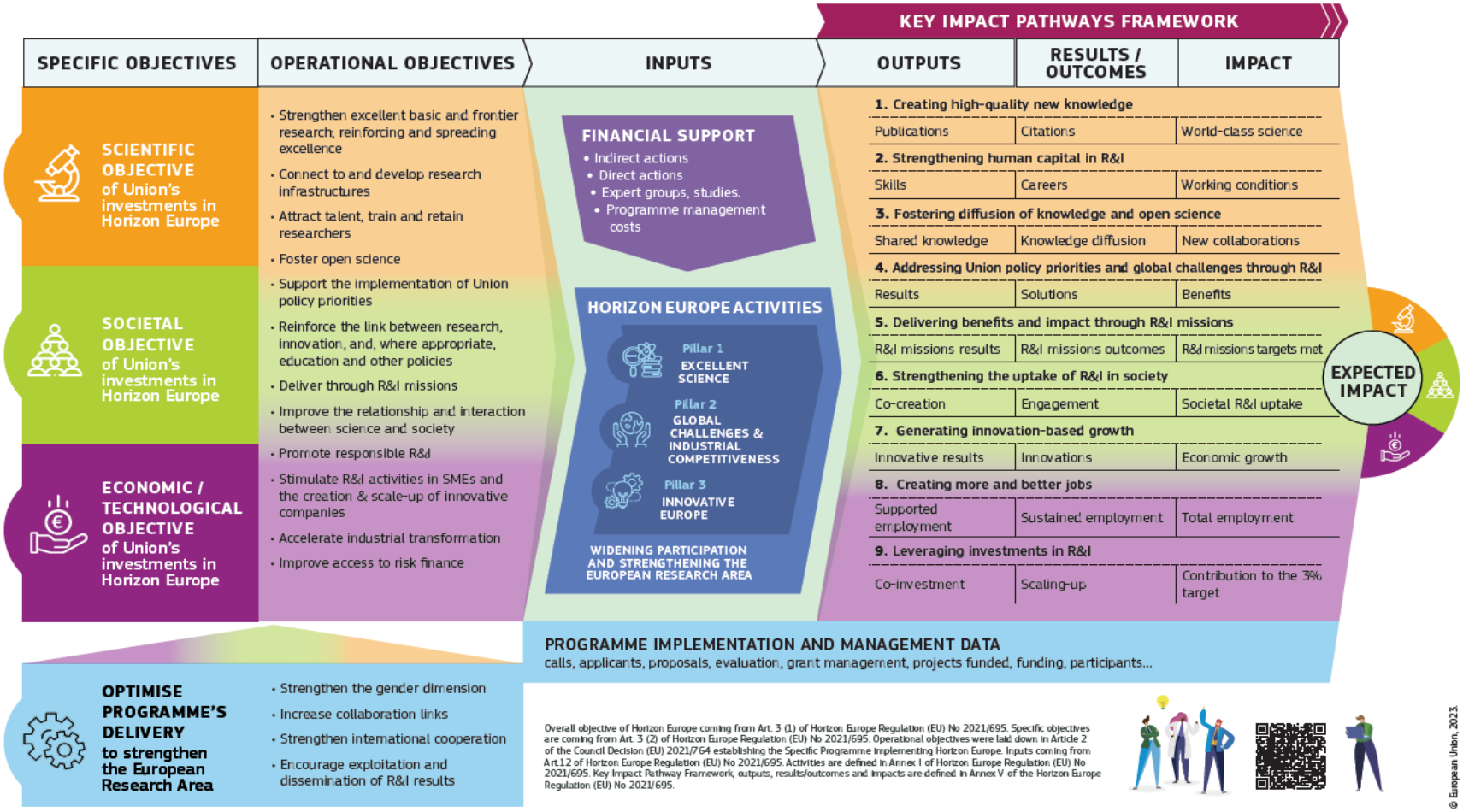


Figure 3: Intervention Logic

3.1.3. Inputs of Horizon Europe

Horizon Europe has a budget of EUR 95.5 billion for the current MFF 2021-2027. This budget includes EUR 5.4 billion from the Next Generation EU instrument, particularly to support fair green and digital transitions, recovery from the COVID crisis, preparedness and resilience. The budget is used to support research and innovation across the European Union and Associated Countries, being paid directly to researchers, innovators and research institutions in the Member States and Associated Countries.

The Programme is implemented directly by the Commission or through funding bodies. Funding is mostly provided through grants but also through financial instruments. The selection of projects to fund is done mainly through open calls for proposals, selected according to the criteria of excellence, impact and the quality and efficiency of implementation.

3.1.4. Activities of Horizon Europe

Horizon Europe is structured **around four main groups of activities** called Pillars (see Article 4 of the Horizon Europe Regulation and Figure 4 below). As specified in Article 3 of the Horizon Europe Regulation, **all four Pillars contribute to the general and specific objectives of the programme**. This means that the achievements of the objectives are not mutually exclusive, and that the four parts are implemented through a series of mutually reinforcing activities. The design of the three pillars ensures interconnections leading to mutual reinforcement of activities, helping meet all of the Programme's objectives and ultimately boosting the overall impact.

Support to basic research remains a cornerstone of the Programme, pursued primarily under the first pillar (Excellent science), but also in the other two pillars; applied research and incremental innovation are the centre of gravity in the second pillar, addressing both industrial and societal needs (Global Challenges and European Industrial Competitiveness), while innovation is the focus of the third pillar (Innovative Europe). The overarching mission-oriented approach provides a sense of direction to all activities supported by the Programme. And, to tackle global challenges, the **European Partnerships** approach was reinforced to become more strategic, coherent, and impact-driven.

Figure 4: Horizon Europe Programme structure

- The **Excellent Science pillar (Pillar I)** supports frontier research projects designed and driven by researchers through the European Research Council. It also funds fellowships and mobility of researchers through Marie Skłodowska-Curie actions and investments in world-class research infrastructures.

- The **Global Challenges and European Industrial Competitiveness pillar (Pillar II)** supports research into societal challenges, reinforces technological and industrial capacities, and is organised around 6 clusters[9] of activities. It also sets five EU Missions with ambitious goals which aim to bring solutions to some of the greatest global challenges: adaptation to climate change, cancer, oceans and water, climate neutral and smart cities and soil health. It supports partnerships with Member States, industry and other stakeholders to work jointly on research and innovation. It includes action by the Joint Research Centre supporting policy-making with independent scientific evidence and technical support.

- The **Innovative Europe pillar (Pillar III)** aims to make Europe a frontrunner in market-creating innovation and SME growth through the European Innovation Council. It supports the development of the overall European innovation ecosystems. Support provided through the European Institute of Innovation and Technology (EIT) aims to foster the integration of business, research, higher education and entrepreneurship.

- A **fourth horizontal pillar on Widening participation and Strengthening the European Research Area** underpins the whole of Horizon Europe. It supports widening EU Member States and Associated countries in their efforts to unlock their national research and innovation potential and it will especially help low R&I performing Member States to increase their participation in Horizon Europe.

In addition, Horizon Europe is implemented through European Defence Fund (EDF) which is a specific programme established by Regulation (EU) 2021/697. Horizon Europe is also complemented by the Euratom Research and Training Programme. Please note that Euratom and EDF monitoring obligations are not covered in this document.

3.1.5. Outputs, results/outcomes and impacts of Horizon Europe

The strategic orientations for R&I investments are defined in the multiannual **Horizon Europe strategic plans** which act as a compass for defining Horizon Europe's activities. The latter are operationalised through (annual/two years) **work programmes** which set out funding opportunities. Funded Horizon Europe projects are expected to bring benefits to society, the economy and science, first through their outputs and then, through their expected outcomes/results and impacts:

- **Project outputs** are concrete short-term outputs created during the implementation of Horizon Europe's projects, such as publications, innovative solutions, algorithms, new business models, prototypes, trained researchers, new infrastructures, new standards etc.
- **Expected results (outcomes)** are mid-term effects of Horizon Europe projects such as uptake, diffusion, use and deployment of the project's results by direct target groups. They are directly linked to the actions supported and allow observing direct outcomes during implementation and not only at the end of a project. Thus, they provide a strong basis for later evaluation activities.
- **Expected impacts** are longer-term effects on society, the economy and science enabled by the outcomes of the R&I investments.

[9] The **six clusters** cover the following topics in line with the policy priorities: 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).

4. EVIDENCE TO DESIGN: MULTIANNUAL STRATEGIC PLAN AND WORK PROGRAMMES

4.1. Horizon Europe Strategic Plan and Work Programmes

4.1.1. Horizon Europe Strategic Plan

A multiannual strategic plan for Horizon Europe facilitates the implementation of the R&I activities[10]. It defines **key strategic orientations, which mirror the political priorities of the European Union.** It outlines the expected impacts from R&I activities and enables to better track and measure them. It ensures consistency between the work programmes, EU priorities and national priorities.

The first Horizon Europe Strategic Plan for the period 2021-2024 is based on the political priorities of the Commission 2019-2024. It sets out 4 key strategic orientations and 15 impact areas. A public consultation was launched in December 2022 on the next Strategic Plan 2025-2027, which is planned to be adopted in first half of 2024 (tentatively).

The **4 key strategic orientations** and related impact areas in Horizon Europe Strategic Plan 2021-2024 are:

Key Strategic Orientations		Impact Areas
A	**Promoting an open strategic autonomy** by leading the development of key digital, enabling and emerging technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations.	(1) A competitive and secure data-economy (2) Industrial leadership in key and emerging technologies that work for people (3) Secure and cybersecure digital technology (4) High quality digital services for all
B	**Restoring Europe's ecosystems and biodiversity**, and managing sustainably natural resources to ensure food security and a clean and healthy environment.	(5) Enhancing ecosystems and biodiversity on land and in waters (6) Clean and healthy air, water and soil (7) Sustainable food systems from farm to fork on land and sea
C	**Making Europe the first digitally enabled circular, climate-neutral and sustainable economy** through the transformation of its mobility, energy, construction and production systems.	(8) Climate change mitigation and adaptation (9) Affordable and clean energy (10) Smart and sustainable transport (11) Circular and clean economy
D	**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 and digital transitions.	(12) A resilient EU prepared for emerging threats (13) A secure, open and democratic EU society (14) Good health and high-quality accessible healthcare (15) Inclusive growth and new job opportunities

[10] See Article 6(6) of the Horizon Europe Regulation (EU) 2021/695.

The **15 impact areas** cover a total of **32 expected impacts** that have been defined in an inclusive and ambitious strategic planning process (see Annex D to this SWD). The expected impacts describe the longer-term effects to which research and innovation are due to contribute. They are a core element of the impact-driven approach of Horizon Europe and cover a wide range of social, economic, ecological and scientific aspirations.

4.1.2. Horizon Europe main Work Programmes

The first **main Work Programme** for Horizon Europe covered the period 2021-2022. A new Work Programme for 2023-2024 was published in early December 2022. Both work programmes outline the objectives and specific topic areas that will receive a total of EUR 14.7 billion (2021-2022) and EUR 13.5 billion (2023-2024).

Work Programmes are designed around a series of coherent packages of **calls for proposals** with impact-driven **destinations** and a number of **topics**. Each destination describes socio-economic challenges to be addressed and the related expected impacts that R&I activities will contribute to (see Annex D). Under each destination, one or more **topics** describe the expected outcomes and the scope of the research and innovation activities to be supported.

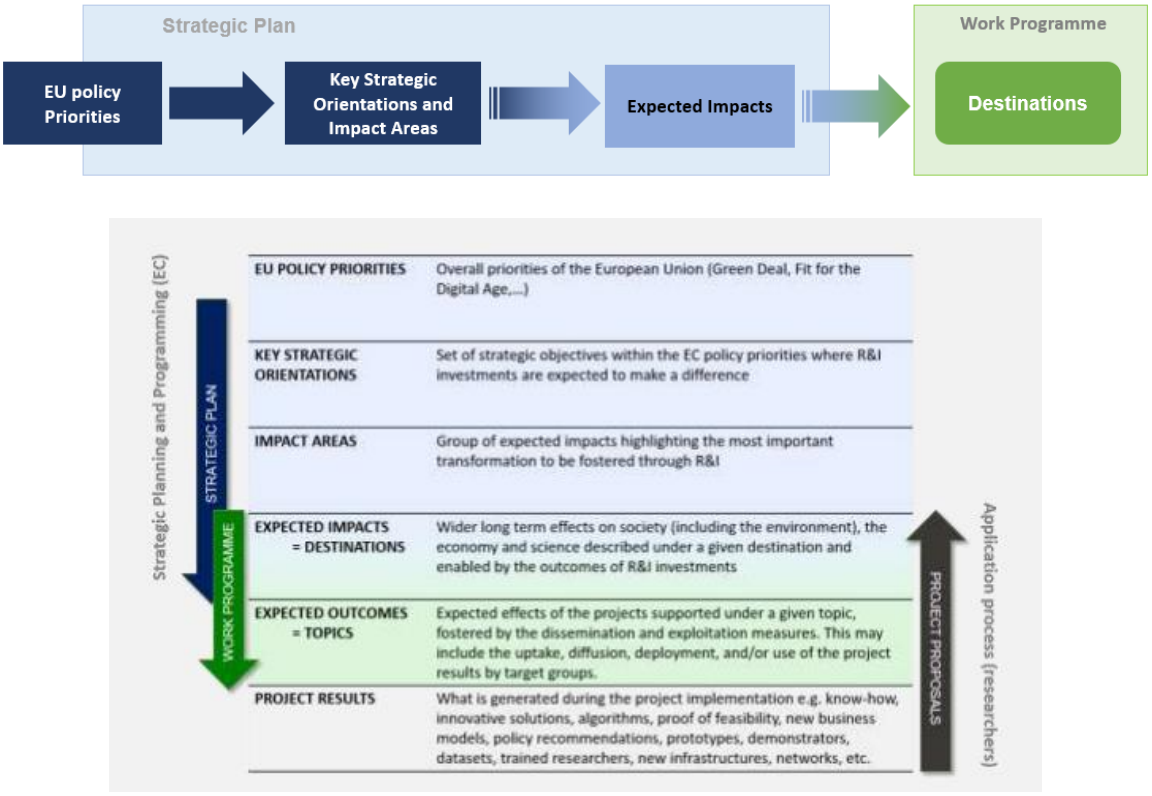


Figure 5: From EU priorities to work programme destinations

The strategic plan also outlines how the six **Clusters** of Horizon Europe's Pillar II, will contribute to the key strategic orientations and the corresponding expected impacts (see Annex D for details).

The implementation of the Strategic Plan and work programmes will be monitored through the following indicators:

- Share of Horizon Europe calls and topics by Key Strategic Orientation and by Impact Area
- Share of Horizon Europe projects by Key Strategic Orientation and by Impact Area
- Share of Horizon Europe calls, topics and projects by cluster

These data will be collected as part of the **programme implementation and management data** (see section 5.2.2). Additional indicators would be calculated on the basis of these data depending on the needs of the analysis.

Other annual work programmes complement the Horizon Europe main Work Programme such as the European Research Council (ERC) work programmes and the European Innovation Council (EIC) work programmes and the JRC work programmes.

4.2. DG Research and Innovation Strategic Plan

In parallel to Horizon Europe strategic plans, **multiannual strategic plans** are also elaborated by DG Research and Innovation (DG R&I) to present how the research and innovation activities contribute to the Commission's policy priorities through their own specific objectives, and define indicators to allow performance to be measured and managed over time (SPP indicators), which are reported in the annual activity reports. The DG R&I strategic plan 2020-2024 covers activities related to Horizon Europe but not only.

The Strategic Plan defines a series of indicators to monitor. Table 1 presents the results indicators relevant to Horizon Europe.[11]

Table 1: Results indicators relevant to Horizon Europe[12], defined in DG Research and Innovation Strategic Plan 2020-2024

Indicators	Description
Result indicator 1	Number of newly reported Intellectual Property Rights (IPRs) applications from Horizon projects addressing the European Green Deal per year *(Horizon Europe Key Impact Pathway 4)*
Result indicator 2	Number of newly reported scientific publications from Horizon projects addressing the European Green Deal per year. *(Horizon Europe Key Impact Pathway 4)*
Result indicator 3	Proportion of climate related spending (climate mainstreaming) in Horizon Europe spending
Result indicator 4	Share of Horizon Europe Green Deal related projects where citizens and end-users contribute to the co-creation of R&I content *(Horizon Europe Key Impact Pathway 6)*
Result indicator 5	Progress towards R&I missions' targets related to the European Green Deal
Result indicator 6	Number of newly reported Intellectual Property Rights (IPRs) applications from Horizon projects addressing the digital transition in Europe per year. *(Horizon Europe Key Impact Pathway 4)*
Result indicator 7	Number of newly reported scientific publications from Horizon projects addressing the digital transition per year. *(Horizon Europe Key Impact Pathway 4)*
Result indicator 8	Amount of public and private investment mobilised with the initial Framework Programme investment (leverage ratio) towards the GDP for R&D 3% target. (*Horizon Europe Key Impact Pathway 9)*
Result indicator 9	Number of researchers accessing European research infrastructures, including e-infrastructures, supported through the Framework Programme

[11] See Annex C for further details on milestones and targets. Further explanation on methodology and source of data can be found in DG Research and Innovation Strategic Plan 2020-2024. The list will be reviewed upon publications of the next Strategic Plan.

[12] Indicators 17 and 19 were not retained as relevant to Horizon Europe.

Result indicator 10	Share of researchers from widening countries[13] researchers' population involved in the Framework Programme per year
Result indicator 11	Share of funds allocated to SMEs in Horizon projects per year
Result indicator 12	FTE jobs supported in entities involved in Horizon projects per year (*Horizon Europe Key Impact Pathway 8)*
Result indicator 13	Share of scientific international co-publications funded by the Framework Programme
Result indicator 14	Number of newly reported Intellectual Property Rights (IPR) applications from Horizon projects tackling emerging threats and improving EU crisis preparedness and resilience per year *(Horizon Europe Key Impact Pathway 4)*
Result indicator 15	Number of newly reported scientific publications from Horizon projects addressing the emerging threats and improving EU crisis preparedness and resilience per year *(Horizon Europe Key Impact Pathway 4)*
Result indicator 16	Number of newly reported scientific publications from Horizon projects addressing health per year *(Horizon Europe Key Impact Pathway 4)*
Result indicator 18	Number and share of female researchers in total number of researchers participating to Horizon projects per year

5. EVIDENCE TO INFORM: PROGRAMME MONITORING & ANALYSIS

5.1. Horizon Dashboard

The HORIZON Dashboard[14] provides access to the necessary data and indicators to fulfil the monitoring and evaluation requirements for Horizon Europe (incl. the Key Impact Pathways) and to support the legal reporting obligations of the programme. It is a key tool for data visualisation and analytics that serves as a one-stop-shop for data on EU R&I Framework Programmes.

Information on the inputs, outputs, results and activities of the programme is collected close to real time with the possibility to disaggregate the data at several levels, e.g. per programme part (see Figure 4 above), per type of action, per country, etc. The Horizon Dashboard covers all Horizon Europe programme parts, including missions, European partnerships and EIT KICs.

Legal obligation, *Article 50 (1)*

The Commission shall monitor continuously the management and implementation of the Programme, the specific programme and the activities of the EIT. In order to enhance transparency, data shall also be made publicly available in an accessible manner on the Commission's website according to the latest update.

The Horizon Dashboard allows for the tracking of the key Horizon Europe projects' outputs, results/outcomes and impacts while facilitating the monitoring of the programme management and implementation through its various stages, activities and management modes and along the common principles established for its implementation. The data and indicators included in the Horizon Dashboard database are described hereafter.

[13] Widening countries are which continue to lag behind in research and innovation (more information here)

[14] The Horizon Dashboard is a publicly available interactive knowledge platform which allows the use to explore and visualise data and statistics on EU Research and Innovation.

5.2. Data and indicators for monitoring and analysis

The framework for the monitoring and evaluation of Horizon Europe articulates around two main sets of data and indicators, included in the Horizon Dashboard: the **Key Impact Pathways indicators** and the **programme implementation and management data** set out in Horizon Europe Regulation (see Figure 6).

All together, they form a comprehensive set of data and indicators supporting robust evidence for monitoring the implementation and progress towards impact of this EU spending programme in accordance with the Commission Communication on Better Regulation. They also provide quantitative evidence to support the evaluation of the programme, covering all the five evaluation criteria: effectiveness, efficiency, relevance, coherence and EU added value.

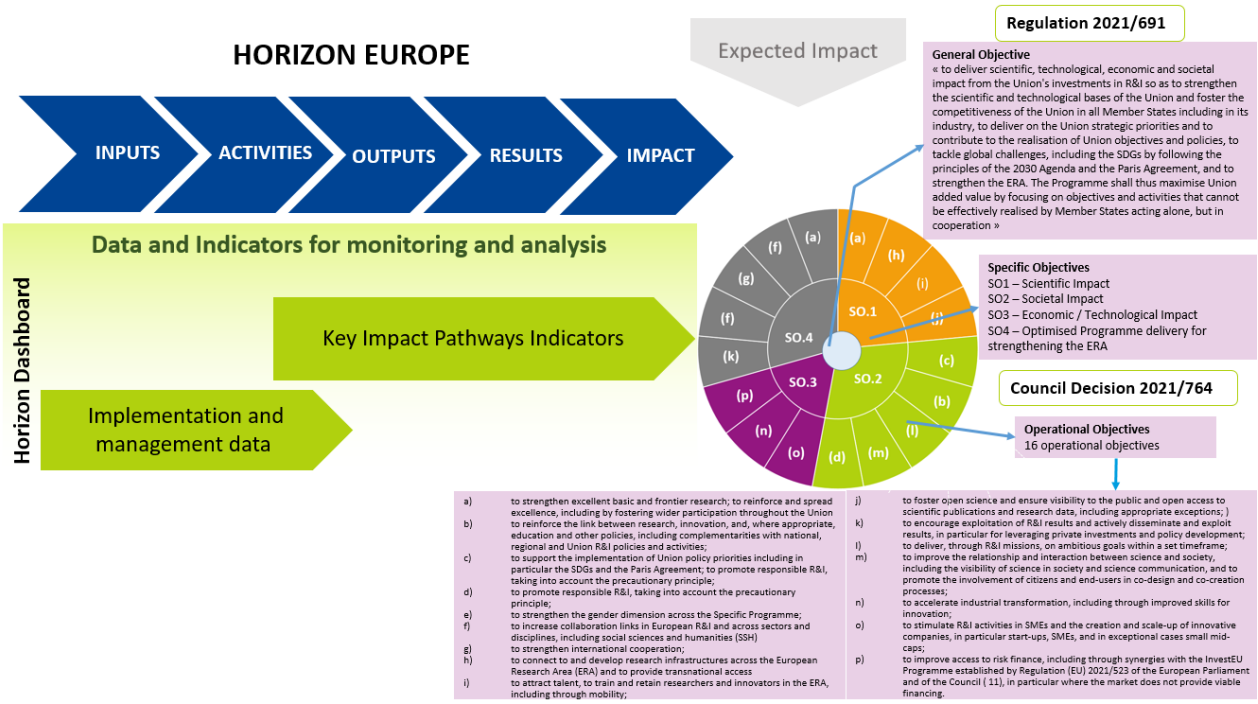


Figure 6: Data & Indicators for the monitoring and analysis of Horizon Europe[15]

5.2.1. Key Impact Pathways

Based on the lessons learned from the predecessor programme Horizon 2020, a new impact monitoring framework called Key Impact Pathways - has been defined for Horizon Europe and embedded in Horizon Europe Regulation *(Article 50 (2) and Annex V).*

[15] For the list of operational objectives (a) - (p) please see section 3.1.2

Legal obligation

- **Article 50:** […] The [Horizon Europe] database shall include time-bound indicators to report on an annual basis on the progress of the Programme towards achievement of the [Horizon Europe] objectives and set out in Annex V along impact pathways.
- **Annex V**: Impact pathways, and related key impact pathway indicators, shall structure the monitoring of the Framework Programme's (FP) performance towards its objectives. The impact pathways are time-sensitive: they distinguish between the short, medium and long term. Impact pathway indicators serve as proxies to report on the progress made towards each type of Research and Innovation (R&I) impact at the FP-level.

The Key Impact Pathways monitoring framework consists of a set of 27 indicators, structured around nine key story lines, to report at short, medium and longer terms on the progress towards scientific, societal and economic impacts (see Figure 7), in line with the specific and general objectives of the programme (set out in Article 3 of Horizon Europe Regulation). More details about the Key Impact Pathways indicators can be found in chapter 6.

Short-term indicators provide information on the short-term outputs of Horizon Europe, medium-term indicators reflect mid-term results/outcomes and longer-term indicators reflect longer-term impacts.

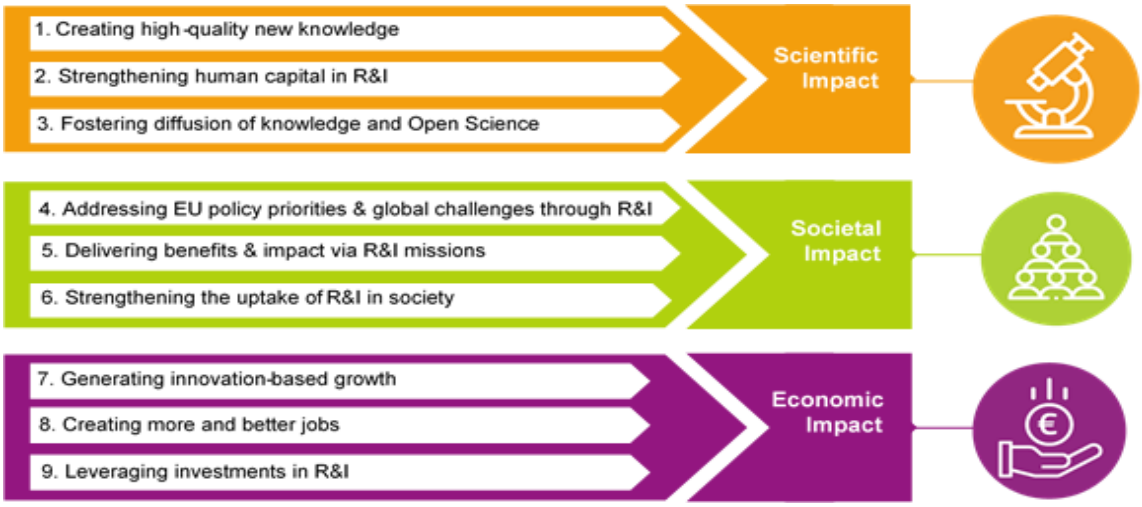


Figure 7: Horizon Europe Key Impact Pathways

The proposed timeframe behind the tracking of progress for all key impact pathways aims to manage expectations on what can reasonably be reported when, and to be able to give indications of progress as soon as possible during implementation:

- Short-term indicators (outputs) can start being collected and reported at the earliest one year after the start of implementation of the R&I Framework Programme and for a very limited number of projects at the beginning, since most projects will run over 3 to 4 years. This data relates to the direct outputs of the projects and activities performed (including key projects' deliverables).
- Medium-term indicators (results/outcomes) cannot start being reported on before three years after the start of the implementation of the R&I Framework Programme (e.g. at the time of the interim evaluation of the Framework Programme). This data mainly relates to the diffusion and use of the outputs produced by the projects.
- Longer-term indicators (impacts) cannot start being reported on before five years after the start of the implementation of the R&I Framework Programme but the bulk of the data will

only be available after 2030. Those data mainly relate to the wider effects achieved based on the diffusion of the outputs in the economy, society and in the scientific sphere.

5.2.2. Programme implementation and management data

Programme implementation and management data provide the analytical basis for all monitoring and evaluation activities relating to the programme. This data might be used to calculate indicators depending on the needs of the analysis. They will also be key to inform the programme evaluation in particular as regards its relevance, coherence and efficiency.

Legal obligation

Article 50 of Horizon Europe Regulation:

1. The Commission shall monitor continuously the management and implementation of the Programme, [...]

The database shall include:

(a) time-bound indicators to report on an annual basis on the progress of the Programme towards achievement of the objectives referred to in Article 3 and set out in Annex V along impact pathways;

(b) information on the level of mainstreaming Social Sciences and Humanities (SSH), the ratio between lower and higher (Technology Readiness Levels (TRLs) in collaborative research, the progress on the participation of widening countries, the geographical composition of consortia in collaborative projects, the evolution of researchers salaries, the use of a two-stage submission and evaluation procedure, the measures aimed at facilitating collaborative links in European R&I, the use of the evaluation review and the number and types of complaints, the level of climate mainstreaming and related expenditures, SME participation, private sector participation, gender participation in funded actions, evaluation panels, boards and advisory groups, the 'Seals of Excellence', the European Partnerships as well as the co-funding rate, the complementary and cumulative funding from other Union programmes, research infrastructures, time-to-grant, the level of international cooperation, engagement of citizens and civil society participation;

(c) the levels of expenditure disaggregated at project level in order to allow for specific analysis, including per intervention area;

(d) the level of oversubscription, in particular the number of proposals and per call for proposals, their average score, the share of proposals above and below quality thresholds.

All data will be reported both at **programme-level and at individual programme-parts level.** This information will be collected and published in close-to-real-time to inform on the programme implementation. It will be made publicly available through the Horizon Dashboard.

Most of this data was already collected under Horizon 2020 but the data collection processes were streamlined to reinforce data availability and quality under Horizon Europe. They include, among other things, information on:

- calls and topics
- proposals and applications submitted and retained, EC contribution requested and total costs of proposals (by source of funds)
- high quality proposals, over-subscription rates, success rates of proposals
- signed grants, participants and participations, EC funding granted

This information shall be collected **according to various dimensions**: types of action, types of organisations, including Civil Society Organisations (with specific data for SMEs), countries and regions of applicants and participants (including from associated and third countries), sectors, thematic domain etc. Data shall also be monitored on the **profiles of beneficiaries and proposal evaluators**, including: gender balance (in projects, evaluators), role(s) in project, share of newcomers to the Programme.

Data on **project implementation issues**, including: time-to-grant, time-to-pay, error rate, satisfaction rate, rate of risk taking, shall also be collected as well as data on **communication**, **dissemination and exploitation** of R&I results.

All this data will cover all requirements defined in Art.50.1 (b), (c) and (d) of the Horizon Europe Regulation.

Table 2 provides details of the data that will be collected per requirement with examples of indicators that could be calculated. The data requirements under Article 50 also reflect the common principles established for the implementation of Horizon Europe and described in Article 7 of the regulation. It also illustrates how the implementation and management data will be used to monitor the **operational objectives** linked to scientific, societal and economic/technological impact and optimal programme deliver.

5.2.3. Contribution of Horizon Europe to the EU horizontal priorities

Article 7 (10) of the Horizon Europe Regulation establishes, as part of the general Union objective of mainstreaming climate actions into Union sectoral policies and Union funds, that actions under Horizon Europe shall contribute to at least **35 % of the expenditure to climate objectives**.

Horizon Europe Regulation also defines a **number of budgetary commitments** to be monitored:

- % of Horizon Europe budget to support biodiversity (Recitals 74,76 to the Horizon Europe Regulation)
- % of spending in Horizon Europe in main digital research and innovation activities (Recital 59 to the Horizon Europe Regulation)
- % of Horizon Europe budget committed to widening participation and excellence (Recital16 to Horizon Europe Regulation)
- % of the budget of Pillar II of Horizon Europe committed to European Partnerships (Annex III to the Horizon Europe Regulation)
- % of the budget of Pillar II of Horizon Europe dedicated to the missions (Article 8 of the Horizon Europe Regulation)
- Contribution of Horizon Europe to Space objectives (Recital 32 of the Horizon Europe Regulation)
- % of EIC budget dedicated to SMEs, including start-ups (Article 9 of the Horizon Europe Regulation)

In addition, **some performance indicators** were developed with the support of DG BUDG and other relevant services:

- Contribution of Horizon Europe to clean air
- Gender equality related expenditure in Horizon Europe (pilot project tracing contributions to gender equality)

Table 2: Implementation and management data to respond to the monitoring obligations defined in Article 50 of the Horizon Europe Regulation

Monitoring requirement (Art.50 obligation)		Level of data availability/ reporting	Data Source[16]	Most relevant operational objective [17]	Examples of Indicators[18]
1	Level of mainstreaming of Social Sciences and Humanities[19]	• Work Programme > topics Projects • Individual Experts	CPS, COMPASS/SyGMa EMI	(f)	• Number of SSH-flagged topics • Projects under SSH flagged topics with at least one SSH partner • Involvement of SSH partners in projects under SSH-flagged topics • SSH External independent peer reviewers
2	Ratio between lower and higher Technology Readiness Levels in collaborative research	• Work Programme> Topics • Project reporting	CPS, On-line Impact Questionnaire	(n)	• Distribution of estimated TRL in Pillar II WP topics • Evolution of TRL in collaborative projects between projects start and completion.
3	Progress of participation of widening countries	• Applicants • Participants • Evaluators	SEP, COMPASS/ SyGMa, Eurostat	(a)	• Evolution of share of applications/participations/budget to Horizon Europe by country • Number of researchers involved in Horizon Europe per million researchers in the population, per country • Success rate of applications per country
4	Geographical composition of consortia in collaborative projects	• Participants	PDM, COMPASS/SyGMa EUROSTAT	(f)	• See monitoring requirement 3 above • Graphical display of Horizon Europe collaborative networks at country of organisation/researcher level
5	Evolution of research salaries	• Individual researchers	External Study/ EU Research careers observatory	(i)	• Evolution of working conditions of researchers involved in Horizon Europe before/after the project
6	Use of two stage submission	• Calls • Applications	CPS, SEP	S.O.4	• Number of calls using two stage submission procedure • Success rates of applications undergoing two-stage submission procedure

[16] See section 8 for details/definitions of data sources
[17] See section 3.1.2 for an overview of operational objectives.
[18] Examples of indicators (non-exhaustive list) that could be calculated using the Horizon Europe Dashboard
[19] The monitoring of the integration of Social Sciences and Humanities (SSH) in the Horizon Europe Programme will also be monitored through dedicated monitoring reports (5th SSH monitoring report)

Monitoring requirement (Art.50 obligation)		Level of data availability/ reporting	Data Source	Most relevant operational objective	Examples of Indicators
7	Measures facilitating collaborative links	• Work Programme > Types of actions • Participants	CPS/ COMPASS/SyGMa	(f)	• See monitoring requirement 4 above • Role of participants in project • Percentage of EU budget spend on collaborative projects • Collaboration links at the level of country of participants and types of organisations
8	Use of the evaluation review	• Calls • Applications	REDRESS/ COMPASS/ PPGMS	S.O.4	• Number of redress cases received in HE
9	Number of complaints, by type of redress	• Calls • Applications	REDRESS/ COMPASS/ PPGMS	S.O.4	• Number of complaints, by type of redress (redress after admissibility, eligibility or after full evaluation
10	Climate mainstreaming: Climate objectives expenditure	• Work Programme > Topics • Projects	CPS (for programmable actions only), COMPASS/SyGMa ABAC (also for bottom-up)	(c)	• Proportion of spending in Horizon Europe contributing to climate objectives. SDG number 13 (Climate action) • Number of projects and expenditure aiming at solutions for climate mitigation/adaptation. • Examples of projects aiming at achieving a better understanding of climate and its impacts.
11	SMEs participation	• Applicants • Participants	PDM, COMPASS/SyGMa	(o)	• Number of distinct SMEs participating in Horizon Europe • Share of SMEs applications/participations/ budget in Horizon Europe
12	Private sector participation	• Applicants • Participants	PDM, COMPASS/SyGMa	(f)	• Number/Share of Horizon Europe beneficiaries from the private for profit sector

Monitoring requirement (Art.50 obligation)		Level of data availability/ reporting	Data Source	Most relevant operational objective	Examples of Indicators
13	Gender	• Work Programme > Topics • Proposals • Projects • Individual Experts/ Researchers/Coordinators	EMI, COMPASS/SyGMa	(e)	• Number and share of Horizon Europe proposals in which the new eligibility criterion (existence of a gender equality plan) is being fulfilled • Number and share of proposals/projects that integrate a gender dimension in their content (applicable for RIAs, IAs, cofund) • Number and share of women researchers/coordinators in projects • Number and share of women expert evaluators • Number and share of women participating in Horizon Europe boards or advisory groups
14	Seals of excellence	• Proposals	COMPASS	(a)	• Number and share of Horizon Europe programmes proposals not selected for funding but awarded with a Seal of Excellence (by programme part) • Number is Seal of Excellence projects that have received public funding from other sources
15	Co-funding rate	• Proposals • Projects	SEP/COMPASS /SyGMa	(p)	• Co-funding rate, including number of companies participating in co-funding
16	Complementarity and cumulative funding with other union programmes	• Projects • External Study	EGRANTS on-boarded FPs' data	(b)	• Share of topics where synergies with other EU programmes e.g. InvestEU exist
17	Research infrastructures	• Project	COMPASS/SyGMa	(h)	• Number of researchers accessing European research infrastructures, including e-infrastructures, supported through the Framework Programme • Number of Research Infrastructures opened for access under grants • Participation of the pan-EU Research Infrastructures
18	Time-to-grant	• Project	COMPASS/SyGMa	S.O.4	• Time-to-grant

Monitoring requirement (Art.50 obligation)		Level of data availability/ reporting	Data Source	Most relevant operational objective	Examples of Indicators
19	International cooperation	• Work Programme > Topics • Applicants • Participants	CPS, PDM, COMPASS/SyGMa	(g)	• Participation of beneficiaries (individuals, organisations) from Associated and Third Countries in Horizon Europe projects • EU financial contribution attributed to participants from Associated and Third Countries • Number and share of Call topics where international cooperation is encouraged and/or required. • Share of scientific international co-publications funded by the Framework Programme • (Use of article 22 (5))
20	Engagement of citizens and civil society participation	• Projects	COMPASS/SyGMa	(m)	• Share of projects with citizen and/or civil society organisations in the consortium
21	Level of expenditure	• Projects	SyGMA	S.O.4	• EU financial contribution to the project • Total cost of the project
22	Level of oversubscription	• Calls	CPS, SEP	S.O.4	• Number of proposals per call • Average score per call • Percentage of proposals above threshold • Percentage of proposals below threshold • Oversubscription rate per call
23	Open Science	• Projects	CORDA External Study	(j)	• Share of projects that integrate open science practices in their activities beyond the contractually mandatory open science practices. • Share of FAIR research data sets (per total number of open research data sets)

6. MONITORING PROGRESS TOWARDS SPECIFIC AND OPERATIONAL OBJECTIVES

Annex V to the Horizon Europe Regulation defines the **key impact pathways (KIP)**, and related key impact pathway indicators which shall structure the monitoring of Horizon Europe's progress towards impact, as referred to in Article 3.

These indicators shall be used to track progress distinguishing between the short, medium and longer terms, including beyond the Programme's duration, reflecting the outputs, results/outcomes and impacts of the Programme. The following section presents details on the operationalisation of these KIPs and related indicators.

The following section present the nine KIPs and the 27 corresponding indicators, as these were defined in Annex V of the Horizon Europe Regulation accompanied by an overview of methodological information.

Precise definitions, detailed methodology and data sources for each of the Key Impact Pathway indicators are provided in the Indicator Methodology and Metadata Handbook.

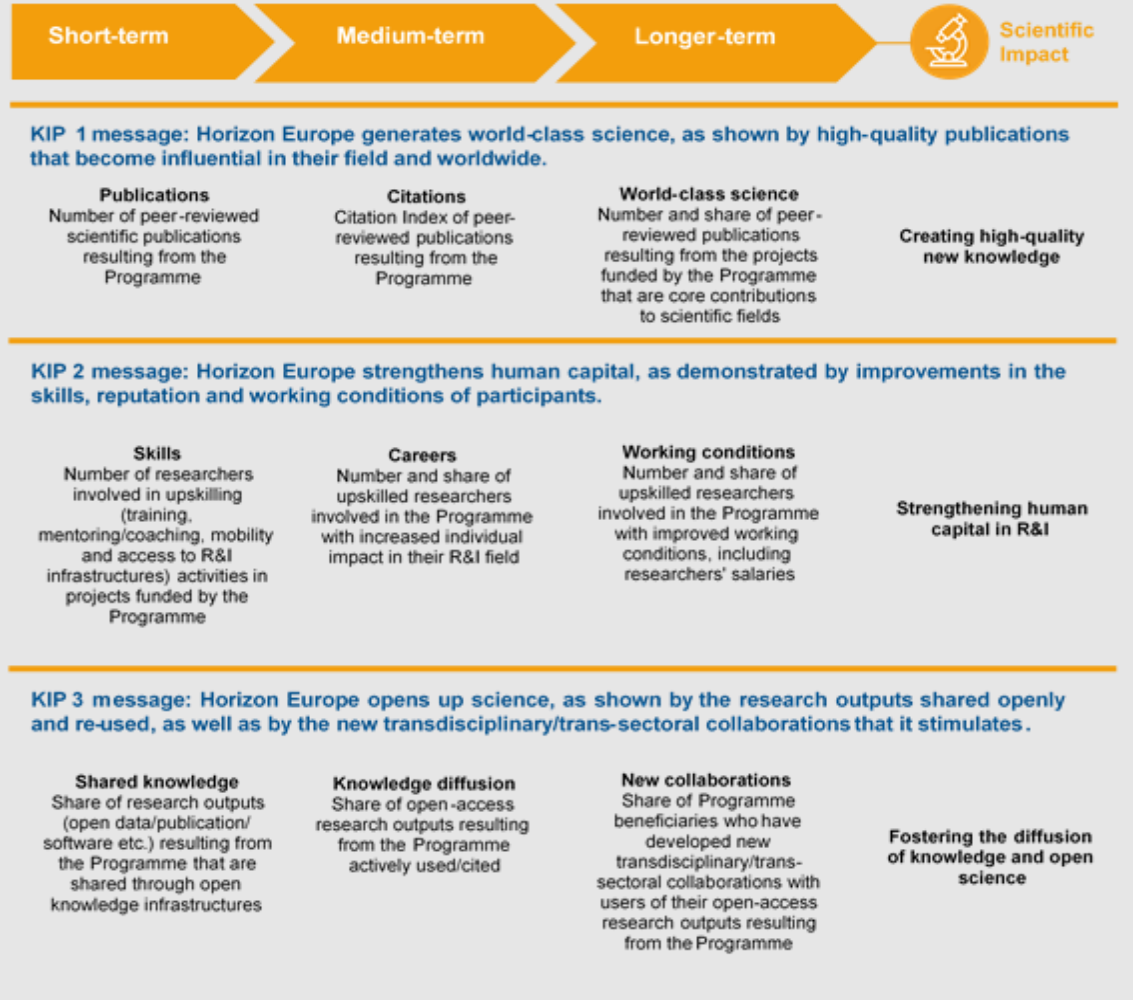
Baseline values for all KIP indicators, as well as relevant benchmarks can be seen in the Baseline and benchmark report.

Details on the operationalisation of the KIPs and related methodologies and indicators can be found in the Operationalisation plan for IT systems report.

6.1. Towards Scientific Impact (Specific Objective 1, Article 3 (2) (a) of Horizon Europe Regulation)

Horizon Europe shall deliver scientific impact by creating high-quality new fundamental and applied knowledge, by strengthening human capital in research and innovation, and by fostering diffusion of knowledge and open science.

Progress towards scientific impact is monitored through a set of three impact pathways and related indicators measuring the progress of the entire programme to reinforce our scientific performance, in terms of the quality of our publications, the improvement of the skills, reputation and working conditions of the researchers involved in the programme and the diffusion and reuse of the generated knowledge.



The data under this section will be monitored for the whole programme but will be particularly relevant under Pillar I of Horizon Europe, which covers the following Excellent Science activities:

- The **European Research Council (ERC)** that provides long-term funding to support excellent investigators and their research teams to pursue ground breaking, high-gain/high-risk research. Research funded by the ERC is expected to lead to advances at the frontiers of knowledge and to set a clear and inspirational target for frontier research across Europe. Scientific excellence is the sole criterion on the basis of which ERC frontier research grants are awarded. Activities of the ERC are also thoroughly monitored through the ERC Monitoring and Evaluation Strategy.
- The **Marie Skłodowska-Curie Actions (MSCA)** that fund excellent research and innovation and equip researchers at all stages of their career with new knowledge and skills, through mobility across borders and exposure to different sectors and disciplines. The MSCA help build Europe's capacity for research and innovation by investing in the long-term careers of excellent researchers.
- **Research infrastructures (RI)** that are facilities providing resources and services for the research communities to conduct research and foster innovation in their fields. Horizon Europe aims to endow Europe with world-class sustainable research infrastructures which are open and accessible to the best researchers from Europe and beyond.

6.1.1. KIP1 - Creating high quality new knowledge

Horizon Europe is expected to generate scientific impact by creating high-quality new knowledge and enabling its diffusion.

Progress on this impact pathway is monitored through the tracking over time of the creation, diffusion and recognition of peer-reviewed scientific publications. Publications are indeed the most visible scientific results of the Programme. They codify, disseminate and provide access to the new knowledge produced by a project.

KIP1 - short-term indicator: PUBLICATIONS	
Indicator name	**Horizon Europe peer-reviewed scientific publications**
Indicator type	Output
Unit of measurement	Number of peer-reviewed scientific publications resulting from the programme.
Data source	EC administrative and monitoring data submitted by Horizon Europe participants through project reporting template, Scopus database.
Link to the objective	By monitoring the number of peer-reviewed publications produced by Horizon Europe, we aim at monitoring at short term that Horizon Europe is on the right track towards its first specific objective that is to create and diffuse high quality new knowledge. Publications codify, disseminate and provide access to the new knowledge produced by a project. Peer-reviewed publications indicator is used in Research and Innovation for monitoring new knowledge. They are considered as a relevant sign of good quality new knowledge.
Link MFF 14-20 / MFF 21-27	This indicator is the continuation of an indicator of Horizon 2020 (Publications in peer-reviewed high impact journals), but is not restricted to high impact journals and includes external matching/validation of the publications.
Other methodological comments	Publications reported in the project are first verified against an external database and then counted. Significant volume of data from indirect actions are not expected before late 2024, as it takes time for beneficiaries to produce papers and report them. The overall number of publications in the EU will be reported as a reference point.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Underlying definition and concepts	Peer-reviewed publications, as published through the traditional channels, consist mainly of articles and proceeding papers, but can also encompass books, chapters, reviews, etc. Each scientific discipline has their own publishing characteristics, and by including document types other than articles these disciplines are also covered.
Frequency of data	Close to real time

KIP1 - medium-term indicator: CITATIONS	
Indicator Name	**Field-Weighted Citation Index of Horizon Europe peer-reviewed publications**
Indicator type	Result/outcome
Unit of measurement	Normalised Means Citation Score (MNCS) of Horizon Europe peer reviewed publications
Data source	EC administrative and monitoring data submitted by Horizon Europe participants through project reporting template; Scopus database.
Link to the objective	By monitoring the citation index of peer reviewed publications produced by the Horizon Europe, we aim at monitoring at medium term that Horizon Europe is on the right track towards one of its longer-term objective that is to create and diffuse high quality new knowledge, as shown by the high-quality publications that become influential in their field and worldwide.
Link MFF 14-20 / MFF 21-27	This indicator is linked to an indicator of Horizon 2020 (Share of publications from ERC-funded projects which are among the top 1 % highly cited per field of science), but includes a broader scope of publications and includes external verification of the publications
Other methodological comments	Field-normalised citation impact indicators, such as a "field-normalised" Mean Normalized Citation Score (or MNCS), calculate an indication of the citation impact of a publication. It is calculated by comparing the number of citations actually received by a publication with the number of citations expected for a publication of the same publication year and same subject field.

Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Frequency of data	Yearly as from 2026

KIP1 - long-term indicator: WORLD-CLASS SCIENCE	
Indicator name	**Peer reviewed publications from Horizon Europe projects that are core contribution to scientific fields**
Indicator type	Impact
Unit of measurement	Share of Horizon Europe peer reviewed publications which are amongst the top 1 % most cited publications produced
Data source	Project reporting, external bibliometric database
Link to the objective	This impact indicator measures that Horizon Europe is on track with its objective to create and diffuse high quality new knowledge, as shown by the high-quality publications that become influential in their field and worldwide
Link MFF 14-20 / MFF 21-27	This indicator is the continuation of an indicator of Horizon 2020 (Share of publications from ERC-funded projects which are among the top 1 % highly cited per field of science), but covers a broader scope and includes external verification of the publications.
Other methodological comments	First data are not expected before 2026
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

Data needs: Beneficiaries are asked to report on the publications co-funded by the Programme. Those are identified through a specific digital object identifier (DOI) when publishing, allowing follow-up tracking of the perceived quality and influence through external database (SCOPUS).

6.1.2. KIP2 - Strengthening human capital in R&I

Horizon Europe is expected to generate scientific impact by strengthening human capital engaged in R&I, as shown by improvements in the skills, reputations and working conditions of participating researchers.

A major novelty of Horizon Europe is that human research capacity can be monitored at the level of individual researchers. Horizon Europe researchers are identified as of grant signature stage, in particular through persistent digital identifiers allowing to monitor their skills, career development and working conditions with little reporting needs.

Progress towards this impact pathway is monitored though a set of three indicators tracking over time the effects of the programme on the individual researchers involved:

KIP2 - short-term indicator: SKILLS	
Indicator name	**Researchers involved in upskilling activities in FP projects**
Indicator type	Output
Unit of measurement	Number of researchers expressed in full-time equivalent (FTE)
Data source	EC administrative and monitoring data submitted by Horizon Europe participants through project reporting
Link to the objective	Horizon Europe offers to the researchers many various ways to improve their careers and their working conditions. By monitoring the number of researchers involved in upskilling activities in Horizon Europe projects, we aim at monitoring at short term that Horizon Europe is on the right track towards its first specific objective that is to improve skills, reputation and working conditions of participants.
Link MFF 14-20 / MFF 21-27	Yes, this indicator covers two indicators reported in Horizon 2020 (MSCA and one on the infrastructures)
Other methodological comments	First figures will come from the JRC direct actions and the EIT. JRC data will include PhD students, Trainees, Researchers using JRC research infrastructure through open access schemes and researchers with temporary contracts, working in the JRC's research projects.

Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Underlying definition and concepts	Upskilling activities cover training, mentoring/coaching, mobility and access to R&I infrastructures. Upskilling effect is dependent on the phase of the career.
Frequency of data	Close to real time

KIP2 – medium-term indicator: CAREERS	
Indicator name	**Upskilled FP researchers with increased individual impact in their R&I field**
Indicator type	Result/outcome
Unit of measurement	Average increase of H-index of funded researchers
Data source	Project reporting, external bibliometric database
Link to the objective	By monitoring the H-index of the researchers involved Horizon Europe projects, we aim at monitoring at medium-term that Horizon Europe is on the right track towards one of its longer-term objective that is to strengthen human capital, as shown by the improvement in skills, reputation and working conditions of individual participants
Link MFF 14-20 / MFF 21-27	No – new indicator introduced
Other methodological comments	The H-index is based on the comparison of the number of articles written by an author to the number of citations. The H-index offers a way to see the evolution of an individual researchers' performance. An increase in the H-index is an indicator of a positive effect of the Programme on researcher's impact in their field. First data are expected no sooner than 2023, as there needs to be a time slot to observe increases in H-indexes.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

KIP2 -long-term indicator: WORKING CONDITIONS	
Indicator name	**Upskilled FP researchers with improved working conditions, including researchers' salaries**
Indicator type	Impact
Unit of measurement	Number of researchers
Data source	Project reporting, surveys
Link to the objective	By monitoring the improvement of the working conditions of researchers involved in Horizon Europe projects, we aim at monitoring that Horizon Europe is fulfilling its longer term objective that is to strengthen human capital, as shown by the improvement in skills, reputation and working conditions of individual participants
Link MFF 14-20 / MFF 21-27	No – new indicator
Other methodological comments	Survey data will be used to collect data on researchers' salaries (net salaries) and contract type. Regarding data on job security, collected data includes several relevant questions which provide data on contract type, satisfaction with pensions/social security provisions, and other aspects of working conditions. Under the survey, the same data is collected for a random stratified sample of researchers who were based in European research performing organizations but did not receive EU funding. The salaries and working conditions of HE researchers are then benchmarked against this representative sample of researchers. The availability of data depends on the planning of the survey, which is expected to happen no sooner than 2023.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

Data needs: the Programme tracks basic information on participating researchers, such as their gender, nationality and career stage. An external database will be used to measure H-index and working conditions will be monitored by surveys.

6.1.3. KIP3 - Fostering diffusion of knowledge and open science

Horizon Europe opens up science, as evidenced by research outputs being openly shared and re-used, and by new collaborations being stimulated.

Acting as a catalyst for the way Europe carries out research, **open science** aspires to bring about better and faster access to research results, to foster interdisciplinary research, speed up innovation, and to involve the public in the research process and the societal problem solving.

Open science is embedded throughout Horizon Europe: in Article 14 of the Horizon Europe Regulation, in the Horizon Europe work programmes, in the proposal evaluation, in the grant agreements, in the project execution and follow-up, and in the programme evaluation.

Key Impact Pathway 3 tracks whether and how the open science-driven diffusion of knowledge has an impact, and how it enables scientific discovery and knowledge to spill over faster (and more reliably).

KIP3 -short-term indicator: SHARED KNOWLEDGE	
Indicator name	**Research outputs (open data/publication/ software etc.) shared through open knowledge infrastructures**
Indicator type	Output
Unit of measurement	Share of Open Access outputs in Horizon Europe expressed in %
Data source	Project reporting, external bibliometric database
Link to the objective	Open access to publications, datasets, software, other research products (e.g., services, tools) allows researchers to build on existing work and facilitate access to scientific knowledge to industry to innovate, to public sector for evidence -based policy making, to public to be engaged and involved in the research process. Therefore, detecting and isolating outputs related to Open Science is an appropriate measure of the short-term progress towards the objective. By monitoring the Research outputs (open data/publication/ software etc.) shared through open knowledge infrastructures, we aim at monitoring at short-term that Horizon Europe is on the right track towards one of its longer-term objective that is to open up science.
Link MFF 14-20 / MFF 21-27	No – new indicator introduced. However, the figures for Horizon 2020 have been collected.
Other methodological comments	All relevant FP research outputs (by type: publications, datasets and software) reported by all Horizon Europe projects (incl. DOI) are matched to an external database. The single extended list of all relevant outputs, removing the duplicates, is used to count numbers and shares. Open Access and Open Science are modus operandi in Horizon Europe.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Frequency of data	Close to real-time

KIP3 -medium-term indicator: KNOWLEDGE DIFFUSION	
Indicator name	**Open access FP research outputs actively used/cited**
Indicator type	Result/outcome
Unit of measurement	Citation Score of open access peer reviewed publications
Data source	Project reporting, external bibliometric database
Link to the objective	By monitoring the open access research outputs actively used/cited, we aim at monitoring at medium-term that Horizon Europe is on the right track towards one of its longer term objective that is to open up science, as shown by research outputs shared openly, re-used and at the origin of new transdisciplinary/trans-sectoral collaborations. This indicator captures the effect that open access brings to fostering diffusion of knowledge by tracking the use of research outputs. The key question addressed is whether the open access research results are cited more than the closed/embargoed ones.
Link MFF 14-20 / MFF 21-27	No – new indicator introduced
Other methodological comments	Field-normalised citation impact indicators, such as a "field-normalised" Mean Normalized Citation Score (or MNCS), calculate an indication of the citation impact of a publication. It is calculated by comparing the number of citations actually

	received by a publication with the number of citations expected for a publication of the same, publication year, and subject field. First data are not expected before 2026.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

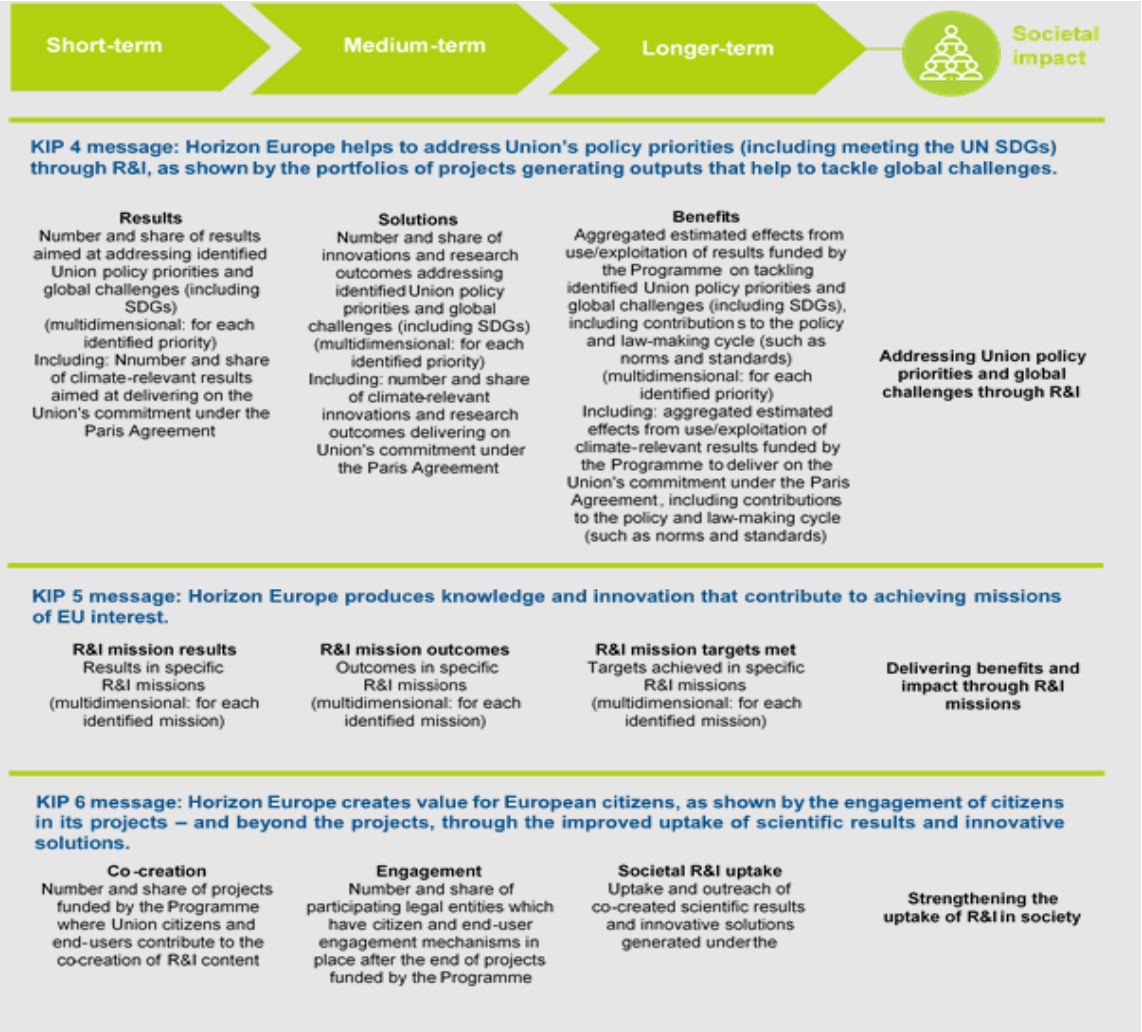
KIP3 -long-term indicator: NEW COLLABORATION	
Indicator name	**FP beneficiaries having developed new transdisciplinary/ trans-sectoral collaborations with users of their open FP R&I outputs**
Indicator type	Impact
Unit of measurement	Collaborative Index of the open access peer reviewed publications
Data source	Project reporting, external study
Link to the objective	Research collaboration is key in fostering diffusion of knowledge. The purpose of having open science as the modus-operandi is to further enhance collaboration across disciplines, between academia and industry, as well as within Europe and beyond. By monitoring the collaborative index of the open access peer reviewed publications, we aim at monitoring at medium-term that Horizon Europe is fulfilling its longer term objective that is to open up science.
Link MFF 14-20 / MFF 21-27	No – new indicator introduced
Other methodological comments	This indicator will be calculated as part of a separate study. The following methods might be used: the starting point is the authors and their affiliations who have produced open access results, and build their co-authorship network, maintaining time stamps to trace these over the years. As a second step, we extract overall insights on degree of collaboration, including the collaborative index, the degree of collaboration, and the collaborative coefficient and provide data by programme, and country of authors' institutions. New Collaborations are estimated by counting the authors' dyads that appear in the context of a project, not observed before. The study will likely be part of the interim evaluation of the programme.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

Data needs: the Programme tracks research outputs reported by the beneficiaries. An external database OpenAire is used to assess open access, knowledge diffusion and collaboration.

6.2. Towards Societal Impact (Specific Objective 2, Article 3 (2) (b) Horizon Europe Regulation)

Horizon Europe shall deliver societal impact by contributing to address, through R&I, the EU policy priorities and global challenges, including UN Sustainable Development Goals.

Progress towards societal impact is monitored across the whole programme, through three impact pathways and related indicators in the short, medium and longer terms:



Data under this section will be monitored for the whole programme but it will be particularly relevant under Pillar II, and in particular to Horizon Europe clusters (see section 4 above), to Horizon EU Missions (see section 6.2.2) and to European Partnerships (see next section).

Consequently, all Horizon Europe KIP indicators and data on projects' results/outcomes and expected impacts will also be available at cluster, mission or partnership level.

European Partnerships

To tackle global challenges, Horizon Europe introduced a revamped strategic, coherent, and impact-driven policy approach: the **European Partnerships**.

In this new policy framework, European Partnerships are expected to help speed up novel solutions, particularly those that can reduce greenhouse gas emissions by 2030 in line with the European Green Deal. They will help achieve fair green and digital transitions and the Horizon Europe 35% climate expenditure targets. They will also contribute to strengthening resilience, especially with regards health, while improving the competitiveness of European industry in line with the European Industrial Strategy.

Due to their specificities, partnerships have developed additional indicators at individual partnership level as well as common indicators for partnerships to monitor the performance. They are reported on in the Biennial monitoring reports on the performance of European Partnerships (BMR). The first BMR was published in May 2022.

6.2.1. KIP4 - Addressing EU policy priorities & global challenges through R&I

Horizon Europe helps to address Union policy priorities through R&I, as shown by its portfolios of projects helping to tackle global challenges.

Horizon Europe-funded projects produce a variety of outputs such as publications and patents, but also other IPR (such as trademarks, copyrights), as well as a variety of exploitable foregrounds (demonstrations, prototypes, pilots and similar), and other innovative outputs. The use by society of such solutions, as well as transference – i.e. the use of societal products/related knowledge by citizens, companies and institutions - is expected to lead to broader societal benefits, changes in society and/or the natural environment.

Progress towards this impact pathway is monitored through a set of 3 indicators:

KIP4 - short-term indicator: OUTPUTS	
Indicator name	**Outputs aimed at addressing identified EU policy priorities and global challenges (including SDGs) (multidimensional: for each identified priority)**
Indicator type	Output
Unit of measurement	Share of outputs aimed at addressing the EU policy priorities (%)
Data source	EC administrative and monitoring data submitted by HE participants
Link to the objective	In the short-term, the share of outputs addressing a policy priority indicates one of the societal impacts of Horizon Europe. By monitoring the outputs generated by projects aimed at addressing identified EU policy priorities, we aim at monitoring at short-term that Horizon Europe is on the right track towards one of its third objective that is to help addressing EU policy priorities and global challenge through research and innovation.
Link MFF 14-20 / MFF 21-27	No – New indicator
Other methodological comments	Horizon Europe funded projects produce variety of products, tracked and reported under scientific and economic outputs. Most of them are also likely to have a societal impact; to trace and estimate it, the produced output needs to be accurately measured and then classified according to the specific EU policy priorities, including the SDGs.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Frequency of data	Close to real time

KIP4 - medium -term indicator: SOLUTIONS	
Indicator name	**Number and share of innovations and research results addressing identified EU policy priorities and global challenges (including SDGs) (multidimensional: for each identified priority)**
Indicator type	Result/outcome
Unit of measurement	Share of results aimed at addressing specific EU policy priorities, including meeting the Sustainable Development Goals (SDGs)
Data source	Project reporting, external databases.
Link to the objective	By monitoring the number and share of innovations and research results addressing identified EU policy priorities and global challenges, we aim at monitoring at medium-term that Horizon Europe is on the right track towards one of its longer term objective that is to helps addressing EU policy priorities (including meeting the SDGs) through research and innovation, as shown by the portfolios of projects generating outputs contributing to tackling global challenges In the medium-term, shares of verified outputs and their performance indicate the societal impact of Horizon Europe.
Link MFF 14-20 / MFF 21-27	No – new indicator
Other methodological comments	Calculated as a simple count of innovations (new or significantly improved: methods, technologies and instruments / commercial goods / commercial services / scientific or industrial processes / business models) reported in all ongoing and finished Horizon Europe projects and classified by their contribution to the specific SDGs and subsequently – EU policy priorities. Additionally, where possible, the scientific results tracked by medium-term indicators under scientific and economic indicators, but also awarded patents, are also classified by their contribution to the specific SDGs and subsequently – EU policy priorities.

Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

KIP4 - long-term indicator: BENEFITS	
Indicator name	**Aggregated estimated effects from use/exploitation of FP-funded results, on tackling identified EU policy priorities and global challenges (including SDGs), including contribution to the policy and law-making cycle (such as norms and standards) (multidimensional: for each identified EU policy priority)**
Indicator type	Impact
Unit of measurement	Aggregated estimated effects from use of FP-funded results on tackling specific EU policy priorities, including contribution to policymaking and legislation.
Data source	Project reporting, studies
Link to the objective	By monitoring this indicator, we aim at monitoring that Horizon Europe is achieving its impact objective that is to help addressing EU policy priorities (including meeting the SDGs) through research and innovation, as shown by the portfolios of projects generating outputs contributing to tackling global challenges
Link MFF 14-20 / MFF 21-27	No – new indicator
Other methodological comments	The indicator focuses on estimated and detected effects from use of Horizon Europe funded results on tackling specific EU policy priorities. In the long-term, specific studies are needed to analyse the societal impact of Horizon Europe in specific areas. We expect to run those studies as part of the interim and ex-post evaluations of the programme.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

Data needs: The indicators rely on projects' results and innovations reported by Horizon Europe beneficiaries for all ongoing and completed Horizon Europe projects and on their classification by EU priority and SDG.

6.2.2. KIP5 - Delivering benefits and impact through R&I missions

EU Missions is a novelty of Horizon Europe. They aim at tackling the great challenges faced by people in their daily lives, and at providing concrete responses to the EU's most urgent challenges based on clear goals, objectives and timelines.

Missions constitute a new way of working which involves different instruments, business models and public and private investments at EU, national, regional and local levels. Each mission will operate as a portfolio of actions – such as research projects, policy measures or even legislative initiatives - to achieve a measurable goal that could not be achieved through individual actions.

The first 5 EU missions, launched in September 2021, will deliver solutions by 2030 in five cross-sectoral areas: adaptation to climate change, cancer, climate-neutral and smart cities, ocean and waters and soil health.

KIP 5 will track the R&I outputs, results and impacts of the mission-funded actions. While R&I Missions feature specific targets and provisions for monitoring their achievements, the Key Impact Pathway 5 focuses on Programme-level monitoring that aggregates key achievements across the R&I missions.

In addition, an indicator framework for monitoring individual Missions against their individual objectives is currently under development.

KIP5 - short-term indicator: MISSIONS RESULTS	
Indicator name	**Outputs in specific R&I Missions (multidimensional: for each identified mission)**
Indicator type	Output
Unit of measurement	Number of outputs
Data source	EC administrative and monitoring data submitted by HE participants
Link to the objective	By monitoring outputs in specific R&I missions, we aim at monitoring at short-term that Horizon Europe is on the right track towards one of its longer term objective that is to produce knowledge and innovation that contribute to achieving Missions of EU interest.
Link MFF 14-20 / MFF 21-27	No – new indicator.
Other methodological comments	This indicator is currently under development following the launch of the EU Missions at the end of 2021. Horizon Europe funded projects produce variety of products, tracked and reported under scientific and economic outputs. Most of them are also likely to have a societal impact.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

KIP5-medium term indicator: MISSIONS OUTCOMES	
Indicator name	**Results in specific R&I Missions (multidimensional: for each identified mission)**
Indicator type	Result/outcome
Unit of measurement	Number of results
Data source	Project reporting, external databases.
Link to the objective	By monitoring results in specific R&I missions, we aim at monitoring at medium-term that Horizon Europe is on the right track towards one of its longer- term objective that is to produce knowledge and innovation that contribute to achieving Missions of EU interest and to deliver benefits and impact through R&I Missions.
Link MFF 14-20 / MFF 21-27	No – new indicator
Other methodological comments	Calculated as a simple count of innovations (new or significantly improved: methods, technologies and instruments / commercial goods / commercial services / scientific or industrial processes / business models) reported in all ongoing and finished Horizon Europe projects and classified by their contribution to the specific missions.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

KIP5-long term indicator: MISSIONS TARGETS	
Indicator name	**Targets achieved in specific R&I Missions (multidimensional: for each identified mission)**
Indicator type	Impact
Unit of measurement	Impact
Data source	Studies
Link to the objective	By monitoring targets achieved in specific R&I missions, we aim at monitoring at long-term one of Horizon Europe objective that is to deliver benefits and impact through R&I Missions. Horizon Europe incorporates EU Missions to increase the effectiveness of funding by pursuing clearly defined targets and delivering solutions to some of the greatest challenges our world is facing. The EU missions' targets serve as a benchmark to estimate the likely progress and their achievement; their monitoring focuses on estimating the potential effects towards the defined R&I targets.
Link MFF 14-20 / MFF 21-27	No – new indicator
Other methodological comments	Depending on the type of mission'S target, the estimates might be mostly qualitative (focusing on general assessment but also providing the most evident stories of influence), but also quantitative (e.g., using econometric modelling to estimate the potential environmental impacts, such as reduction of CO2, based on the emerging evidence acquired during monitoring of outputs and results)
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

Data needs: In addition to the data needs associated to each of the distinct KIP, portfolios of projects will need to be clearly identified for each mission in order to be able to monitor each of the KIP indicators at the level of the missions,

6.2.3. KIP6 - Strengthening the uptake of research and innovation in society

Horizon Europe is committed to increasing the involvement of citizens and civil society in the research process, **contributing to building a society based on knowledge and education**, and **deepening the relationship between science/innovation and society**. Progress towards this impact pathway is monitored through a set of 3 indicators:

KIP6 - short-term indicator: CO-CREATION	
Indicator name	**FP projects where EU citizens and end-users contribute to the co-creation of R&I content**
Indicator type	Output
Unit of measurement	%
Data source	EC administrative and monitoring data submitted by HE participants.
Link to the objective	By monitoring Horizon Europe projects, where EU citizens and end-users contribute to the co-creation of R&I content, we aim at monitoring at short-term that Horizon Europe is on the right track towards one of its longer-term objective that is to strengthen the uptake of innovation in society, as shown by the engagement of citizen in the projects and beyond the projects by improved uptake of scientific results and innovative solutions.
Link MFF 14-20 / MFF 21-27	No – new indicator
Other methodological comments	To measure the involvement of citizens, social partners and civil society in the research process funded by the programme, this indicator tracks the number and share of Horizon Europe projects where EU citizens, workers and other end-users contribute to the co-creation of R&I content, additionally estimating the role of such contribution (such as consultation/dissemination, co-creation, co-ownership/joint decision-making). It is calculated based on a simple count of all ongoing and finished Horizon Europe projects where EU citizens, workers and other end-users contribute to the co-creation of R&I content. It relies on the administrative data provided at the beginning of the project, and then tracks changes reported as projects progress. Indicator values are expressed as share of the total programme. First data are expected no sooner than 2022.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Underlying definition and concepts	EC administrative and monitoring data submitted by HE participants includes data on role of the citizens and end-users involved in projects (such as co-creating R&I visions, agendas, policies or frameworks or R&I action plans or technology roadmaps / collecting data for the project, analysing data for the project/ Providing resources, e.g. computational, space/locations, practical support, monitoring and/or evaluating R&I results / Testing & experimenting with innovative R&I solutions / Contributing to scientific publications or patent applications / Debating R&I findings and implications for them). Importantly, citizens are distinguished from end-users, in order to understand the data behind this indicator.
Frequency of data	Close to real-time

KIP6 - medium-term indicator: ENGAGEMENT	
Indicator name	**FP beneficiary entities with citizen and end-users engagement mechanisms after FP project**
Indicator type	Result/outcome
Unit of measurement	Number and share of FP beneficiaries with citizen and end-user engagement mechanisms after FP project.
Data source	Project reporting
Link to the objective	By monitoring Horizon Europe beneficiary entities with citizens and end-users engagement mechanisms after a Horizon Europe project, we aim at monitoring at

	medium-term that Horizon Europe is on the right track towards one of its longer term objectives that is to strengthens the uptake of innovation in society, as shown by the engagement of citizen in the projects and beyond the projects by improved uptake of scientific results and innovative solutions. This medium-term indicator measures the effects of the heightened attention to and demand for co-creation in Horizon Europe through the development of citizen engagement mechanisms in beneficiary entities (such as social dialogue and social partner projects, citizen fora, participatory research, co-creation facilities, experimental sites and similar).
Link MFF 14-20 / MFF 21-27	No – new indicator
Other methodological comments	In the medium-term, the identification of presence of citizen engagement mechanisms allows estimation of number (and share) of Horizon Europe beneficiary entities that possess and utilise them. First significant data are expected no sooner than 2023.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

KIP6 - long-term indicator: SOCIETAL R&I UPTAKE	
Indicator name	**FP co-created scientific results and innovative solutions**
Indicator type	Impact
Unit of measurement	Number of results and innovative solutions
Data source	Project reporting, studies
Link to the objective	The long-term indicator focuses on uptake and outreach of framework programme co-created scientific results and innovative solutions. The aim is to assess the extent of the uptake and outreach of the scientific results (e.g. in the fields of science, innovation, the economy and society) and innovative solutions originating from the programme.
Link MFF 14-20 / MFF 21-27	No – new indicator
Other methodological comments	A study will be launched for the assessment of the extent of the uptake and outreach of scientific results and innovative solutions co-created in the Horizon Europe. The study is planned as part of the interim evaluation of Horizon Europe.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

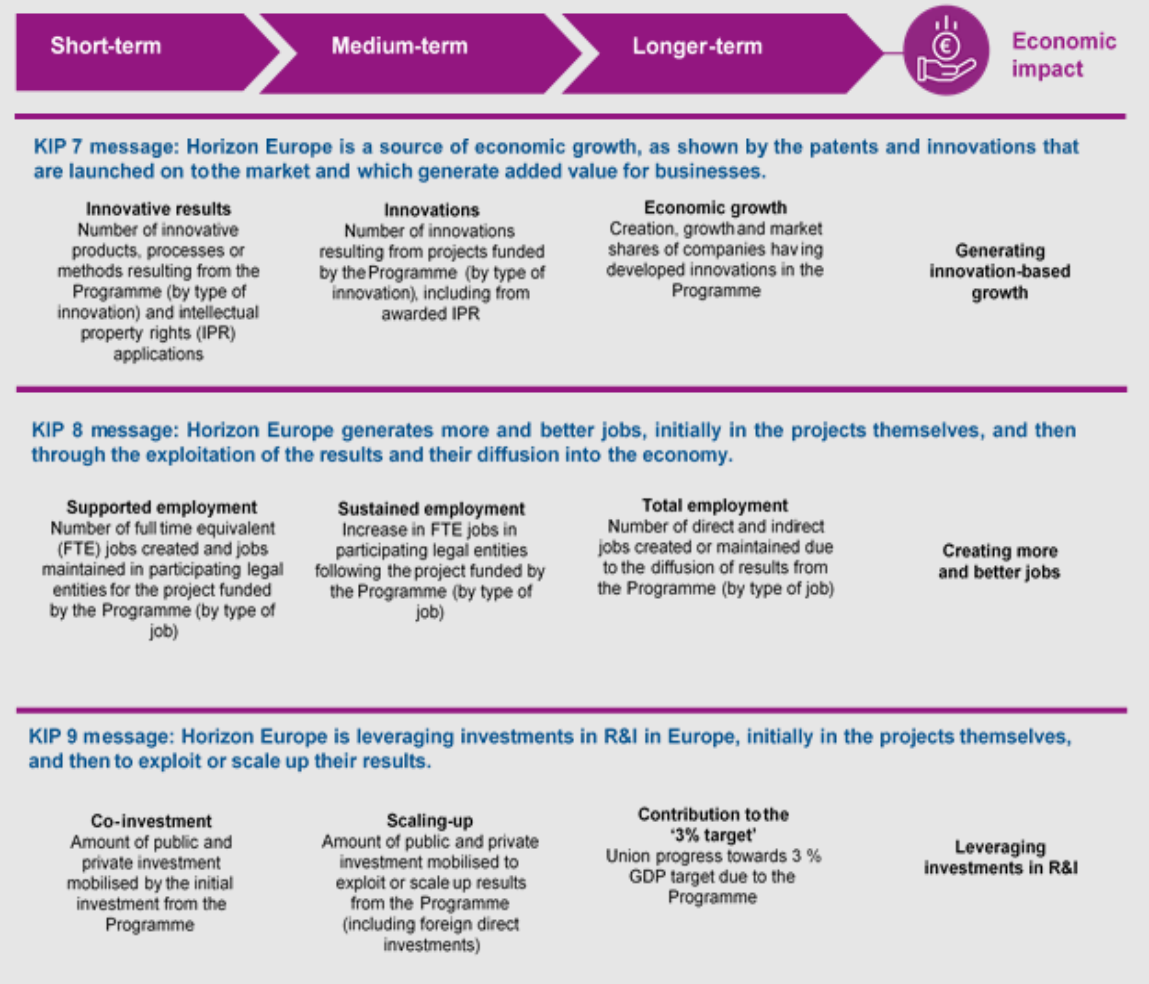
6.3. Towards Technological and Economic Impact (Specific Objective 3, Article 3 (2) (c) Horizon Europe Regulation)

Horizon Europe shall deliver technological and economic impact by influencing the creation and growth of companies, especially SMEs including start-ups, by creating direct and indirect jobs and by leveraging investments for R&I.

The programme's economic and technological impact comes from the transformation of scientific excellence into innovations that generate economic outcomes: employment, exports, competitiveness, value-added and higher GDP.

Progress towards economic impact is monitored through a set of 9 indicators measuring at short, medium and long term that Horizon Europe:

– **is a source of innovation- based growth**, as shown by the patents and innovations that are launched on the market and generate added value for businesses
– **generates more and better jobs**, initially in the projects, and then through the exploitation of the results and their diffusion in the economy
– **is leveraging investments** for research and innovation in Europe, initially in the projects, and then to exploit or scale-up their results



The indicators will be monitored for the whole programme but will be particularly relevant under Pillar III, Innovative Europe and in particular to the activities of:

- the **European Innovation Council (EIC)** that supports game changing innovations throughout the lifecycle from early stage research, to proof of concept, technology transfer, and the financing and scale up of start-ups and SMEs. The European Innovation Council impact reports present key information on the EIC performance.
- the **European Innovation Ecosystems** that focusses on building an interconnected, inclusive innovation ecosystem that encompasses European, national, regional and local initiatives as well as under-represented actors and territories, while also reinforcing the ecosystems' innovation capacity.
- the **European Institute of Innovation and Technology (EIT)** that strengthens Europe's innovation ability by powering solutions to pressing global challenges and through nurturing entrepreneurial talent and innovation actions. EIT has developed the EIT monitoring and evaluation strategy and a detailed EIT Impact Framework.

6.3.1. KIP7 - Generating innovation-based growth

Horizon Europe is a source of economic growth, as patents and innovations developed under the Programme are launched on the market and generate added value for businesses.

Progress towards this impact pathway is monitored through a set of 3 indicators:

KIP7 - short-term indicator: INNOVATIVE OUTPUTS	
Indicator name	**Innovative products, processes or methods from FP (by type of innovation) & Intellectual Property Rights (IPR) applications**
Indicator type	Output
Unit of measurement	Number of innovative products, processes or methods & Intellectual Property Rights (IPR) applications resulting from the Programme
Data source	EC administrative and monitoring data submitted by HE participants & external patent database
Link to the objective	By monitoring the number of innovative products, processes or methods from FP & foreground Intellectual Property Rights applications, we aim at monitoring at short term that Horizon Europe is on the right track towards its specific objective to be a source of economic growth, as shown by the patents and innovations that are launched on the market and generate added value for businesses. To maintain and improve its relative competitiveness in the global economy, the EU indeed needs a constant supply of new technological outputs and intellectual property.
Link MFF 14-20 / MFF 21-27	This indicator links to an indicator of Horizon 2020 ('Patent applications and patents awarded in Future and Emerging Technologies'), but covers more types of innovations and includes links to an external database.
Other methodological comments	The indicator is calculated as a simple count of number of innovative products, processes and methods & foreground Intellectual Property Rights (IPRs) applications reported in all ongoing and finished Horizon Europe projects. First data for indirect activities are not expected before late 2022.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Frequency of data	Close to real-time

KIP7 - medium-term indicator: INNOVATIONS	
Indicator name	**Innovations from FP projects (by type of innovation) including from awarded IPRs**
Indicator type	Result/outcome
Unit of measurement	Patent citations, family size, scope
Data source	Project reporting, external patent database
Link to the objective	By monitoring the number of Innovations from FP projects (by type of innovation) including from awarded foreground IPRs, notably patents, we aim at monitoring at medium-term that Horizon Europe is on the right track towards one of its longer term objective that is to be a source of economic growth, as shown by the foreground patents and innovations that are launched on the market and generate added value for businesses. In the medium-term, the foreground patents' indicators are good indicators of progress to technological/economic impact
Link MFF 14-20 / MFF 21-27	This indicator links to an indicator of Horizon 2020 (Patent applications and patents awarded in Future and Emerging Technologies), but includes verification with an external database, distinction between patent family members, and deeper analytical insight.
Other methodological comments	One of the most robust findings of IPR-related research is the skewness of patent value distribution – few patents are valuable, while most others are worth little, if anything at all. This indicator will use external data sources to estimate the impact potential of the patents.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

KIP7 - long-term indicator: ECONOMIC GROWTH	
Indicator name	**Creation, growth & market shares of companies having developed FP innovations**
Indicator type	Impact
Unit of measurement	Growth of funded companies
Data source	Project reporting, external database of companies, studies
Link to the objective	By monitoring the growth of companies having developed innovations, we aim at demonstrating the economic impact of Horizon Europe. One of Horizon Europe's objective is indeed to be a source of economic growth, as shown by the patents and innovations that are launched on the market and generate added value for businesses. Horizon Europe should indeed help create reciprocal relationships between research-performing organisations and high-tech SMEs. This reciprocity then leads to an improved transfer of knowledge and exploitation of research results by the companies. If this is the case, there must be a clear and quantifiable effect on the financial performance of beneficiary SMEs, measurable in the long-term.
Link MFF 14-20 / MFF 21-27	This indicator is linked to the indicator of Horizon 2020 on Growth
Other methodological comments	In the first step, the Horizon Europe companies are matched to an external company database. The next step is to obtain relevant data on the firms' turnover and relevant metadata. This will be reported for funded companies. In addition, as part of a study, a control sample of firms will be created, which consists of non-funded SMEs that were part of consortia, or applied themselves, for the same grants (i.e. same call, same year) as the beneficiaries, but did not receive funding due to budgetary constraints. Once both samples of companies are matched, a sharp discontinuity design with a difference-in-difference method are applied to analyse firm performance across the selected time window.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

Data needs: Data on innovative outputs and innovations will be provided by the beneficiaries in their periodic and final reports. External databases on patents (Patstat) and company data (Orbis) are needed to compile the various indicators.

6.3.2. KIP8 - Creating more and better jobs

Horizon Europe generates more and better jobs, initially in the projects, and then through the exploitation of results and their diffusion into the economy.

This impact pathway is about overall employment in the economy, not only researchers Its progress is monitored through a set of 3 indicators:

KIP8 - short-term indicator: SUPPORTED EMPLOYMENT	
Indicator name	**FTE jobs created, and jobs maintained in beneficiary entities for the FP project (by type of job)**
Indicator type	Output
Unit of measurement	Cumulative number of full time equivalent (FTE) jobs created, and jobs maintained in participating legal entities funded by the Programme
Data source	EC administrative and monitoring data submitted by HE participants
Link to the objective	By monitoring the number of jobs created, we aim at monitoring at short-term that Horizon Europe is on the right track towards one of its third specific objective by generating more and better jobs, initially in the projects, and then through the exploitation of the results and their diffusion in the economy. A significant share of Horizon Europe investment indeed goes to personnel costs, which directly supports existing jobs or the creation of new positions in beneficiary organisations. Horizon Europe funding also supports and maintains existing jobs that would otherwise be lost if no funding was attracted. This contributes to economic impact of the programme, and can be used as a short-term indicator.
Link MFF 14-20 / MFF 21-27	The indicator is linked to Horizon 2020 indicator ('Growth and job creation in participating SMEs') but covers now all Horizon Europe funded activities.
Other methodological comments	Data already available

Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Frequency of data	Close to real-time

KIP8 - medium-term indicator: SUSTAINED EMPLOYMENT	
Indicator name	**FTE jobs in beneficiary entities following FP project (by type of job)**
Indicator type	Result/outcome
Unit of measurement	Growth of employment in funded companies.
Data source	Project reporting, external database of companies, studies
Link to the objective	By monitoring the number of FTE jobs in beneficiary entities following FP project, we aim at monitoring at medium-term that Horizon Europe is on the right track towards one of its longer-term objectives that is to generate more and better jobs, initially in the projects, and then through the exploitation of the results and their diffusion in the economy Horizon Europe helps create reciprocal relationships between research-performing organisations and high-tech SMEs. This reciprocity then leads to an improved transfer of knowledge and exploitation of research results by the firms. If this is the case, there must be a clear and quantifiable effect on the employment in beneficiary entities, measurable in the medium-term.
Link MFF 14-20 / MFF 21-27	The indicator is linked to Horizon 2020 indicator ('Growth and job creation in participating SMEs') but is extended to all programme parts
Other methodological comments	In the first step, the Horizon Europe companies are matched to an external company database. The next step is to obtain relevant data on the firms' employment and relevant metadata. This will be reported for funded companies. In addition, as part of a study, a control sample of firms is created, which consists of non-funded entities that were part of consortia, or applied themselves, for the same grants (i.e. same call, same year) as the beneficiaries, but did not receive funding due to budgetary constraints. Once both samples of companies are matched, a sharp discontinuity design with a difference-in-difference method are applied to analyse firm performance across the selected time window. The studies are planned to be part of interim evaluation.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

KIP8 - long-term indicator: TOTAL EMPLOYMENT	
Indicator name	**Direct & indirect job created or maintained due to diffusion of FP results (by type of job)**
Indicator type	Impact
Unit of measurement	Number of direct & indirect jobs created or maintained
Data source	Project reporting, studies; data from relevant stakeholders and processes, including social partners and social dialogue, as well as ESTAT/NSI, public employment services and national administrations.
Link to the objective	By monitoring the number of direct & indirect job created or maintained due to diffusion of FP results, we aim at monitoring that Horizon Europe is achieving its expected economic impact objective that is to generate more and better jobs, initially in the projects, and then through the exploitation of the results and their diffusion in the economy Horizon Europe funding will induce technological change; job markets and skills requirement are being deeply transformed due to technological change.
Link MFF 14-20 / MFF 21-27	This indicator is linked to indicator of Horizon 2020 on Jobs
Other methodological comments	A macroeconometric model will be used to estimate the total employment induced by Horizon Europe funding. It has been used in several previous assignments to measure the economic impact of previous programmes, including for the ex-ante impact assessment of Horizon Europe. It will be used to produce aggregate job creation effects of FP funding for different time windows (3 year; 5+ year) and for different skill levels, including low, medium, high skill jobs. We expect to run studies as part of the interim and ex-post evaluations of the programme.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

Data needs: Data on jobs will be reported by the beneficiaries via the Form C 'Use of Resources' statements and in their periodic/final reports. An external database will be needed (Orbis) to enrich the data collected as well as studies to analyse the type of jobs created (as required in the regulation) and the long term indicator on Total Employment.

6.3.3. KIP9 - Leveraging investments in R&I

Like its predecessor Programme, Horizon Europe is expected to play a role as a catalyst for R&D activities within industry, research and academia, including through the EIC, the missions and partnerships.

The central assumption is that Programme funding stimulates further R&D funding, in particular funding attracted by industry, SMEs and start-ups. Progress towards this impact pathway is monitored through a set of 3 indicators:

KIP9 - short-term indicator: CO-INVESTMENT	
Indicator name	**Public & private investment mobilised with the initial FP investment**
Indicator type	Output
Unit of measurement	EUR billion
Data source	EC administrative and monitoring data submitted by HE participants through project reporting
Link to the objective	Depending on the funding instrument applied, beneficiaries in Horizon Europe are required to contribute at least a certain share of their own funds to the projects. This significant co-investment of public and private investment towards achieving the programme objective is used as a short-term indicator. By monitoring the public & private investment mobilised with the initial Horizon Europe investment, we aim at monitoring at short-term that Horizon Europe is on the right track towards one of its specific objectives that is to leverage investments for research and innovation in Europe, initially in the projects, missions or partnerships and then to exploit or scale-up their results.
Link MFF 14-20 / MFF 21-27	This indicator is linked to indicator of Horizon 2020 on investment
Other methodological comments	Calculated as the amounts (in EUR) of public & private investment mobilised in all ongoing and finished Horizon Europe projects. Data on public & private co-invested amounts are derived from the EC monitoring system. Specifically, each project participant has their EU and total contributions listed for each project application. The difference between the total project costs and the EU funding is equal to the co-investment made. First data are expected to be available after the signature of the first grant agreements.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en
Frequency of data	Close to real time

KIP9 - medium-term indicator: SCALING-UP	
Indicator name	**Public & private investment mobilised to exploit or scale-up FP results (including foreign direct investments)**
Indicator type	Result/outcome
Unit of measurement	EUR billion
Data source	Project reporting, external databases
Link to the objective	By monitoring the Public & private investment mobilised to exploit or scale-up FP results, we aim at monitoring at short-term that Horizon Europe is on the right track towards one of its longer term objective that is to leverage investments for research and innovation in Europe, initially in the projects, and then to exploit or scale-up their results. Leverage represents the additional investment mobilised by the project, the missions or the partnerships beyond the initial project total cost. This includes notably venture capital investment or additional private/public investment attracted by SMEs thanks to the innovations developed in their Horizon Europe projects.
Link MFF 14-20 / MFF 21-27	This indicator is linked to indicator of Horizon 2020 on investment

Other methodological comments	Initial data is declared by the beneficiary entities themselves as part of their final reports. Furthermore, at legal entity level, amount of public & private investment mobilised by participating entities are estimated using external databases.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

KIP9 - long-term indicator: CONTRIBUTION TO '3% TARGET'	
Indicator name	**EU progress towards 3% GDP target due to Horizon Europe**
Indicator type	Impact
Unit of measurement	EUR billion
Data source	Project reporting, studies
Link to the objective	The dimension measured of the specific objective is the leverage on investments in R&I Horizon Europe funding will stimulate further R&D funding, and particularly funding attracted by industry, SMEs and start-ups. In the long-term, this indicator estimates the aggregate effect of Horizon Europe.
Link MFF 14-20 / MFF 21-27	This indicator is linked to the indicator of Horizon 2020 (cf. the H2020 General Objective)
Other methodological comments	A macroeconometric model will be used to estimate the total leverage induced by Horizon Europe funding. It has been used in several previous assignments to measure the economic impact of previous programmes, including for the ex-ante impact assessment of Horizon Europe. It will be used to estimate amount of additional leverage (direct and indirect) attracted to R&D per euro spent in Horizon Europe, including through the missions and partnerships. We expect to run studies as part of the interim and ex-post evaluations of the programme.
Full metadata available at this address	https://commission.europa.eu/document/a165984e-fac6-4b5c-85c6-4bacd06c5d14_en

Data needs: The indicators rely on the project administrative/financial reporting data and on data declared by beneficiaries in their final reports. External databases such as Crunchbase, Dealroom or Orbis Zephyr will be used to derive the amount of follow up investment mobilised by companies involved in the Programme. Econometric models will be used to estimate the economic effects of Horizon Europe.

6.4. Efficient Implementation and optimised programme delivery (Specific Objective 4, Article 3 (2) (d) Horizon Europe Regulation)

In the Horizon Europe intervention logic, the optimisation of the programme delivery (4th programme specific objective) is key to deliver scientific, economic and societal impact (the 3 first specific objectives).

This objective relates to the way the programme is implemented, its accessibility and outreach capacity towards all participating countries, in particular participants from low R&I performing countries, but also other key parameters related to participation: gender, scientific discipline, or international cooperation.

In line with the legal obligation stipulated in Annex V of the Horizon Europe Regulation, the data on the optimised delivery of the Programme will be collected and reported in close to real-time **as part of implementation and management data** (see section 5.2.2 above) referred to in Article 50 Horizon Europe Regulation. This data will also be used to monitor the operational objectives relevant to specific objective 4 (see Table 2).

Legal obligation

Annex V:

- In addition and beyond key impact pathways indicators, data on the optimised delivery of the Programme for strengthening the ERA, [….] are collected and reported in close to real-time as part of implementation and management data, referred to in Article 50.
- This includes the monitoring of […] of data on proposals, applications, participations, projects, applicants and participants (including data on the type of organisation, such as civil society organisations, SMEs and private sector), country (such as a specific classification for country groups such as Member States, associated countries and third countries), gender, role in project, scientific discipline or sector, including SSH). […]

7. EVIDENCE TO IMPROVE: HORIZON EUROPE EVALUATION

An interim and an ex-post evaluation of Horizon Europe will be performed, in line with Article 52 Horizon Europe regulation. These studies will analyse the programme's design, implementation, results and longer-term impacts of research and innovation investments. They will inform areas for improvement for the implementation of the current EU research and innovation programme and the design of future ones. They will result in a set of recommendations for policy and programme adjustments to maximise the impact of the EU investments and better align to the strategic priorities of the Union.

The evaluations will cover all Horizon Europe instruments, in every scientific field of science supported. They will also cover every component of the programme, including European partnerships, missions, the European Institute of Technology and direct research actions by the Joint Research Centre.

The evaluations will address the relevance, coherence, efficiency, effectiveness and EU added value of the Horizon Europe programme. Figure 8 below shows how the evaluation criteria are assessed within the framework of the Horizon Europe intervention logic. Further down,

Table ***3*** provides a description of each evaluation criterion, including its rationale, examples of indicators and data sources.

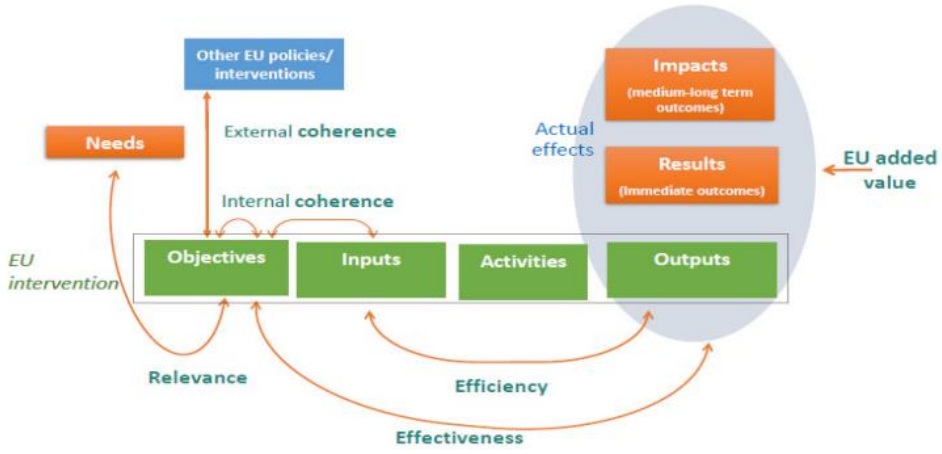


Figure 8: Horizon Europe Evaluation

The evaluations will take account of the work for the final evaluation of Horizon 2020 and build on existing monitoring data and programme analyses such as the **Monitoring Flashes**, **Biennial monitoring report on performance of European partnerships**, macroeconomic modelling (e.g. QUEST, RHOMOLO), data from the **Community Research and Development Information Service** (CORDIS) and external datasets (e.g. **Scopus**, **Orbis**). They will include data from previous Framework Programmes (Horizon 2020, FP7 and before, where possible) for the analysis of the longer-term impact of EU research and innovation investments. Simplification and reduction of burden will be examined.

A mix of quantitative and qualitative methods will be used, such as data analyses, interviews, surveys and counterfactual analyses. The analyses conducted within these studies will include triangulation of evidence.

Table 3: Evaluation criteria and examples of indicators

Evaluation criteria	Example of Indicators	Examples of Data sources
Effectiveness *Looks at the main outputs, outcomes and impacts from the projects supported, towards achieving scientific, economic/technological and societal impact in line with the overall Framework Programme objectives.*	• Projects' (first) outputs, results/outcomes and impact based on Key Impact Pathway indicators (see section 6) • Barriers and drivers to projects' progress • Share of FAIR[20] research data sets	• Projects' reporting • Business databases • Publications databases • Interviews • Survey • Case studies • External Study
Efficiency *Looks at the performance of the implementation processes, in terms of administration and management, project application and selection processes, funding allocation given the objectives set in terms of sectors, thematic areas, types of organisations, countries, etc. Analysis of the cost-effectiveness, simplification and burden reduction.*	• Distribution of grants and funds (e.g. geographic, thematic, organisations) • Error rate • Time-to-pay, time-to-grant • Stakeholders' satisfaction levels on implementation	• Analysis of programme management and implementation data • Interviews • Survey • Case studies
Coherence *Looks at the complementarities, synergies, gaps and overlaps of Horizon Europe with other relevant public EU, Member States' and relevant regional and private programmes and initiatives.*	• Complementary funding leveraged through other policies/programmes • Systems in place to foster synergies with other programmes • Horizon Europe beneficiaries benefitting from other programmes	• Analysis of other documentation on other policies/programmes • Analysis of relevant programme management and implementation data • Interviews • Survey • Case studies
EU added value *Looks at what would have happened if the Horizon Europe had not existed in comparison to what is*	• Scale, speed and scope additionality provided through Horizon Europe participation in terms of business growth, jobs, scientific activity	• Projects' reporting • Business databases (for counterfactual) • Publications databases (for counterfactual)

[20] Findability, Accessibility, Interoperability, and Reusability

done by other EU, national or regional support		• Interviews • Survey • Case studies
Relevance *Looks at the adequacy of Horizon Europe strategic programming process, including for priority-setting, Work Programme development and drafting process - given Horizon Europe objectives and the needs, priorities and problems to be addressed.* *It also includes the analysis of the internal coherence of Horizon Europe policy mix as defined as the set of activities, instruments, types of actions used to implement Horizon Europe*	• Oversubscription rate per action, call, topic, etc. • Distribution of applications (e.g. geographic, thematic, organisations) • Stakeholders' satisfaction levels on programme design • Use of evidence (evaluation, foresight, etc.) in the strategic programming • Consultation of stakeholders to identify the needs, problems to be addressed	• Programme documentation (basic act, Work Programmes) • Analysis of socio-economic, scientific and technological trends, forecasts and foresight • Interviews • Survey • Case studies • Stakeholder consultation

8. DATA MANAGEMENT

8.1. Data collection

Data linked to this framework for Horizon Europe monitoring an evaluation are collected by the Commission throughout the R&I programmes lifecycle and through surveys or acquired from third parties.

Horizon Europe data is mainly collected at proposal, evaluation, grant agreement and reporting stages through the corporate IT system "eGrants" that supports the whole programme lifecycle. This comprehensive toolset consists of several information systems that are complementary and interlinked such as:

- The Call Passport System - CPS for managing calls information
- The Participant Data Management system - PDM for registering beneficiaries and validating legal entity and financial data
- The system for the submission and evaluation of proposals - SEP – for applicants to create and submit proposals, and for experts to evaluate and rank them.
- The system for managing the complaints on the evaluation procedure - REDRESS
- The Synchronised Grant Management system - SYGMA - for managing grants and monitoring funded projects during their entire life cycle, including capturing information and data on the dissemination and use of their results.
- The fully integrated workflow for grants, experts and audit management - COMPASS
- The eGrants data warehouse as the overall warehouse for structured data, tapping into the previous systems.

Most data are provided by the beneficiaries through forms (proposals template, periodic reporting template, final reporting template) and enriched through the programme life cycle (evaluation, financing etc.). The proposals and reporting templates of Horizon Europe were enhanced to simplify and reduce the administrative burden on the beneficiaries and to allow for capturing the necessary data for impact monitoring. The data collected through the templates - such as company, patents, publications data - are then complemented with/validated against external data sources to improve data quality (completeness, accuracy). Horizon Europe data might also be complemented

by EU R&I indicators computed by Eurostat, the World Bank or other international organisations (ex: GDP per country, number of researchers by country, etc…).

JRC, EIT and European Partnership data collection specificities

It is to be noted that some programme parts are not supported (or not yet) by eGrants (ex: some European partnerships, EIT KICs, JRC direct actions).

For partnerships and EIT KICs, data is collected via pre-defined templates and uploaded in the eGrants data warehouse so that all data can be gathered at the same place for further treatment and exploitation. Data related to JRC direct actions is not integrated yet and a feasibility assessment is in progress.

Data on the cascading grants of EIT and ex-P2P (co-funded partnerships and some institutionalised (Article 185 TFEU initiatives) will be collected via separate channels (e.g. EIT KIC IT tool) using reporting templates. This methodology will allow detailed monitoring of the implementation of the grants. The data objects collected correspond to the items collected via the Horizon Europe reporting template, and so will allow for standard reporting.

8.2. Indicators, data visualisation and analytics

R&I framework programmes' data – internal or external - are gathered in one single data base, the **e-Grants data warehouse**. The aggregated set of reusable R&I data is called CORDA, standing for Common Research Data. CORDA includes data from previous framework programmes FP5 to F7, Horizon 2020 and now Horizon Europe programme (calls, applicants, proposals, evaluations, grants, participants, project results etc.).

Most indicators are/will be built in the eGrants data warehouse, the only exception being for some of the longer-term impact indicators, that will be computed via surveys or studies.

Data are collected once, processed and shared according to the 'need to share' principle through a set of analytical tools and reporting services called Horizon Data services that provide access to data for policy-making, reporting, and monitoring, and to inform the general public. Horizon Data Services include:

- HORIZON Dashboard the one-stop-shop to R&I data, and it is publicly accessible through the Funding and Tender Opportunities portal.
- HORIZON Self-Service BI for Commission services to create their own queries and reports on CORDA data set, using SAP - BusinessObjects
- HORIZON Data Catalogue for the general public to access EU Open data or other DGs or executive agencies to access the CORDA data store.

In addition, the general public can find information about the projects and the related documents in CORDIS, while Commission members of the R&I family can mine unstructured text documents stemming from the eGRANTS suite (SEDIA) with CORTEX. In addition, the JRC's portal open data (Joint Research Centre Data Catalogue) provides an inventory of data produced by the JRC, organised in dataset collections. The JRC's inventory of models used by the Commission (MIDAS) includes those developed by the JRC and those financed by the Framework Programmes for Research more generally.

Indicators and data of the framework will be exposed in the Horizon Dashboard (see section 5.1 above), the one-stop-shop for data and statistics on EU Research and Innovation. This intuitive and interactive knowledge platform allows to explore and visualise data on various research topics, to prepare statistics on funding implementation and research results, whether it is for reporting, analysis, monitoring or decision-making purposes. The Horizon Dashboard has a version available for the general public and a version for the Commission members of the R&I family.

8.3. Reporting

The Key Impact Pathways (KIPs) indicators described under section 6 and the contribution to the EU Horizontal Priorities described under section 5.2.3 will be reported annually in the Programme Performance Statement of Horizon Europe as part of the programme performance framework for the EU budget under the 2021-2027 MFF[21] and in the Commission's Annual Management and Performance Report for the EU Budget (AMPR).

Outputs and some results/outcomes indicators will be reported annually in Horizon Article 190 TFEU annual report and in DG RTD annual report of the SPP cycle.

All data and indicators collected will feed into the mid-term and final evaluation of the Horizon Europe programme.

Every executive agency of the European Commission publishes an annual activity report. It details achievements, initiatives taken and the financial and human resources spent during the year.

The joint undertakings organise their continuous monitoring and reporting of the management and implementation of their activities and periodic reviews of the outputs, results/outcomes and impacts of the funded indirect actions implemented in accordance with Article 50 of and Annex III to the Horizon Europe Regulation. That monitoring and reporting includes among others time-bound indicators for the purpose of reporting on an annual basis on the progress of their activities towards the achievement of the general, specific and operational objectives, including joint undertakings' additional objectives, as well as along KIPs set out in Annex V to the Horizon Europe Regulation.

The Biennial Monitoring Report on European Partnerships, developed under the framework of the Partnership Knowledge Hub, aims to provide a strong and continuously evolving evidence base to guide the implementation of European Partnerships throughout their life cycles and to inform strategic discussions on Horizon Europe's new policy approach to them.

[21] See Annex 2 of Commission to the European Parliament and the Council on the performance framework for the EU budget under the 2021-2027 MFF

Annex A Legal Requirements from Regulation (EU) 2021/695

Article 50 (1)

"1. The Commission shall/ monitor continuously the management and implementation of the/ Programme, the specific programme referred to in point (a) of Article 1(2) and the activities of the EIT. In order to enhance transparency, data shall also be made publicly available in an accessible manner on the Commission's website according to the latest update. In particular, data for projects funded under ERC, European Partnerships, missions, the EIC and the EIT shall be included in the same database."

*The **database** shall include:*

(a) time-bound indicators to report on an annual basis on the progress of the Programme towards achievement of the objectives referred to in Article 3 and set out in Annex V along impact pathways;

(b) information on the level of mainstreaming SSH, the ratio between lower and higher TRLs in collaborative research, the progress on the participation of widening countries, the geographical composition of consortia in collaborative projects, the evolution of researchers salaries, the use of a two-stage submission and evaluation procedure, the measures aimed at facilitating collaborative links in European R&I, the use of the evaluation review and the number and types of complaints, the level of climate mainstreaming and related expenditures, SME participation, private sector participation, gender participation in funded actions, evaluation panels, boards and advisory groups, the 'Seals of Excellence', the European Partnerships as well as the co-funding rate, the complementary and cumulative funding from other Union programmes, research infrastructures, time-to-grant, the level of international cooperation, engagement of citizens and civil society participation;

(c) the levels of expenditure disaggregated at project level in order to allow for specific analysis, including per intervention area;

(d) the level of oversubscription, in particular the number of proposals and per call for proposals, their average score, the share of proposals above and below quality thresholds."

Article 52

"1. Programme evaluations shall be carried out in a timely manner to feed into the decision-making process of the Programme, the next framework programme and other initiatives relevant to R&I.
2. The interim evaluation of the Programme shall be carried out with the assistance of independent experts selected on the basis of a transparent process once there is sufficient information available about the implementation of the Programme, but no later than four years after the start of that implementation. It shall include a portfolio analysis and an assessment of the long-term impact of previous framework programmes and shall form the basis to adjust or re-orientate the Programme, as appropriate. It shall assess the Programme's effectiveness, efficiency, relevance, coherence, and Union added value.
3. At the end of the implementation of the Programme, but no later than four years after the end of the period specified in Article 1, a final evaluation of the Programme shall be completed by the Commission. It shall include an assessment of the long-term impact of previous framework programmes.
4. The Commission shall publish and communicate the conclusions of the evaluations accompanied by its observations and shall present them to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions."

Annex V: KEY IMPACT PATHWAY INDICATORS

***"Impact pathways**, and related key impact pathway indicators, shall structure the monitoring of the Programme's progress towards its objectives as referred to in Article 3. The impact pathways shall be time-sensitive and reflect three complementary impact categories reflecting the non-linear nature of R&I investments: scientific, societal and technological or economic. For each of those impact categories, proxy indicators are used to track progress distinguishing between the short, medium and longer terms, including beyond the Programme's duration, with possibilities for breakdowns, including by Member States and associated countries. Those indicators shall be compiled using quantitative and qualitative methodologies. Individual Programme parts contribute to those indicators to a different degree and through different mechanisms. Additional indicators can be used to monitor individual Programme parts, where relevant.*

The micro-data behind the key impact pathway indicators are collected for all parts of the Programme and for all delivery mechanisms in a centrally managed and harmonised way and at the appropriate level of granularity with minimal reporting burden on the beneficiaries.

***In addition and beyond key impact pathways indicators**, data on the optimised delivery of the Programme for strengthening the ERA, fostering the excellence-based participations from all Member States in the Programme as well as facilitating collaborative links in European R&I are collected and reported in close to real-time as part of implementation and management data, referred to in Article 50. This includes the monitoring of collaborative links, of network analytics, of data on proposals, applications, participations, projects, applicants and participants (including data on the type of organisation, such as civil society organisations, SMEs and private sector), country (such as a specific classification for country groups such as Member States, associated countries and third countries), gender, role in project, scientific discipline or sector, including SSH), and the monitoring of the level of climate mainstreaming and related expenditures."*

Annex B Operational objectives from Decision (EU) 2021/764

Article 2 (2)

"The operational objectives of the Specific Programme are the following:

(a) to strengthen excellent basic and frontier research; to reinforce and spread excellence, including by fostering wider participation throughout the Union;
(b) to reinforce the link between research, innovation, and, where appropriate, education and other policies, including complementarities with national, regional and Union R&I policies and activities;
(c) to support the implementation of Union policy priorities including in particular the SDGs and the Paris Agreement;
(d) to promote responsible R&I, taking into account the precautionary principle;
(e) to strengthen the gender dimension across the Specific Programme;
(f) to increase collaboration links in European R&I and across sectors and disciplines, including social sciences and humanities (SSH);
(g) to strengthen international cooperation;
(h) to connect to and develop research infrastructures across the European Research Area (ERA) and to provide transnational access;
(i) to attract talent, to train and retain researchers and innovators in the ERA, including through mobility;
(j) to foster open science and ensure visibility to the public and open access to scientific publications and research data, including appropriate exceptions;
(k) to encourage exploitation of R&I results and actively disseminate and exploit results, in particular for leveraging private investments and policy development;
(l) to deliver, through R&I missions, on ambitious goals within a set timeframe;
(m) to improve the relationship and interaction between science and society, including the visibility of science in society and science communication, and to promote the involvement of citizens and end-users in co-design and co-creation processes;
(n) to accelerate industrial transformation, including through improved skills for innovation;
(o) to stimulate R&I activities in SMEs and the creation and scale-up of innovative companies, in particular start-ups, SMEs, and in exceptional cases small mid-caps;
(p) to improve access to risk finance, including through synergies with the InvestEU Programme established by Regulation (EU) 2021/523), in particular where the market does not provide viable financing."

Annex C Results indicators defined in DG Research & Innovation Strategic Plan

The DG R&I Strategic Plan 2020-2024 defines a series of indicators out of which the following results indicators are relevant to Horizon Europe. Most of these indicators cover both the Horizon 2020 and Horizon Europe programmes[22].

Policy Priority 1: A EUROPEAN GREEN DEAL:

Specific objective 1.1: High-quality science, knowledge and innovative solutions support climate policies and help to preserve biodiversity, ecosystem and natural resources		
Result indicator 1: Number of newly reported Intellectual Property Rights (IPRs) applications from Horizon projects addressing the European Green Deal per year *(Horizon Europe Key Impact Pathway 4)*		
Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
49	Higher than 2019 baseline	Higher than 2019 baseline
Result indicator 2: Number of newly reported scientific publications from Horizon projects addressing the European Green Deal per year. *(Horizon Europe Key Impact Pathway 4)*		
Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
6 120	Higher than 2019 baseline	Higher than 2019 baseline
Specific objective 1.2: Mainstreaming of the public and private research and innovation investments for climate actions strengthens the European Green Deal's impact		
Result indicator 3: Proportion of climate related spending (climate mainstreaming) in Horizon Europe spending		
Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
29 %	35%	35%
Specific objective 1.3: Co-creation of Horizon Europe and its Missions and partnerships increases awareness of the key role of research and innovation for achieving climate neutrality		
Result indicator 4: Share of Horizon Europe Green Deal related projects where citizens and end-users contribute to the co-creation of R&I content *(Horizon Europe Key Impact Pathway 6)*		
Baseline (average 2014-2019)	**Interim milestone** (2022)	**Target** (2024)
11% (value for the whole FP)[23]	Higher than value	Higher than value
Result indicator 5: Progress towards R&I missions' targets related to the European Green Deal		
Baseline (2020)	**Interim milestone** (2022)	**Target** (2024)
0	Higher than 2020 baseline	Higher than 2020 baseline

[22] For methodological details please see the Annex of the Strategic Plan.

[23] This figure (11%) is the share of the Horizon2020 projects which declared all forms of societal engagement. However only 10% of such projects includes the involvement of citizen and civil society in content co-creation.

Policy Priority 2: A EUROPE FIT FOR THE DIGITAL AGE

Specific objective 2.1: High-quality science, knowledge and innovative solutions facilitate a digital transition in Europe, including a new European approach to Artificial Intelligence

Result indicator 6: Number of newly reported Intellectual Property Rights (IPRs) applications from Horizon projects addressing the digital transition in Europe per year. *(Horizon Europe Key Impact Pathway 4)*

Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
50	Higher than 2019 value	Higher than 2019 value

Result indicator 7: Number of newly reported scientific publications from Horizon projects addressing the digital transition per year. *(Horizon Europe Key Impact Pathway 4)*

Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
3 481	Higher than 2019 baseline	Higher than 2019 baseline

Result indicator 8: Amount of public and private investment mobilised with the initial Framework Programme investment (leverage ratio) towards the GDP for R&D 3% target *(Horizon Europe Key Impact Pathway 9)*

Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
1 : 0.23	Higher than 2019 baseline	Higher than 2019 baseline

Specific objective 2.2: The revitalised European Research Area sets directions for societal, economic and ecological transitions in Europe and contributes to spreading excellence, closing research and innovation gap and working out a common global response to emerging challenges

Result indicator 9: Number of researchers accessing European research infrastructures, including e-infrastructures, supported through the Framework Programme

Baseline (August 2020)	**Interim milestone** (2022)	**Target** (2024)
114 319 (of which 102 949 having access through e-Infrastructures)	Higher than 2020 baseline	Higher than 2020 baseline

Result indicator 10: Share of researchers from widening countries researchers' population involved in the Framework Programme per year

Baseline (2017)	**Interim milestone** (2022)	**Target** (2024)
0.95%	Higher than 2017 baseline	Higher than 2017 baseline

Specific objective 2.3: Research and innovation actions and the European Innovation Council in particular support development and scaling-up of SMEs with breakthrough and disruptive technologies

Result indicator 11: Share of funds allocated to SMEs in Horizon projects per year

Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
18.38%	Higher than 2019 value	Higher than 2019 value

Policy Priority 3: AN ECONOMY THAT WORKS FOR PEOPLE

Specific objective 3.1: Research and innovation actions, increased R&I investments and the R&I component of the European Semester boost economic growth and jobs creation		
Result indicator 12: FTE jobs supported in entities involved in Horizon projects per year ***(Horizon Europe Key Impact Pathway 8)***		
Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
102,051 FTEs	Higher than baseline	Higher than baseline

Policy Priority 4: A STRONGER EUROPE IN THE WORLD

Specific objective 4.1: Regional research and innovation strategies and broader association policy contribute to promoting common European R&I values and creating a global Research and Innovation Space		
Result indicator 13: Share of scientific international co-publications funded by the Framework Programme		
Baseline (2018)	**Baseline** (2018)	**Baseline** (2018)
41%	Higher than 2018 baseline	Higher than 2018 baseline

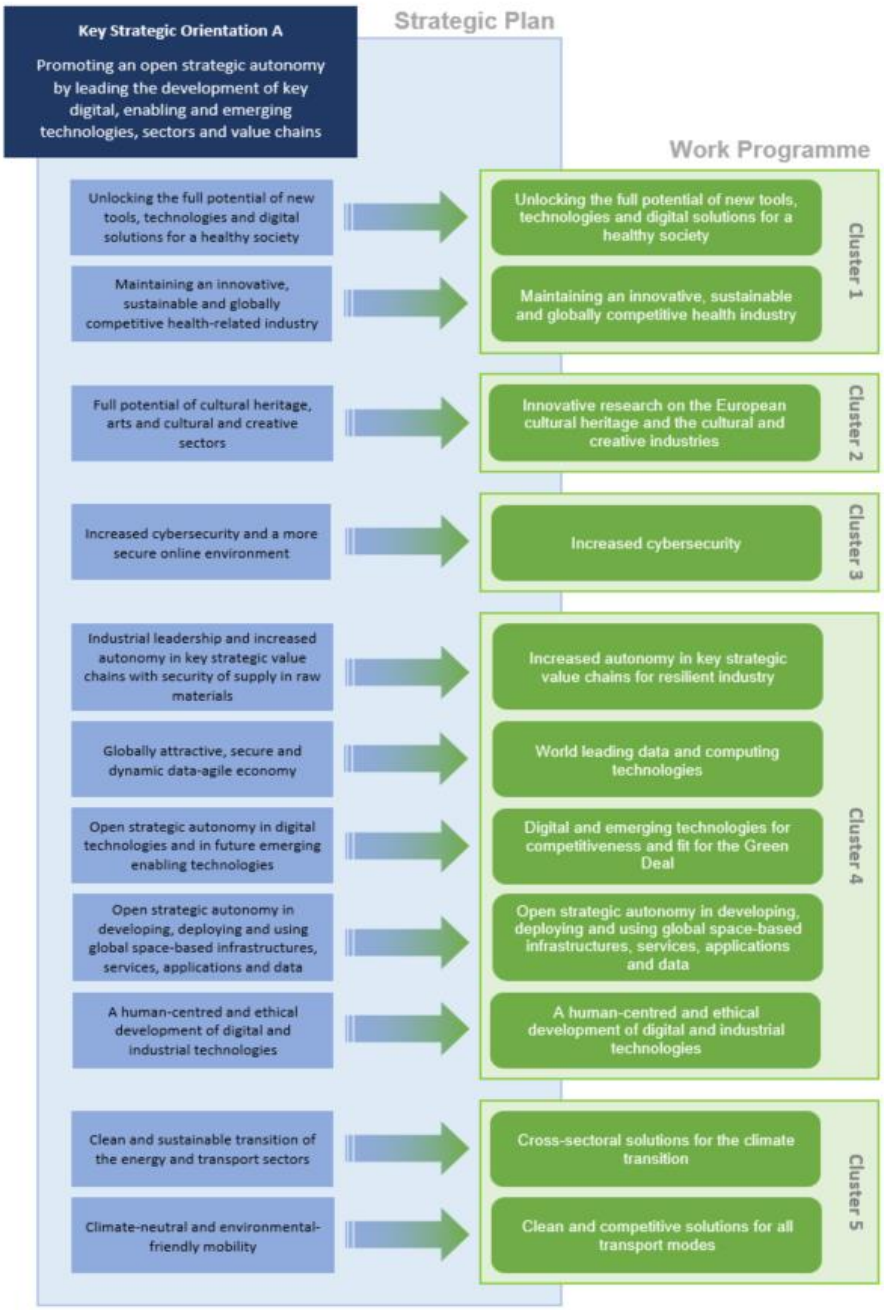
Policy Priority 5: PROMOTING OUR EUROPEAN WAY OF LIFE

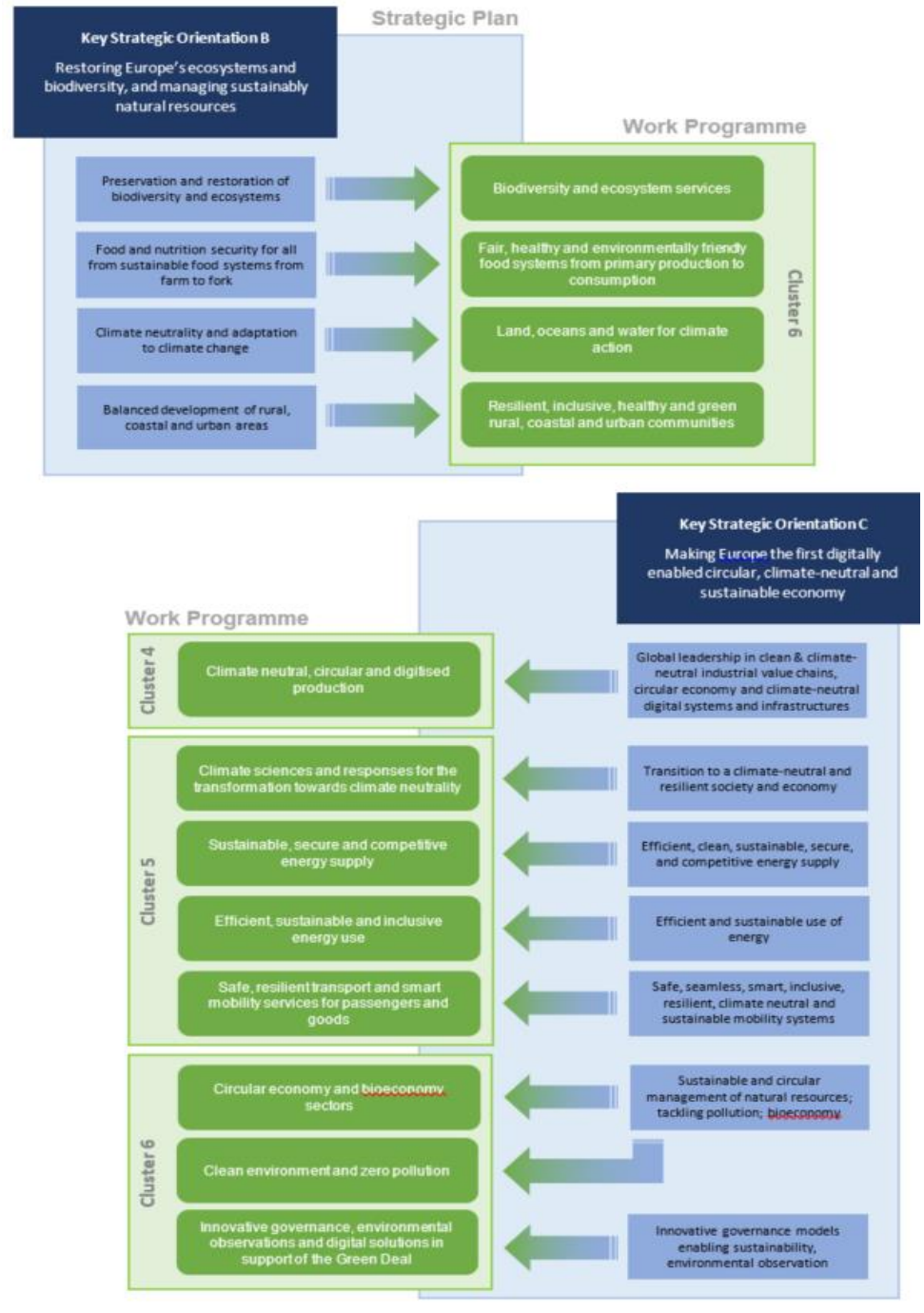
Specific objective 5.1: Research and Innovation develop and deploy solutions, technologies and innovations to tackle emerging threats and improve crisis preparedness		
Result indicator 14: Number of newly reported **Intellectual Property Rights (IPR)** applications from Horizon projects tackling emerging threats and improving EU crisis preparedness and resilience per year ***(Horizon Europe Key Impact Pathway 4)***		
Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
4	Higher than baseline	Higher than baseline
Result indicator 15: Number of newly reported scientific publications from Horizon projects addressing the emerging threats and improving EU crisis preparedness and resilience per year ***(Horizon Europe Key Impact Pathway 4)***		
Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
541	Higher than baseline	Higher than baseline
Specific objective 5.2: Research and innovation support the European health initiatives including the European plan to fight cancer		
Result indicator 16: Number of newly reported scientific publications from Horizon projects addressing health per year ***(Horizon Europe Key Impact Pathway 4)***		
Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
3 067	Higher than baseline	Higher than baseline

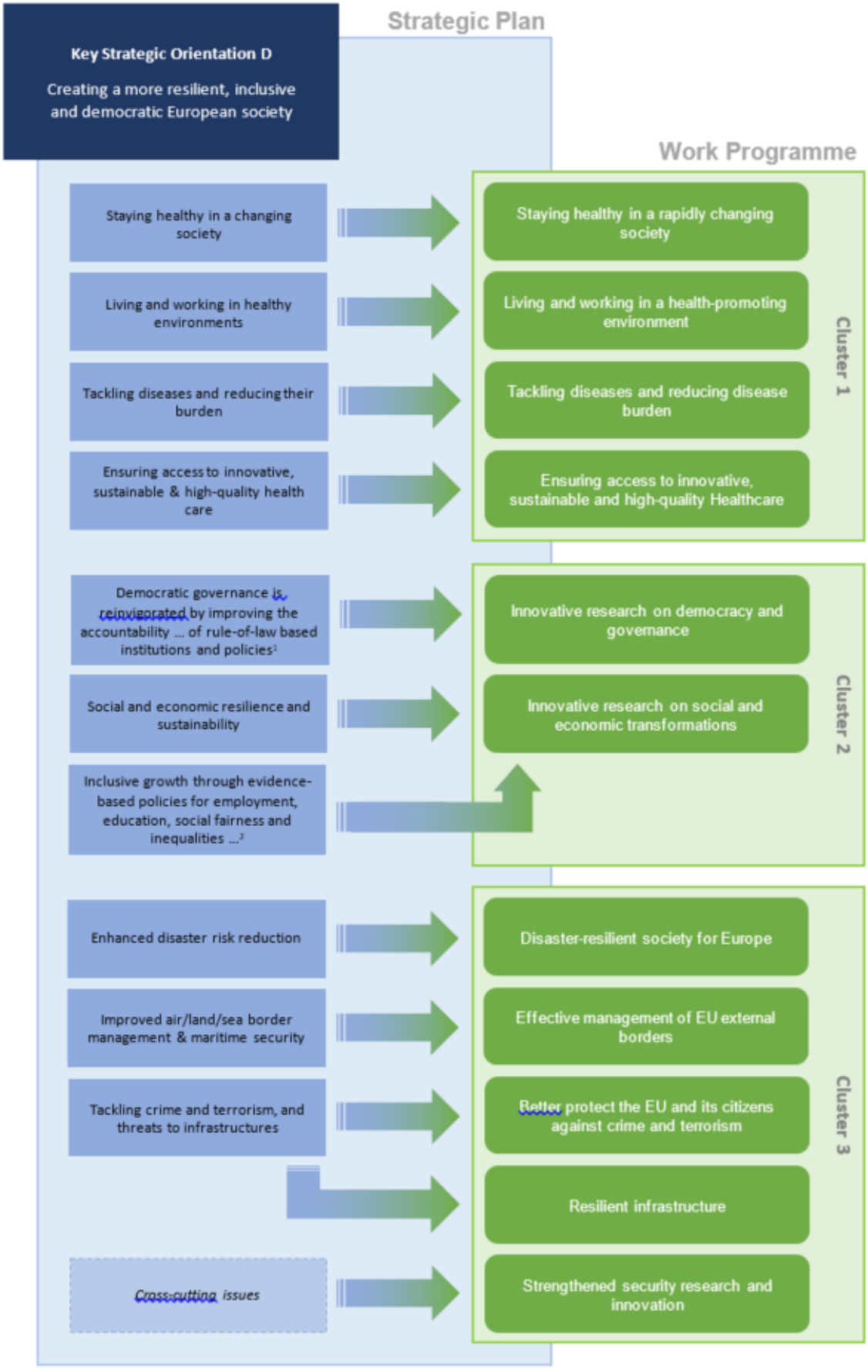
Policy Priority 6: A NEW PUSH FOR EUROPEAN DEMOCRACY

Specific objective 6.1: European research and innovation support citizens' involvement, social inclusion and equalities in Europe, including through communication of the European research and innovation added value		
Result indicator 18: Number and share of female researchers in total number of researchers participating to Horizon projects per year		
Baseline (2019)	**Interim milestone** (2022)	**Target** (2024)
35.64%	40%	45%

Annex D Key strategic orientations, Expected impacts and corresponding Work Programme destinations




Key Strategic Orientation B
Restoring Europe's ecosystems and biodiversity, and managing sustainably natural resources
Strategic Plan
Work Programme
Preservation and restoration of biodiversity and ecosystems
Food and nutrition security for all from sustainable food systems from farm to fork
Climate neutrality and adaptation to climate change
Balanced development of rural, coastal and urban areas
Biodiversity and ecosystem services
Fair, healthy and environmentally friendly food systems from primary production to consumption
Land, oceans and water for climate action
Resilient, inclusive, healthy and green rural, coastal and urban communities
Cluster 6
Key Strategic Orientation C
Making Europe the first digitally enabled circular, climate-neutral and sustainable economy
Work Programme
Cluster 4
Climate neutral, circular and digitised production
Global leadership in clean & climate-neutral industrial value chains, circular economy and climate-neutral digital systems and infrastructures
Cluster 5
Climate sciences and responses for the transformation towards climate neutrality
Transition to a climate-neutral and resilient society and economy
Sustainable, secure and competitive energy supply
Efficient, clean, sustainable, secure, and competitive energy supply
Efficient, sustainable and inclusive energy use
Efficient and sustainable use of energy
Safe, resilient transport and smart mobility services for passengers and goods
Safe, seamless, smart, inclusive, resilient, climate neutral and sustainable mobility systems
Cluster 6
Circular economy and bioeconomy sectors
Sustainable and circular management of natural resources; tackling pollution; bioeconomy
Clean environment and zero pollution
Innovative governance, environmental observations and digital solutions in support of the Green Deal
Innovative governance models enabling sustainability, environmental observation


Key Strategic Orientation D
Creating a more resilient, inclusive and democratic European society
Strategic Plan
Work Programme
Staying healthy in a changing society
Living and working in healthy environments
Tackling diseases and reducing their burden
Ensuring access to innovative, sustainable & high-quality health care
Staying healthy in a rapidly changing society
Living and working in a health-promoting environment
Tackling diseases and reducing disease burden
Ensuring access to innovative, sustainable and high-quality Healthcare
Cluster 1
Democratic governance is reinvigorated by improving the accountability ... of rule-of-law based institutions and policies[1]
Social and economic resilience and sustainability
Inclusive growth through evidence-based policies for employment, education, social fairness and inequalities ...[2]
Innovative research on democracy and governance
Innovative research on social and economic transformations
Cluster 2
Enhanced disaster risk reduction
Improved air/land/sea border management & maritime security
Tackling crime and terrorism, and threats to infrastructures
Cross-cutting issues
Disaster-resilient society for Europe
Effective management of EU external borders
Better protect the EU and its citizens against crime and terrorism
Resilient infrastructure
Strengthened security research and innovation
Cluster 3