



# Horizon Europe and the Green Transition: Interim evaluation support study

Final Report  
("Phase 2" study)

Independent  
Expert  
Report



Research and  
Innovation

## Horizon Europe and the Green Transition: Interim evaluation support study Final Report (“Phase 2” study)

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Manuscript completed in May 2024

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PDF	ISBN 978-92-68-19579-6	doi:10.2777/67934	KI-05-24-589-EN-N
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Luxembourg: Publications Office of the European Union, 2024

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## Final Report ("Phase 2" study)

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# EXECUTIVE SUMMARY

## Evaluation objective and methodology

This report is part of a study combining a back-to-back approach for the ex-post evaluation of Horizon 2020 and the interim evaluation of Horizon Europe, with a thematic focus on Green Transition aspects and the long-term impact of the Framework Programme(s). It constitutes the final report for the second phase of the evaluation study focusing on Horizon Europe.

This evaluation study covers all activities of the European Framework Programmes in the impact area Green Transition, i.e. all related activities in Horizon 2020 (2014-2020) and the first phase of Horizon Europe (2021-2023). It notably covers two Clusters under Horizon Europe: Cluster 5 (Climate, Energy, and Mobility) and Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture & Environment), sitting in Pillar II. Jointly, they represent 45% of the budget allocated to Pillar II, and 25.2% of the Horizon Europe total budget.

This evaluation study also assesses European Partnerships under the Framework Programme with a legal obligation for evaluation (Joint Undertakings, Knowledge and Innovation Communities, Art. 185 or 187 TFEU <sup>1</sup>) active in Green Transition-related fields, as well as thematically relevant Missions and the JRC. Other Partnerships relevant for the Green Transition (Co-funded and Co-programmed European Partnerships) are taken into account as part of the evaluation of the thematic areas.

The evaluation was conducted between February 2023 and January 2024. A specific methodological approach was designed during the inception phase of the study, in agreement with the Steering Committee, using a mix of various data collection and data analysis tools such as bibliometrics, case studies, survey, benchmarking, etc. The different tools mobilised throughout the evaluation enabled the collection of evidence to answer the various evaluative questions considered.

## Overview of the Green Transition in Horizon Europe

According to phase 1 results focusing on Horizon 2020, research and innovation can play a considerable role in providing the desired directionality for the Framework Programme. The Framework Programme aims to provide the foundational technological requirements, and technological and social innovations, for shaping the transformation process to a green European society, paving the way for the required behavioural change through integration of all stakeholders, including civil society. However, **the Green Transition goes far beyond transitions pushed by new technologies**. Nature-based solutions, as well as non-technological and socio-economic innovations, are also hugely important to realise the transition.

**The European Green Deal has programmatically influenced the design of Horizon Europe**, although it was presented only after the Commission's initial proposal for Horizon Europe was adopted. Within Horizon Europe the European Green Deal is most prominently reflected through the development of the directly climate-related Missions (Adaptation to Climate Change, Climate-Neutral Cities, Soil, and Ocean and Waters), Cluster 4 (Digital,

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<sup>1</sup> Treaty on the Functioning of the European Union

Industry and Space), Cluster 5 (Climate, Energy, Mobility) and Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment). The strategic orientations of Horizon Europe for 2021-2024 clearly aimed at supporting the ongoing economic, societal, and industrial transformations by accelerating the twin Green and Digital Transition.

In line with the EU Multiannual Financial Framework (MFF) 2021-2027, climate and biodiversity mainstreaming targets were set for Horizon Europe: according to the Horizon Europe legal basis, 35% of total (administrative and operation) budget shall contribute to climate objectives (legally binding), and the programme should contribute to the overall ambition of providing 7.5% of annual spending under the MFF to biodiversity objectives in 2024 and 10% in 2026 and 2027<sup>2</sup>.

## Key findings per evaluation criteria

The intervention logics indicate that **the Green Transition is strategically encompassed within Horizon Europe** by four Key Strategic Orientations (KSOs). All are linked to the Green Transition priorities as outlined in the European Green Deal. However, KSOs B and C do so in the most direct way via interlinkages between the European Green Deal priorities and Impact Areas of Horizon Europe.

The introduction of Key Impact Pathways (KIPs) also contributed to a **reorientation from an activity-driven to an impact-driven programme**<sup>3</sup>. The KIPs represent a new approach to evaluating and communicating the impact of EU R&I funding built around three pillars and nine storylines. The KIPs of Horizon Europe aim to capture long-term and wider effects on science, society, and economy, including capturing impacts of the European Green Deal.

All three pillars of KIPs (scientific, societal, and economic) have significant implications for the Green Transition. Nonetheless, given the complexity of the topic, there is **insufficient** reflection of the European Green Deal and other societal objectives stemming from key EU policy priorities in the Key Impact Pathways. There are also potential trade-offs between some of the priorities stipulated in KIPs and Green Transition objectives that span beyond the scope of the Framework Programme, particularly regarding the discussion about limits to growth and decoupling<sup>4</sup>.

## Relevance

The assessment regarding relevance showed and confirmed that Clusters 5 and 6 are highly relevant for the Green Transition and the related policy objectives. The design processes of Horizon Europe have been built upon an **interplay of top-down and bottom-up processes** that integrate long-term priorities, societal needs, and emerging issues in the Green Transition area.

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<sup>2</sup> Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 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

<sup>3</sup> European Commission 2022, *Horizon Europe (HORIZON) Programme Guide*, [https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide\\_horizon\\_v1.5\\_en.pdf](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_v1.5_en.pdf)

<sup>4</sup> Vogel, J., & Hinkel, J. (2023). Is green growth happening? An empirical analysis of achieved versus Paris-compliant CO<sub>2</sub>–GDP decoupling in high-income countries. *The Lancet Planetary Health*, 7(9), e759–e769.



For tackling the Green Transition, **improvements in the programming** of the Framework Programme have been made. In terms of stakeholder needs in the Green Transition area, engagement processes at the EU level related to the implementation of the European Green Deal and reflection of its priorities in R&I agenda-setting are well connected<sup>5, 6</sup>. At the Commission level, the Horizon Europe Strategic Plan 2021-2024 was created through **a co-creation process between all relevant DGs**, aiming to increase ownership and optimise the impact of investments. To support the complex societal transition processes, the work programme design at the Commission level now takes a co-creation approach, with a common budget envelope at Cluster level, under a Steering Board composed of Director-Generals, an Executive Committee composed of Directors, and an individual Directors' Group for each programme part (e.g. Cluster). (In contrast to the approach in Horizon 2020 where DGs disposed of their own R&I budget line, which limited the need for effective co-creation).

Concerning the scope of R&I activities performed, **all Destinations correspond directly with dedicated EU priorities for the Green Transition**. Still, in the area related to the Green Transition, **Clusters 5 and 6 are predominantly focused on advancing specific technologies and industrial transition**. However, insufficient attention is given to the pipelines of necessary solutions, the right mix of available and emerging technologies, the interplay of different technological and non-technological solutions, and the nature and logic of the Green Transition processes as such.

Broader issues of socio-cultural change – including aspects of multi-stakeholder alignment, governance, lifestyles, and behaviour change – have received relatively less attention. They are mostly subsumed under specific Destinations in Cluster 5, while Cluster 6 takes a more transversal approach. One positive aspect is that Destinations which focus on climate science, food and communities allocate more than half their funding to projects that feature inputs from social sciences and humanities (SSH), which helps them consider societal needs and broader societal processes. In Cluster 5, Destinations in the areas of smart mobility and communities put particular emphasis on social innovation. Projects in energy supply and clean transport modes, as well as projects supporting the implementation of Partnerships, generally engage a broad range of actors, albeit with a primary focus on industry stakeholders and cross-value chain collaborations. Missions tend to adopt broader engagement priorities with a particular focus on citizens, cities and local authorities. However, the instrument is still not sufficiently understood by groups such as civil society and local authorities.

Weaknesses have been identified in addressing broad structural and infrastructural transformations, driving the definition and implementation of new paradigms, values, regulations, standards and norms, and in a lack of priorities for the fields of action to achieve these societal and governmental transformations more broadly. **Horizon Europe still has to deliver on addressing more complex societal aspects of the Green Transition to enhance its relevance**. These include vested and competing interests, addressing established assumptions and power structures, integration of diverse values and types of knowledge, social change conducive to the Green Transition, and further advancing open-ended and needs-based approaches.

International cooperation is necessary to jointly tackle climate change and environmental challenges. In Clusters 5 and 6, three geographic areas outside of Europe received specific

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<sup>5</sup> European Commission (2022). Shaping the EU's climate transition: European citizens take the floor. <https://op.europa.eu/en/publication-detail/-/publication/55bf10bc-c762-11ec-b6f4-01aa75ed71a1/>

<sup>6</sup> European Commission (2023). Horizon Europe strategic plan 2025-2027 analysis. <https://op.europa.eu/en/publication-detail/-/publication/b3baec75-fdd0-11ed-a05c-01aa75ed71a1/>

attention: Africa, China, and Latin America and the Caribbean. In 2023, specific Science, Technology, and Innovation (STI) cooperation agendas were set for all three regions, enabling cooperation with higher directionality in the coming years. While Horizon Europe has set up some strategic considerations for level-playing-field cooperation with these regions, the strategic approach towards international cooperation still needs to deliver results in terms of engaging third countries and associated countries.

## Coherence

**The new Horizon Europe programming approach that engages all relevant DGs, contributed to increasing the coherence of the Framework Programme significantly. This new portfolio approach** to designing and managing the work programme, for which regular Cluster meetings with policy DGs and the JRC are performed, **is an important step towards developing the programme in a more integrated and multi-disciplinary way.**

**Nonetheless, thematic portfolio management for projects funded across Horizon Europe Clusters, Partnerships, and Missions is missing.** To increase the internal coherence of Horizon Europe's actions, and create synergies between different types of actions funded under different Pillars, mechanisms for thematic portfolio management of projects across different programme parts and implementation bodies should be established. As a pre-requisite, the main project funding database, eGrants, should integrate project data from Co-Funded Partnerships and EIT KICs.

Compared to Horizon 2020, **linkages and synergy creation mechanisms between Horizon Europe and other funding mechanisms at the European level have increased** but challenges persist. While awareness-raising activities and cross-referencing to programmes such as the Innovation Fund increased, more top-down coordination between different DGs is needed to decrease fundamental differences in eligibility and evaluation criteria and timing. To realise the Green Transition, there is a key need to build co-ordinated bridges from demonstration activities in Horizon Europe to the large-scale implementation support provided by other programmes. This requires strengthening external coherence via linkages between Horizon Europe projects and other funding mechanisms outside Horizon Europe, such as better monitoring or support in preparing convincing business cases for certain technologies and solutions.

**Rationalising the partnership landscape has contributed to developing more coherent approaches in many partnership areas.** This has helped Co-Funded Partnerships to significantly increase public funding from EU Member States and strengthen collaboration with the EU level. For the Co-Funded Partnerships, strategic cooperation frameworks and proactive involvement from the EC concerning strategic planning of Work Programmes to facilitate the creation of synergies are needed.

**For the Horizon Europe Missions, a key challenge seems to be the need for stronger emphasis of implementation, uptake and behavioural change.** All Missions have developed some bottom-up mechanisms for ensuring vertical governance and coordination with the national, regional, and local levels, but limiting factors remain insufficient coordination between national, regional, and local levels of governance, leverage of investments and access to resources outside of Horizon Europe, and stakeholder engagement including with citizens and businesses.

## Effectiveness

Concerning the evaluation criterion of effectiveness, most projects are still at an early stage of development and therefore only the projects' *expected* outcomes are considered.

The analysis indicates that Cluster 5 and Cluster 6 projects are likely to develop sustainable solutions contributing to the Green Transition. With their diverse portfolio of anticipated results and outcomes, most Destinations in Cluster 5 strongly emphasise projects with scientific, technological close-to-market outputs, and technology and innovation outcomes (Destination 2, 3, 5, 6). Cluster 6 also provides for a broad range of anticipated results across its seven Destinations, including projects across biodiversity and ecosystems, 'farm to fork', circular economy, bioeconomy, zero pollution, climate action (land, ocean, and water), communities, and governance. **The breadth and depth of the outcomes from these results are found (through the intervention logic analysis) to provide a sufficient structural approach to support the acceleration of the transition to achieve climate neutrality by 2050 as required by the European Green Deal**, alongside opportunities to strengthen and balance environmental, social, and economic goals on a path towards sustainability. It should be also noted more broadly here that **the thematic alignment of all current HE projects with climate and biodiversity policy priorities is found to be 26% and 8% respectively.**

**Considerable knowledge and capacity outputs (publications, competence, skills, knowledge of researchers, and increasing international visibility and action through collaboration) are expected for both Clusters.** The intervention logic analysis shows Cluster 6 results contributing to recommendation- and input-to-policy-based outputs and outcomes for policymakers (with projects providing research publications), as well as to skills, knowledge and competence of researchers, and to international visibility and action through collaboration. In contrast, Cluster 5 strongly focuses on testing-, demonstrating- and piloting-based outputs and outcomes.

The low extent to which patent-based outputs and results are present for both Clusters and the difference between the nature of the innovation activities being pursued by each of the Clusters are indicated by the differing (and low) level of focus of the Clusters on patents, with 20% of respondents for Cluster 5 and only 10% for Cluster 6 indicating that their projects have or are likely to result in patent-based outputs.

The tensions between the need for decisions to advance specific technologies and the potential for lock-ins and a more disorderly Green Transition are only addressed to a limited extent in Cluster 5. While it is considered in the programming phase and its prioritisation, it still can play a role. In most cases, solutions must be demonstrated and validated across diverse contexts. **A forward-looking analysis has indicated that it remains unclear whether longer-term targets (i.e. the EGD or EU 2050 strategy) can be sufficiently met with the approach taken:** e.g. whether substantial emissions reductions will be achieved as a result of Destination 3 on Sustainable, Secure and Competitive Energy Supply within reasonable time horizons.<sup>7</sup> Still, the limited number of funded projects does not allow to fully reflect the structural differences between the economies of Member States, including their different capacities to integrate new technologies into existing infrastructure.

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<sup>7</sup> An important point that should be noted here though is that HE is not designed to deliver the long-term targets. HE facilitates the development of technologies and solutions and where the wide-scale deployment of these is beyond the scope of HE. Furthermore, there are many critical external factors that influence the achievement of the long-term targets.

In Cluster 6, the strong focus on stakeholder engagement and multi-actor processes (including gender and inclusivity considerations) are expected to lead to greater societal embedding of innovations and business opportunities. For Cluster 6, the Technology Readiness Level (TRL) approach is considered to only work to a limited extent. Some Destinations and several sub-destinations are dedicated to social change and social innovation in addition to science-driven technological development. Only the combination of both is perceived as an impactful pathway towards a Green Transition.

The broad scope of the calls and topics within Cluster 5 and Cluster 6 across multiple different instruments and types of projects increases the complexity and may dilute or reduce the overall results and outcomes. Although they have a different focus, the Cluster calls, Partnerships and Missions support the same types of projects (IA, RIA, CSA). An assessment of the instruments and greater specialisation could help reduce the complexity and risks of overlaps or duplications.

**The Horizon monitoring system is seen by some stakeholders as insufficient for the task for which it is intended:** it is not able to spot the TRL levels or to indicate how far the development of critical technologies has progressed in line with the requirements of a 55% reduction scenario, and it is unable to indicate the extent to which a technology will reduce costs for industry, etc. However, it should be noted that this degree of monitoring may not be realistic. Reliable cost assessments would require access to (and disclosure of) confidential business data and a highly sophisticated level of modelling. Furthermore, while R&I activity may often not deliver what was expected, it can provide significant learning opportunities. A systematic process to identify and utilise learnings from projects that have not progressed/delivered as expected does not exist at present in a structured way. (It is only done on an ad-hoc basis and, while there may be some learning shared between projects, this refers more to the general implementation of projects, such as the sharing of best practice).

While a cross-cutting analysis of the individual Partnership evaluations shows that these can progress towards the objectives that have been set, in many instances the outputs and outcomes of the first calls under Horizon Europe are not yet visible. Therefore it is too early to provide a final assessment of the Partnerships' effectiveness. Findings show that most projects under the CBE (Circular Bio-based Europe JU) have reached their key project objectives. The EIT Food-KIC is also found to have been very successful in supporting entrepreneurs, with its KPIs appearing overall to have been met. Furthermore, insight indicates that Partnerships bring forward high-quality deliverables that feed into policy development.

## Efficiency

For **efficiency**, stakeholders are generally **satisfied with the application, administrative and management processes, including for Partnerships**. The effort to prepare and submit a Horizon Europe proposal was overall considered satisfactory, albeit less so by unsuccessful applicants (as one might expect). For the beneficiaries who participated in Horizon 2020, changes introduced in Horizon Europe regarding application and administrative processes were perceived positively.

For institutionalised and co-programmed Partnerships, administration and management of the initiatives have thus far been assessed to be efficient. They have streamlined structures and coordinated governance processes. Institutionalised Partnerships build upon the work of their predecessors, allowing for further simplification. Co-funded Partnerships were efficient for those Partnerships able to build on previous activities, and less efficient for those that

were not able, particularly in terms of initial grant management. Coordination between the European Commission and the Partnerships could be further improved in work programme preparation in terms of consistent communications and timing. Overall, **programme implementation challenges for Partnerships remain based on the differences in application and reporting processes** across different types of Partnerships.

The **co-design process**, while seen as a positive change for coherence, generated some **inefficiencies due to the administrative burden of coordination**. Meanwhile, in implementation, the Framework Programme is considered to be flexible, both for consortium changes and evolution of project objectives due to changed circumstances. Several co-programmed and institutionalised Partnerships are considered to adequately respond to changing market needs through the involvement of the right stakeholders.

**Though the Framework Programme is open and does attract new applicants, there is a need to facilitate access for new applicants, particularly SMEs.** Although in most cases their project is not a continuation of research activities previously funded, most beneficiaries have participated in a previous FP. While previous experience does not guarantee success, there is a rate of renewal and participants who were successful in the past are selected to work on new projects. In terms of barriers to new applicants, the Framework Programme is seen as complex to understand, with a sizable number of topics being spread out over multiple different instruments and implementation modes (incl. Partnerships). Projects are seen as too large, impeding the inclusion of SMEs. It must be noted, however, that there is a lack of information on lump sum participations which could facilitate participation by SMEs. Finally, identifying relevant partners remains a particular challenge for new applicants and SMEs that are not well-connected to established networks.

**A degree of discrepancy** is noted **between the policy approach of the research funding (i.e. more impact orientation) and project formation, where the research logic dominates**. Thus, there are difficulties in including industry, new actors (e.g. farmers) and communication professionals in the proposals. These drivers towards new types of applicants may be expected and even encouraged, given the moves towards market-ready solutions and stakeholder engagement in Horizon Europe.

Given the infancy of Horizon Europe implementation, **cost efficiency cannot yet be determined**, but the leverage factor (ratio of amount co-financed to amount contributed by the EU) was considered. For Cluster 5, excluding Partnerships, the leverage factor was 0.141, of which financing was leveraged principally for Innovation Actions (leverage factor 0.240). For Cluster 6, excluding Partnerships, it was 0.051, similarly principally for IA actions (0.130). Partnerships have higher leverage factors: for Cluster 5, 0.493 and for Cluster 6, 0.227. Differences between the Clusters and the Partnerships can be explained by the nature of the projects and the effect of Innovation Actions.

**Overall, budget allocations are perceived to be aligned with the projects' ambitions.** However, **a disproportionate relationship between ambition (through strategic planning) versus budget allocation has been noted across all implementation modes**, preventing some relevant challenges to the Green Transition from being addressed and resulting in the rejection of hundreds of high-quality applications.

At programme level, there is an insufficient translation of the SDGs and other societal objectives stemming from key EU policy strategies into the Key Impact Pathways. Additionally, **participant data for EIT-KICs, Co-funded Partnerships and third-party payments were not integrated into eGrants at the time of the evaluation**, impeding the

overall programme monitoring. The development of an effective monitoring of stakeholder groups participating in European Partnerships and the Horizon Europe work programmes is essential for elaborating project-portfolio strategies, dissemination of results (notably from Partnerships) and further enhancement of valorisation strategies.

In comparison to Horizon 2020, it was found that the project monitoring and evaluation systems have been improved to integrate dissemination and exploitation aspects. Nonetheless, there is an ongoing need to reinforce dissemination and exploitation of results in both Cluster 5 and 6, to ensure higher-level TRL projects are brought to market. Both Horizon Results Booster and the Horizon Results Platform are underused. There is also a need to **further promote shared activities and learning between projects**. Finally, **feedback to policy, given the distance between the EC and the implementation of the programme, could be improved**. A policy-to-feedback framework being developed by the EC could help improve this. Additionally, coordination and support actions could be developed for the different Destinations with the objective of sharing results across projects and with policy makers.

## EU added value

**EU added value is identified as one of the programme's key strengths**, albeit effects cannot yet be fully assessed. Key benefits identified include opportunities for researcher mobility, access to relevant research expertise across Europe, funding opportunities, tackling of topics insufficiently covered at the national level, and capacities to address grand societal challenges. **To a limited extent, regulations (including national differences in implementing EU regulations) and language barriers are negatively impacting EU added value**.

**The Partnerships and Missions were found to be positioned in areas with high EU added value**. They foster collaboration by mobilising relevant stakeholders to implement long-term strategic R&I objectives but there is a need for synergy-creation mechanisms between them to support deployment of the solutions needed.

## Contribution of the Framework Programme to the Green Transition

The analysis conducted, using keyword-based queries, allowed the identification of the share of projects under each HE programme part thematically aligned with the Green Transition topic, as well as with specific subtopics covered in phase 1 of the evaluation. It shows a strong alignment between Clusters 5 and 6 with the Green Transition (about 90%), the highest of all HE Programme components. Illustrating the topical mainstreaming, **more than a quarter of Horizon Europe projects outside Clusters 5 and 6 are thematically aligned with Green Transition topics**. The highest contributions come from the European Institute of Innovation and Technology (EIT) and Cluster 4 (Digital, Industry and Space).

Through the Case Studies and individual Partnerships evaluations, it was found that **all programme parts covered in this evaluation contribute to the Green Transition, and the case studies confirmed that Horizon Europe addresses emerging themes in each area**. However, perceived challenges include policy priority evolutions and the lack of understanding by most stakeholders of what a Green Transition entails and the role of R&I in supporting it. Continued political prioritisation of the Green Transition, co-creation processes and effective communication are necessary to address these challenges. While all Partnerships contribute to the Green Transition by addressing long-term needs, in some

cases, it was found that the Partnership objectives contributing to the Green Transition were secondary, e.g. in cooperative, connected, and automated mobility (CCAM).

The multi-level perspective approach indicates that projects under Clusters 5 and 6 will contribute to the Green Transition to a similar extent for both Clusters. Anticipated results slightly exceed the results from Horizon 2020. Most projects will contribute to the macro process of 'building and nurturing niches'. **Most Horizon Europe projects are anticipated to contribute to a large or very large extent to the macro-process 'expanding and mainstreaming niches'** in a similar or better way than in Horizon 2020. Findings are lower for the third macro-process 'opening and unlocking regimes', with the contribution of between a third and a half of the projects. While this result is to be expected for an R&I programme focussing on developing and testing new solutions, **it can also be concluded that more research into transitioning processes and abandoning existing rules and practices to achieve the Green Transition is needed.**

# ACRONYMS

Acronym	Meaning
2Zero	Towards zero emission road transport partnership
ANSP	Air Navigation Service Provider
BATT4EU	European Partnership for Batteries
BBI	Bio-based Industries Joint Undertaking
Biodiversa+	European Biodiversity Partnership
Built4People	People centric sustainable Built Environment
CAJU	Clean Aviation Joint Undertaking
CAP	Common Agriculture Policy
CBE JU	Circular Bio-based Europe Joint Undertaking
CCAM	Connected, Cooperative and Automated Mobility
CCUS	Carbon capture utilisation and storage
CEAP	EU Circular Economy Action Plan
CEF	Connecting Europe Facility
CEP	EU Circular Economy Package
CETP	Clean Energy Transition Partnership
CFP	Common Fisheries Policy
CINEA	European Climate, Infrastructure and Environment Executive Agency
CS	Case study



Acronym	Meaning
CSA	Coordination and Support Action
CSP	Clean Steel Partnership
DUT	Driving urban transitions to a sustainable future
EAFRD	European Agricultural Fund for Rural Development
EASA	European Union Aviation Safety Agency
EDA	European Defence Agency
EC	European Commission
EGD	European Green Deal
EIT	European Institute of Innovation & Technology
ERA	European Research Area
ERDF	European Regional Development Fund
ESA	European Space Agency
EU	European Union
FCH2	Fuel Cells and Hydrogen Joint Undertaking
FP	European Framework Programme for R&I
FP7	7 <sup>th</sup> European Framework Programme for R&I
FP10	(Upcoming) 10 <sup>th</sup> European Framework Programme for R&I
GANP	Global Air Navigation Plan
H2020	Horizon 2020 (8 <sup>th</sup> European Framework Programme for R&I)
HE	Horizon Europe (9 <sup>th</sup> European Framework Programme for R&I)

Acronym	Meaning
IA	Innovation Action
ICAO	International Civil Aviation Organization
IPCEI	Important Project of Common European Interest
JRC	Joint Research Centre
JTI	Joint Technology Initiative
JU	Joint Undertaking
KIC	Knowledge and Innovation Community
KIP	Key Impact Pathway
KPI	Key Performance Indicator
KSO	Key Strategic Orientations
LAC	Latin America and the Caribbean
LEIT	Leadership in Enabling and Industrial Technologies
MaaS	Mobility as a Service
MOG	Mission Owner Group
MS	Member State
MFF	Multiannual Financial Framework
NBS	Nature-based solutions
NCP	National Contact Point
NGO	Non-Governmental Organisation
RIA	Research and Innovation Action

Acronym	Meaning
R&D	Research and Development
R&D&I	Research and Development and Innovation
R&I	Research and Innovation
SBEP	Sustainable Blue Economy Partnership
SDG	Sustainable Development Goal
SC	Societal Challenge (part of H2020)
SESAR	Single European Sky ATM Research
SESAR 3	Single European Sky ATM Research 3
SME	Small and Medium-sized Enterprise
SRIA	Strategic Research and Innovation Agenda
SSH	Social sciences and humanities
STI	Science, Technology, and Innovation
TFEU	Treaty on the Functioning of the European Union
TOR	Terms of Reference
TRL	Technology Readiness Level
WP	work programme
ZEWZ	Zero-emission waterborne transport

# 1. Introduction

## 1.1. Objectives and scope of the evaluation

The purpose of this study is to provide the European Commission with the specific data and analyses needed to support the ex-post evaluation of Horizon 2020 (phase 1, in 2022<sup>8</sup>) and the interim evaluation of Horizon Europe (phase 2, in 2023, object of this report) in the impact area 'Green Transition'. The study feeds into the back-to-back approach set for the ex-post evaluation of Horizon 2020 and the interim evaluation of Horizon Europe and thus informs the implementation of Horizon Europe in the current Multiannual Financial Framework (MFF, 2021-2027) as well as the design of the next Framework Programme (FP10). The outcome of this study also feeds into the next Partnerships Biennial Monitoring Report (BMR).

The overall aim of this study is to identify lessons learned from the implementation of Horizon 2020 (phase 1) and Horizon Europe (phase 2) while also assessing longer-term effects of FP activities towards the Green Transition and providing evidence-based suggestions for the improvement of the Framework Programmes in the light of experience.

While the study has the legal obligation to conduct two different evaluations, one with an ex-post character and the other with an interim character, the key thematic focus of this evaluation is on the Green Transition aspects and the long-term impact of the Framework Programme(s).

This evaluation study covers all activities of the European Framework Programmes in the impact area Green Transition, i.e., all related activities in Horizon 2020 (2014-2020) and the first phase of Horizon Europe. This evaluation study also assesses Partnerships active in Green Transition-related fields with a legal obligation for evaluation (Joint Undertakings, Knowledge and Innovation Communities, Art. 185 or 187 TFEU). Other Partnerships relevant for the Green Transition (Co-programmed and Co-funded European Partnerships) and Horizon Europe Missions are taken into account as part of the evaluation of the thematic areas.

More specifically, this evaluation study covered, in Phase 2:

- Horizon Europe programme parts:
  - Cluster 5: Climate, Energy, and Mobility.
  - Cluster 6: Food, Bioeconomy, Natural Resources, Agriculture & Environment.
- Partnerships with a legal obligation for an individual evaluation:
  - Art. 187: Circular Bio-based Europe (CBE) Joint Undertaking + predecessor (BBI), Clean Aviation Joint Undertaking + predecessor (CleanSky 2), Clean Hydrogen Joint Undertaking + predecessor (FCH2), Single European Sky ATM Research 3 (SESAR 3)

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<sup>8</sup> Evaluation study on the European framework programmes for research and innovation for addressing global challenges and industrial competitiveness - Focus on activities related to the green transition : final report phase 1 : Horizon 2020, <https://op.europa.eu/en/publication-detail/-/publication/2feea276-31af-11ee-946a-01aa75ed71a1/language-en/format-PDF/source-293953234>

Joint Undertaking + predecessor (SESAR), Europe's Rail Joint Undertaking + predecessor (Shift2Rail).

- EIT Knowledge and Innovation Communities: EIT Urban Mobility, EIT Climate-KIC, EIT Food, EIT InnoEnergy.
- Partnerships without a legal obligation for an individual evaluation:
  - Co-programmed European Partnerships: Clean Steel and Low Carbon Steelmaking, Batteries: Towards a competitive European industrial battery value chain, Connected and Automated Mobility (CCAM), Towards Zero-Emission Road Transport (2ZERO), Zero-Emission Waterborne Transport (ZEWT), People-centric Sustainable Built Environment (Built4People).
  - Co-funded European Partnerships: Water4all: Water security for the planet, Clean Energy Transition, Driving Urban Transitions to a Sustainable Future (DUT), A climate-neutral, sustainable, and productive Blue Economy, European Biodiversity Partnership (Biodiversa+).
- Missions: Adaptation to Climate Change; Restore our Ocean and Waters by 2030; 100 Climate-Neutral and Smart Cities by 2030; A Soil Deal for Europe.

To conduct the evaluation, a specific methodological approach was designed during the inception phase, in agreement with the steering committee (Appendix B).

## 1.2. Methodological approach

While the study has the legal obligation to conduct two different evaluations, one with an ex-post character in Phase 1 and the second with an interim character, the key thematic focus of this evaluation is on the Green Transition aspects of the Framework Programme(s). Therefore, the evaluation elaborated working definitions for a Green Transition and a methodological framework to consider the specific challenges of a Green Transition in relation to the instruments and actions set out in Horizon 2020 and Horizon Europe. The evaluation followed the main principles of theory-based evaluation (Chen 1990; Weiss, 1997; Rogers, 2007; Funnell & Rogers, 2011), and developed theories of change that related 1) the general and specific needs/challenges of the Green Transition, with 2) the interventions of the related parts of the Framework Programmes and the European Partnerships.

To answer the evaluation questions of the study in relation to the interventions in scope, the selected methodological approach mixed various data collection and data analysis tools. The different tools mobilised throughout the evaluation allowed to collect evidence to answer the various evaluation questions considered under this evaluation. The table below provides an overview of the contribution of each tool to the different evaluative criteria.

**Table 1: Correspondence between the evidence collected through the tools mobilised and the evaluative criteria (the colour intensity reflects the importance of the tool)**

	Relevance	Coherence	Efficiency	Effectiveness	EU added value	Partnerships specific criteria
Desk research	Dark Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue
Data analysis	Light Blue	Light Blue	Light Blue	Dark Blue	Light Blue	Light Blue
Scoping interviews	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
International benchmarking	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Case study	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Light Blue
Surveys	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Light Blue
Partnership evaluations	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue

Source: own elaboration

As a result, several analyses were produced and provided as separate appendices: 1) Quantitative analyses; 2) Topical and benchmark case studies; 3) Survey results. Results from the consultation are provided in the synopsis report.

To analyse to which extent Horizon Europe has induced processes for a Green Transition, the evaluation uses the concept of the Multi-Level Perspective (MLP) and the embedded concept of transformative outcomes, which has been considered as guidance for the analysis of the interventions and operationalised in the survey design and the case studies<sup>9</sup>.

For the European Partnerships for R&I under the scope of this evaluation, a specific approach was designed to cover both phases of the study. Indeed, PRIMA was the only Partnership for which the evaluation was completed during phase 1. The evaluations of all other Partnerships were completed during the phase 2 of the study. To feed into phase 1 with Partnership elements, an approach covering both phases was developed, with collection and analysis of primary and secondary data during phase 1, that continued in phase 2. An analysis of the results is provided in in Appendix J, with the main insights included in this report. Inputs from the Biennial Monitoring Report will be inserted when shared by the Commission.

Regarding the four Missions, findings originate from both primary and secondary data. The timing of Mission assessments largely overlapped with the evaluation studies – as the assessments started first, their data was used as the core input for the evaluation and parallel

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<sup>9</sup> Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research policy*, 31(8-9), 1257-1274.  
 Smith, A., Voß, J. P., & Grin, J. (2010). Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. *Research policy*, 39(4), 435-448.  
 Ghosh, B., Kivimaa, P., Ramirez, M., Schot, J., & Torrens, J. (2021). Transformative outcomes: assessing and reorienting experimentation with transformative innovation policy. *Science and Public Policy*, 48(5), 739-756.

data collection exercises were not initiated, in agreement with the Steering Committee of this study.

To disseminate the findings of the study and validate the conclusions of the study, two policy workshops with representatives from the European Commission and Partnerships were conducted based on evidence collected for the draft final report.

### **1.3. Content of the final report**

The final report presents the analysis of each specific programme part within the scope of the evaluation in phase 2, as well as an overview of a horizontal analysis across the Framework Programme, based on a triangulation of the findings from the various data collection tools.

The report is organised as follows:

- An introduction section, to present the objectives, scope, and content of the report
- A second section on the Green Transition in Horizon Europe, and the state of play
- A third section on the evidence of findings
- A fourth section on the contribution of the Framework Programme to a Green Transition
- A last section on the overall conclusions and recommendations.

In addition, the report is completed by several appendixes:

- Appendix A: Procedural information
- Appendix B: Methodology and analytical models used
- Appendix C: Evaluation matrix
- Appendix D: Intervention logics
- Appendix E: Quantitative data analysis
- Appendix F: Synopsis of stakeholder consultation
- Appendix G: Survey results
- Appendix H: Results from the international benchmarking
- Appendix I: Case studies
- Appendix J: Overall assessment of the contribution to this area of the different types of Partnerships under Horizon Europe
- Appendix K: Analysis of Key Impact Pathways and Specific Issues

- Appendix L: Contribution of EU Missions to the Green Transition.

The table below presents the codes used in the report to refer to specific sources.

**Table 2: List of references to specific Partnership evaluations and case studies**

Table		Table
Shift2Rail / Europe's Rail	Institutionalised	PE-EU-Rail
Clean Aviation Joint Undertaking (CAJU)	Institutionalised	PE-CA
SESAR 3 - ATM	Institutionalised	PE-SESAR
Circular Bio-Based Europe Joint Undertaking (CBE JU)	Institutionalised	PE-CBE
Clean Hydrogen Joint Undertaking & Fuel Cells and Hydrogen 2 JU	Institutionalised	PE-CH
EIT Urban Mobility	KICs (institutionalised)	PE-EIT-UM
EIT Inno Energy	KICs (institutionalised)	PE-EIT-InnoEnergy
EIT Climate-KIC	KICs (institutionalised)	PE-EIT-Climate-KIC
EIT Food	KICs (institutionalised)	PE-EIT-Food
Water Security for the Planet (Water4all)	Co-funded	PE-W4A
Clean Energy Transition Partnership (CETP)	Co-funded	PE-CETP
Driving urban transitions to a sustainable future (DUT)	Co-funded	PE-DUT
Sustainable Blue Economy Partnership (SBEP)	Co-funded	PE-SBEP
Clean Steel Partnership (CSP)	Co-programmed	PE-CSP
European Partnership for Batteries (BATT4EU)	Co-programmed	PE-BATT4EU
Connected Cooperative and Automated Mobility (CCAM)	Co-programmed	PE-CCAM



Table		Table
Towards zero-emission road transport (2ZERO)	Co-programmed	PE-2ZERO
Zero-emission waterborne transport (ZEWT)	Co-programmed	PE-ZEWT
People-centric Sustainable Built Environment (Built4People)	Co-programmed	PE-B4P
Biodiversa+	Co-funded	PE-B+
Knowledge and solutions to enable resilient responses to the impacts of climate change		CS-1
Cross-cutting solutions towards climate neutrality for communities and cities		CS-2
Developing solar energy's contribution to a more efficient, clean, sustainable, secure, and competitive energy supply		CS-3
Climate-neutral and environmentally friendly solutions for road transport		CS-4
Solutions to make transport safer		CS-5
Achieving climate resilience and restoring nature with regards to oceans and water		CS-6
A Biodiversity Transition for Europe		CS-7
R&I for healthy soils		CS-8
Sustainable Agriculture for a Green Transition		CS-9
Research and Innovation for making rural areas stronger, connected, resilient and prosperous		CS-10
Earth Observation as essential tool for SDG policy design and implementation and the specific contributions of citizen observatories		CS-11
Cross-cutting case study on International R&I cooperation to foster the green transition. Given its nature, it deviates slightly from the common CS template, e.g. by including a portfolio analysis for third countries, etc.		CS-12
Hydrogen applications in energy and mobility		CS-13

Table	Table
Leveraging synergies with other EU/national/regional funding mechanisms	CS-14
Stakeholder engagement for the Green Transition	CS-15

## 2. The Green Transition in Horizon Europe, and the state of play

The main aim of the report is to analyse to what extent the interventions within Clusters 5 and 6, related Missions, and Partnerships are useful tools to contribute to the Green Transition, without assuming that these activities alone already provide a full and complete picture of the Green Transition. For example, financial instruments going beyond R&I funding are placed within Horizon Europe but are outside the scope of this study, and other instruments are placed outside the scope of Horizon Europe (e.g., regulatory framework, trade) and have been dealt with only to a limited extent in this study. Against this background, this section provides a first indication on how the Framework Programmes, and notably Horizon Europe, considered the notion for the Green Transition in its conceptualisation.

### 2.1. The Green Transition in Horizon Europe

The European Green Deal<sup>10</sup> (EGD) is Europe's adapted growth strategy aiming to transform the EU into a fair and prosperous society, with a modern, resource-efficient, and competitive economy, where there are no net emissions of greenhouse gases (GHG) in 2050 and where economic growth is decoupled from resource use. In addition, the Green Deal emphasises the need to protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment-related risks and impacts. At the same time, the EGD aims to make this transition just and inclusive, by putting people first and paying particular attention to regions, industries and workers that will face the greatest challenges. As a new EU policy initiative, launched in 2019, the EGD sketches out all elements for the conceptualisation of a Green Transition in Europe.

The European Green Deal has programmatically influenced the design of the new Framework Programme for R&I, Horizon Europe (HE), most prominently through the development of the directly climate-related R&I Missions (Adaptation, Climate-Neutral Cities, Soil, and Ocean and Waters Missions), Cluster 4 (Digital, Industry and Space), Cluster 5 (Climate, Energy, Mobility) and Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment). The previous Framework Programme Horizon 2020 (H2020) was built upon very different lines of thinking, focusing on restoring and safeguarding European competitiveness and growth, scientific excellence, and to promote the policy goals of open innovation, open science, and openness to the world (three O's). Nevertheless, H2020 has put tackling Societal Challenges (SC) effectively, and addressing EU policy priorities and global challenges through research and innovation, on an equal footing with fostering scientific excellence and enabling industrial leadership. An increased focus towards

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<sup>10</sup> [https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF)

sustainability objectives was also observed through the development of H2020's work programmes, including the launch of the Green Deal call <sup>11</sup>.

The strategic orientations of Horizon Europe for 2021-2024 <sup>12</sup> clearly aimed at supporting the ongoing economic, societal, and industrial transformations by accelerating the twin Green and Digital Transitions. It notably identified four key strategic orientations (KSO):

- A. Promoting 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;
- B. Restoring Europe's ecosystems and biodiversity, and managing sustainably natural resources to ensure food security and a clean and healthy environment;
- C. Making Europe the first digitally enabled circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction, and production systems;
- D. Creating a more resilient, inclusive, and democratic European society, prepared for 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.

The reconstruction of the intervention logic indicates that the Green Transition is strategically encompassed in HE, with the four KSO being directly (B and C) or indirectly (A and D) linked to the Green Transition priorities. Furthermore, in line with the EU Multiannual Financial Framework (MFF) 2021-2027, climate and biodiversity mainstreaming targets were set for Horizon Europe: 35% of funding geared towards climate objectives (legally-binding) and should contribute to the overall ambition of providing 7.5% of annual spending under the MFF to biodiversity objectives in 2024 and 10% in 2026 and 2027 <sup>13</sup>. The table below presents the climate-related spending previsions of Horizon Europe as of June 2023 (the share of climate spending of Cluster 5 and 6 is much higher, with keyword queries showing more than 85%, Table 12).

**Table 3: Climate-related spending at the payment level for Horizon Europe (millions EUR)**

Programme	2021	2022	2023	2024	2025	2026	2027	Total	% of the HE envelope
Horizon Europe	4,193.2	4,419.8	4,748.0	4,604.0	4,302.6	4,392.5	4,682.5	31,342.6	34%

Source: European Commission 2023, Climate overview based on the average commitment percentage of climate-relevant spending by programme in each multiannual financial framework period to the outstanding payments by programme in each multiannual financial framework period at the end of 2022, [https://commission.europa.eu/document/download/91fe678c-c5f0-45ee-8fba-7b902125616b\\_en?filename=Climate%20overview.pdf](https://commission.europa.eu/document/download/91fe678c-c5f0-45ee-8fba-7b902125616b_en?filename=Climate%20overview.pdf)

<sup>11</sup> DG RTD 2021, *The European Green Deal call for proposal in Horizon 2020*, <https://op.europa.eu/en/publication-detail/-/publication/a44918ee-62d6-11ec-a033-01aa75ed71a1/language-en>

<sup>12</sup> DG 2021, *Horizon Europe Strategic plan 2021-2024*, <https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/3c6ffd74-8ac3-11eb-b85c-01aa75ed71a1>

<sup>13</sup> Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 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

However, similarly to what was concluded in Phase 1 of this evaluation, working definitions for the contribution of R&I to a Green Transition have been missing. The strategic orientations of Horizon Europe only underline its potential to decouple detrimental environmental effects and socio-economic growth.

Whether this is feasible is questionable. Evidence suggests that a decoupling of CO<sub>2</sub> emissions and growth to the extent necessary for reaching the targets of the Paris agreement may not be within reach or feasible. The emission reductions that high-income countries achieved through absolute decoupling fall far short of Paris-compliant rates: at the achieved rates, these countries would on average take more than 220 years to reduce their emissions by 95%, emitting 27 times their remaining 1.5°C fair-shares in the process.<sup>14</sup> Furthermore, it is important to mention that resource scarcities and planetary boundaries are important frameworks in the scientific discourses of Green Transition. Scientists agree that changes in the organisation of human society and economy are needed to stop the degradation of the natural environment<sup>15</sup>. Also, the public and policy acceptance of alternatives to the growth paradigm could influence the notion and articulation of needs in relation to the Green Transition.

In Horizon Europe, the introduction of Key Impact Pathways (KIPs) represents reorientation from an activity-driven to an impact-driven programme<sup>16</sup>. The three pillars of KIPs impacts (scientific, societal, and economic) all have significant implications for the Green Transition. The framework has both unique strengths and limitations when it comes to capturing the diverse Horizon Europe contributions to the Green Transition. The HE KIPs aim to capture long-term and wider effects on the society and the economy, including capturing impacts on the European Green Deal (EGD). Nonetheless, given the complexity of the topic, there is an insufficient translation of the EGD and other societal objectives stemming from key EU policy strategies into these KIPs. It should be noted that within the two Clusters, Destinations in the work programmes are derived from the Strategic Plan and detail the relevant expected impacts.

Therefore, and to ensure continuity, the study used the reconstruction of working definitions for a Green Transition performed for Horizon 2020<sup>17</sup>. R&I for a Green Transition should adhere to the following principles:

- R&I should contribute to the development of technologies and innovations which facilitate that all (technological) solutions and the respective innovation systems become net zero.
- In the meantime, while this is a longer-term endeavour, more sustainable alternatives need to be made available now (i.e. more efficient use and effective uptake of existing technologies as well as innovative business models).

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<sup>14</sup> Vogel, J., & Hicke, J. (2023). Is green growth happening? An empirical analysis of achieved versus Paris-compliant CO<sub>2</sub>-GDP decoupling in high-income countries. *The Lancet Planetary Health*, 7(9), e759-e769.

<sup>15</sup> Sandberg, M., Klockars, K., & Wilén, K. (2019). Green growth or degrowth? Assessing the normative justifications for environmental sustainability and economic growth through critical social theory. *Journal of Cleaner Production*, 206, 133-141.

<sup>16</sup> European Commission 2022, *Horizon Europe (HORIZON) Programme Guide*, [https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide\\_horizon\\_v1.5\\_en.pdf](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_v1.5_en.pdf)

<sup>17</sup> DG RTD 2023, *Evaluation study on the European framework programmes for research and innovation for addressing global challenges and industrial competitiveness. Focus on activities related to the green transition : final report phase 1 : Horizon 2020*, <https://op.europa.eu/en/publication-detail/-/publication/2f6ea276-31af-11ee-946a-01aa75ed71a1/language-en/format-PDF/source-296483548>

- Producers and consumers along the value chains need to make more sustainable choices, for which there is a need to provide the required networks and capacities for rethinking and redesigning the incentives to deliver the required behavioural change.
- Negative externalities to the environment and to society need to be reduced at the same time, to prevent, minimise, or repair damages and ensure higher resource efficiency.

## 2.2. The state of play

This section provides information on the state of play of implementation of Clusters 5 and 6 of Horizon Europe. Further details are provided in Appendix E.

Horizon Europe has a total budget of EUR 95.5bn for the 2021-2027 period (in comparison, Horizon 2020 budget was EUR 78bn). This budget is divided in four pillars:

1. Pillar I - Excellent Science: EUR 25bn (26.2% of the total budget).
2. Pillar II - Global challenges and European industrial competitiveness: EUR 53.5bn (56%).
3. Pillar III - Innovative Europe: EUR 13.6bn (14.2%).
4. Pillar IV - Widening participation & strengthening the European research area: EUR 3.4bn (3.6%).

The Clusters 5 and 6, under the scope of this evaluation, sit in Pillar II. Jointly, they represent 45% of the budget allocated to Pillar II, and 25.2% of the Horizon Europe total budget.

**Table 4: Budget for Clusters 5 and 6**

	2021-2027 budget (billions EUR)	% of Pillar II	% of the HE envelope
Cluster 5	15.123	28.3%	15.8%
Cluster 6	8.952	16.7%	9.4%

Source: European Commission 2021, Horizon Europe, budget – Horizon Europe - the most ambitious EU research & innovation programme ever, <https://data.europa.eu/doi/10.2777/202859>

The table below provides the distribution of projects and European Union contribution (referred to as "EC Contribution" in CORDA) and participations by Cluster, Destinations, and Missions. In Cluster 5, Destination 3 (Sustainable, secure, and competitive energy supply) accounts for most projects (138) and EC contributions (EUR 874 million) allocated so far. It is followed by Destination 5 (Clean and competitive solutions for all transport modes). In Cluster 6, the Destinations 7 (Innovative governance, environmental observations, and digital solutions in support of the Green Deal) and 2 (Fair, healthy and environment-friendly food systems from primary production to consumption) were the largest ones so far, depending on the criteria used (D7 is the one with most projects, 73, and D2 received most EC contributions, EUR 421 million). Some projects are classified as "Partnerships not classified under Destinations", which refers to the Institutionalised Partnerships under Art. 187. Co-

programmed Partnerships are included in the data on Destinations, while projects funded under Co-funded Partnerships are not included in CORDA (only the general grant for the co-funded Partnership is included). Missions are usually associated with a smaller number of projects compared to Destinations but, some of them account for higher EC contributions and participations per project (e.g. Climate-Neutral and Smart Cities).

**Table 5: Number of projects, EC contributions and participations by Destinations and Missions**

Programme part	Nb projects	EC contribution (EUR million)	Nb participations	EC contr. Per project (EUR million)	Participations per project	EC contr. per participation (EUR thousand)
<b>Cluster 5 - Climate, Energy and Mobility</b>	<b>582</b>	<b>4,316.7</b>	<b>9,782</b>	<b>7.4</b>	<b>16.8</b>	<b>441</b>
D1: Climate Science and Responses for the Transformation Towards Climate Neutrality	43	246.2	754	5.7	17.5	327
D2: Cross-Sectoral Solutions	70	340.9	865	4.9	12.4	394
D3: Sustainable, secure, and competitive energy supply	138	874.9	1,963	6.3	14.2	446
D4: Efficient, sustainable, and inclusive energy use	25	159.9	463	6.4	18.5	345
D5: Clean and competitive solutions for all transport modes	77	494.3	1,136	6.4	14.8	435
D6: Safe, Resilient Transport and Smart Mobility services for passengers and goods	56	366.6	1,135	6.5	20.3	323
Mission: CIT (Climate-Neutral and Smart Cities)	14	147.2	432	10.5	30.9	341
Mission: ADAPTATION (Adaptation to Climate Change)	21	217.3	517	10.3	24.6	420
Mission Coordination	1	2.0	26	2.0	26.0	77
New European Bauhaus initiative	6	29.7	117	5.0	19.5	254

Mission: OCEAN (Restore our Ocean and Waters)	37	220.0	744	5.9	20.1	296
Inst. Partnerships*	86	1,180.3	1,550	13.7	18.0	762
Copernicus Projects (main Cluster 4)	4	31.8	75	8.0	18.8	424
Other actions not subject to calls for proposals	4	5.4	5	1.4	1.3	1089
<b>Cluster 6 - Food, Bioeconomy Natural Resources, Agriculture and Environment</b>	<b>434</b>	<b>2,585.5</b>	<b>8,254</b>	<b>6.0</b>	<b>19.0</b>	<b>313</b>
D1: Biodiversity and Ecosystem Services	50	308.1	956	6.2	19.1	322
D2: Fair, healthy, and environmentally friendly food systems from primary production to consumption	69	421.2	1,401	6.1	20.3	301
D3: Circular Economy and Bioeconomy	45	252.0	749	5.6	16.6	336
D4: Clean Environment and Zero Pollution	30	112.6	434	3.8	14.5	260
D5: Land, ocean, and water for climate action	20	159.2	517	8.0	25.9	308
D6: Resilient, inclusive, healthy, and green rural, coastal, and urban communities	20	111.2	439	5.6	22.0	253
D7: Innovative governance, environmental observations, and digital solutions in support of the Green Deal	73	321.0	1,169	4.4	16.0	275
Mission: CIT	11	142.8	363	13.0	33.0	393
Mission: ADAPTATION	21	217.3	517	10.3	24.6	420
Mission Coordination	1	2.0	26	2.0	26.0	77
New European Bauhaus initiative	6	29.7	117	5.0	19.5	254
Mission: OCEAN	37	219.0	743	5.9	20.1	295
Mission: SOIL (A Soil Deal for Europe)	27	154.2	479	5.7	17.7	322

Inst. Partnerships*	21	116.3	293	5.5	14.0	397
Copernicus Projects (main Cluster 4)	3	18.8	51	6.3	17.0	369
<b>Deduplicated figures for groups overlapping multiple clusters*</b>						
Mission: CIT	14	147.2	432	10.5	30.9	341
Mission: ADAPTATION	21	217.3	517	10.3	24.6	420
Mission Coordination	1	2.0	26	2.0	26.0	77
New European Bauhaus initiative	6	29.7	117	5.0	19.5	254
Mission: OCEAN	38	222.0	745	5.8	19.6	298

NOTES:

Institutionalised Partnerships are not assigned to individual Destinations in CORDA database.

This table also includes grants whose main Clusters are not Clusters 5 or 6, but that are assigned to these Clusters through secondary linkages in CORDA. This is the case, for example, of Copernicus Programme – European Union’s Earth Observation programme, which is linked to Clusters 5 and 6, in addition to its main linkage to Cluster 4.

\*Some groups (notably Missions) contain projects that are linked to more than 1 cluster in CORDA. These groups are deduplicated in the lower part of the table above (Deduplicated figures for groups overlapping multiple clusters). In some cases (ADAPTATION, Coordination, New European Bauhaus) all projects overlap both clusters and, the figures displayed for cluster 5 and 6 are exactly those in the deduplicated part. For CIT and OCEAN, part of the projects relates to both clusters and, as such, the figures displayed in the deduplicated section of this table are lower than the sum of the figures displayed for each cluster.

SOURCE: CORDA database, version June 2023

The dataset used for this report includes projects that started in 2022 and 2023. Most of the projects will be concluding between 2025 and 2027, greatly limiting the possibility for analysis of outputs (and even more so outcomes and impacts) as part of this evaluation.

In terms of type of actions, Research and Innovations Actions (RIA) accounted for about half of the projects in both Clusters (52% of Cluster 5 and 49% of 6). Innovation Actions (IA) accounted for a higher share of projects in Cluster 5, compared with Cluster 6 (36% vs. 29%), while Coordination and Support Actions (CSA) accounted for a higher share of Cluster 6 projects (22%) compared to the participation of these actions in Cluster 5 (12%). However, regarding “per project” indicators, IA have the largest EC contributions and participations per project in both Clusters (see Table 6).



**Table 6: Number of projects, EC contributions and participations by funding scheme**

Programme part	Type of Action	Projects		EC contribution		Participations		EC contr.	Participations	EC contr.
		Nb	Share	EUR million	Share	Nb	Share	per project (EUR million)	per project	per participation (EUR thousand)
Cluster 5	CSA	68	12%	179.1	4%	940	10%	2.6	13.8	191
	IA	212	36%	2,671.8	62%	4,924	50%	12.6	23.2	543
	RIA	302	52%	1,465.8	34%	3,918	40%	4.9	13.0	374
Cluster 6	CSA	94	22%	323.7	13%	1,463	18%	3.4	15.6	221
	IA	128	29%	994.0	38%	2,879	35%	7.8	22.5	345
	RIA	212	49%	1,267.8	49%	3,912	47%	6.0	18.5	324

NOTES: Type of actions referring to Joint Undertakings (JU) are aggregated in the corresponding type of action (e.g., JU-IA is included under IA in this table)

Share: Share against the Cluster total. Cluster totals exclude data from Co-funded European Partnerships and EIT KICs.

SOURCE: CORDA database, version June 2023

In terms of participants, most projects from both Clusters included at least one organisation from the academic or educational sector (Higher or Secondary Education Establishments HES: 90% in Cluster 5 and 94% in Cluster 6), private sector (Private for-profit entities PRC: 96% in Cluster 5 and 93% in Cluster 6), and research organisations (Research Organisations REC: 92% in Cluster 5 and 96% in Cluster 2). The SME share among private participations in Cluster 6 was 68%, compared with 47% in Cluster 5. 96% of Cluster 6 projects involved at least one SME participant, against 91% of projects from Cluster 5. The share of projects involving the public sector and the group of remaining other sectors was higher in Cluster 6, compared to Cluster 5 (public: 50% in 6 vs 32% in 5; other: 79% in 6 vs 56% in 5), reflecting a higher propensity of other types of organisations (e.g., Non-Governmental Organisations) to engage in activities related to Cluster 6. SME participation among Cluster 6 is higher than in Cluster 5. Respectively 19% (Cluster 5) and 21% (Cluster 6) of organisations are newcomers. The highest shares of new participations are from the private, public, or other sectors, with virtually no new participations from Educational and Research organisations. The two types of organisations receiving higher amounts of EC contributions per participation are research organisations for both Clusters, private organisations in Cluster 5 and educational organisations in Cluster 6.

EU27 countries accounted in both Clusters for more than 90% of the EC contributions and about 85% of participations. The share of projects involving participations from non-EU27 countries is higher in Cluster 6 than in Cluster 5 for all groups of other countries (associated, third countries, and the UK).

The success rate (defined as the share of eligible proposals that were retained to receive grants) was 25% for both Clusters under consideration. This represents an increase compared with the number observed for H2020, for which success rates ranged from 13.6% in the Energy societal challenge to 23.7% in the transport<sup>18</sup>. Differences exist between types

<sup>18</sup> DG RTD 2023, *Evaluation study on the European framework programmes for research and innovation for addressing global challenges and industrial competitiveness. Focus on activities related to the green transition : final report phase 1 : Horizon 2020*, <https://op.europa.eu/en/publication-detail/-/publication/2feea276-31af-11ee-946a-01aa75ed71a1/language-en/format-PDF/source-296483548>

of actions (e.g., 21% in RIA from Cluster 5 to 70% for IA of Joint Undertakings (JU-IA)). For each retained proposal, 1.59 high quality proposals in Cluster 5 and 1.73 high quality proposals in Cluster 6 were not granted (below H2020 average). Finally, time-to-grant (TTG) reached 229 days for Cluster 5 and 243 for Cluster 6, slightly above the TTG observed for H2020 Green Transition proposals, of 225 days.

In terms of gender equality amongst project participants, 30% of Cluster 5 researchers are women, and 45% of Cluster 6 researchers (see Appendix E for more details on the findings and methodology). Looking specifically at project coordinators rather than all participants, these shares decrease, with 26% of project coordination roles held by women in Cluster 5 and 39% in Cluster 6. An 80% share of Cluster 5 project applications included a Gender Equity Plan, and 76% of Cluster 6 project applications.

### 2.3. Insights from the international benchmarking

The main goal of the international benchmarking is to identify lessons to be learnt from best practices in R&I funding worldwide and put them in the perspective of the Framework Programmes in the area covered by the study. While phase 1 focused more on efficiency and effectiveness, phase 2 focuses more on relevance and coherence. That said, even though evidence regarding the effectiveness and uptake of results are only starting to emerge, the benchmarking did make an effort to capture early indications of developments in these dimensions; while not all scrutinised cases can offer much yet, some can.

The international benchmarking methodology is based on a qualitative comparative analysis of the international benchmarking case studies with Horizon Europe (Appendix H). The benchmarking cases relied on an independent evaluation report, where available, and conducted an additional desk research on and qualitative interviews with key stakeholders of the examined case.

The international benchmarking cases under consideration comprise a) the *CSIC* (Spanish National Research Council) renowned institutions in the European Research Area and, specifically, its research *Global Area LIFE* that is relevant to the topic of the overall evaluation; b) the French investment plan *France 2030* whose objectives include funding dedicated to decarbonisation; c) the *Industrial Strategy Challenge Fund* (ISCF; UKRI, UK Research and Innovation) which has set up a number of *Challenges* relevant to the Green Transition, such as decarbonisation or circular economy; and d) the Swedish strategic innovation programme *Viable Cities* that focuses on promoting cross-sectoral cooperation between municipalities, industry, academia, research institutes and civil society, to foster innovations that accelerate the transition to climate-neutral and sustainable cities. The full studies can be found in Appendix H.

The synthesis of results for comparison (see Table 7) is based on the overall results of the Green Transition evaluation available as of November 2023. The rating is based on a qualitative assessment by the benchmarking team and ranges from ++ (*best*) to -- (*worst*), with o as average.

Some of the highlights regarding **relevance** are that all examined cases, including Horizon Europe, perform well. *CSIC* (ES) and *UKRI* (UK) have a slight edge over the others, though, due to their high alignment with and embeddedness in their respective national R&I environment, which helps meet stakeholder and policy needs. Concerning **coherence**, *Viable Cities* is a prime example of strong internal and external coherence through an ongoing effort to stay connected with societal needs and close collaboration with national and international initiatives concerning environmental and sustainability-related goals. *France 2030* is another example that emphasises alignment with objectives on the national and EU level. Horizon Europe fares well but does have room for improvement regarding both the internal and external coherence, such as mechanisms to support joint cross-Cluster activities and increase knowledge valorisation to increase the internal coherence of activities in Cluster 5 and 6 with other parts of the Framework Programme (see 26); or strategic links between Horizon Europe activities and other funding mechanisms focusing on upscaling and replication, not just the Missions. When it comes to **effectiveness**, many of the examined

cases, including Horizon Europe, have not progressed far enough to provide a substantial body of evidence. That said, there are some indications which aspects are satisfactory and what could be improved. *Viable Cities* and the UKRI with its *ISCF* have been successful, the former in terms of implementing its goals and involving a wide range of stakeholders, the latter in terms of mobilising funding from the private sector.

**Table 7: Horizon Europe and international benchmarking cases along selected dimensions (++/+/0/-/-)**

	Horizon Europe (2020–2023)	France 2030 (FR)	CSIC (SP)	UKRI (UK)	Viable Cities/FORMAS (SWE)
Relevance	<p style="text-align: center;">+</p> <ul style="list-style-type: none"> <li>Stakeholders' engagement from strategic agenda down to the operational level (multi-actor approach, societal involvement, research-industry collaborations, citizen science, SSH, science-policy interfaces, place-based engagement, and other approaches)</li> <li>Alignment between stakeholders needs and policy objectives</li> <li>Continuously high technology and market focus creates gaps in early-stage knowledge</li> <li>Focus on international cooperation is strong at strategic level, but less in real activities; special focus on Africa, China, and Latin America; but tension between</li> </ul>	<p style="text-align: center;">+</p> <ul style="list-style-type: none"> <li>50% of objectives and budget to decarbonisation</li> <li>Some flexibility in the design allows for adaptation to the evolving context</li> <li>Special instrument (PEPR, Priority Research Equipment Programmes) aiming at supporting emerging solutions along the TRL scale</li> <li>Need for prioritisation and concentration of resource to produce the desired impact (thematic diffusion)</li> <li>Unclear whether Do No Significant Harm (DNSH) principle applies to all or just part of the funded projects</li> </ul>	<p style="text-align: center;">++</p> <ul style="list-style-type: none"> <li>Global Area of LIFE received more than 30 awards and recognitions in 2021 alone for its contribution to environmental, agricultural, food, and natural science</li> <li>CSIC's overall research goals are aligned with the Spanish Science, Technology, and Innovation Strategy 2021-2027, which itself aligns with European goals</li> <li>The <i>Interdisciplinary Thematic Platforms</i> (PTIs) are fully aligned with green aspect of the <i>Spanish National Recovery and Resilience</i> funds</li> </ul>	<p style="text-align: center;">++</p> <ul style="list-style-type: none"> <li>The <i>Industrial Strategy Challenge Fund</i> shows good interaction and close cooperation with stakeholders</li> <li>High degree of flexibility to ensure projects are aligned with the respective challenge</li> <li>The design (consisting of separate, clearly defined challenges) ensures that support is provided on the most relevant themes (e.g. decarbonisation)</li> <li>There is good interaction and close cooperation with the involved stakeholders from the industry. The fund is designed to act as a gearbox between industry, policy, and government to spur innovation and increase R&amp;I uptake by the</li> </ul>	<p style="text-align: center;">+</p> <ul style="list-style-type: none"> <li>Frontrunner among the Swedish innovation programmes concerning employing a mission-based strategy clearly connected to missions and strategies on the European level</li> <li>Multi-stakeholder mandate ensures relevance</li> <li>All funded projects are required to contribute to a transformative change, including governing institutions, behaviours, culture, and norms as well as technological innovation</li> </ul>

	Horizon Europe (2020–2023)	France 2030 (FR)	CSIC (SP)	UKRI (UK)	Viable Cities/FORMAS (SWE)
	enhancing EU autonomy and sovereignty, while maintaining strong partnership with key partners (USA, African Union, Mediterranean countries)			industry. As a result, the challenge directors and policy-makers have a good understanding of the current needs and state of the industry and can design the challenge in such a way that it complements and reflects the industry needs	
Coherence	<p style="text-align: center;">+</p> <ul style="list-style-type: none"> <li>• Strong internal alignment between HE Clusters 5 and 6 and the overall objectives of HE, at the programmatic level</li> <li>• However, the degree of joint activities between Cluster 5 projects and Cluster 6 projects with other parts of the Horizon Europe Framework Programme is low, which might result in a lack of coherence</li> <li>• Increased internal coherence due to</li> </ul>	<p style="text-align: center;">++</p> <ul style="list-style-type: none"> <li>• Strong internal coherence (integration of the value chain) + continuity with the PIAs (<i>Future Investment Programmes</i>; the predecessor of <i>France 2030</i>)</li> <li>• However, lack of logical framework to ensure internal coherence (in development)</li> <li>• Good external coherence with European level and other national</li> </ul>	<p style="text-align: center;">+</p> <ul style="list-style-type: none"> <li>• Internal coherence can be improved as there is an extremely decentralised structure that puts the CSIC at risk of large research overlaps and silos</li> <li>• Recently improved by introducing PTI</li> <li>• External coherence is good as the Spanish government (and therefore the CSIC) have purposefully aligned themselves with European goals</li> </ul>	<p style="text-align: center;">0</p> <ul style="list-style-type: none"> <li>• Internal coherence can be improved, there is a risk of silos, and a lack of cross-sectoral cooperation</li> <li>• External coherence depends on the challenges, some align with national frameworks (e.g. SSPP – Smart Sustainable Plastic Packaging)</li> <li>• There are certain programmes on EU level that can be aligned with or related to the challenge fund,</li> </ul>	<p style="text-align: center;">++</p> <ul style="list-style-type: none"> <li>• Operations are based on a detailed effect logic, which is continuously updated according to the programme’s objectives. The impact logic furthermore connects the identified societal needs with the programme’s operations, mission, and vision</li> <li>• Internal coherence due to it being based on a relevant theoretical approach</li> </ul>

	Horizon Europe (2020–2023)	France 2030 (FR)	CSIC (SP)	UKRI (UK)	ViabLe Cities/FORMAS (SWE)
	<p>jointly designed work programmes (co-designed with a common envelope and under a steering board composed of director generals for each programme rather than DGs being independently managed, in a siloed way)</p> <ul style="list-style-type: none"> <li>• However, co-funding and cross-fertilisation of projects within Horizon Europe projects, and between Horizon Europe and other instruments is limited; still, higher share of Cluster 6 projects (57%) shows potential synergies with other EU programmes than Cluster 5 projects (23%)</li> <li>• Strongest synergies found with LIFE, ERDF, RFF (both</li> </ul>	<p>strategies (e.g.: National Low Carbon Strategy); out of the 16 objectives and conditions for success, at least 9 significantly seem to reflect the upheaval in the geostrategic or geo-economic context, particularly illustrated by the low-carbon aircraft objective</p> <ul style="list-style-type: none"> <li>• The conclusion of the <i>in-itinere</i> evaluation on decarbonisation is that there is an alignment between the objectives of ecological planning and the actions of <i>France 2030</i></li> </ul>		<p>such as the EU plastic strategy which has similarities with the Smart Sustainable Plastic Packaging challenge, however, there is no evidence that shows clear and deliberate alignment of the ISCF with European programmes</p>	<p>in transition management and operating on the system level while addressing the overall goals of the strategic innovation programmes</p> <ul style="list-style-type: none"> <li>• Strong external coherence with national and international objectives, initiatives, and missions. By building the programme around the European mobilisation around "Mission Climate Neutral and Smart Cities 2030" and by closely collaborating with similar international initiatives, <i>ViabLe Cities</i> has ensured the programme's alignment with national and international environmental and</li> </ul>

	Horizon Europe (2020–2023)	France 2030 (FR)	CSIC (SP)	UKRI (UK)	Viable Cities/FORMAS (SWE)
	<p>Clusters 5&amp;6); CAP, EMFF (Cluster 6)</p> <ul style="list-style-type: none"> <li>Limited synergies with national (and other) funding sources</li> </ul>				sustainability-related objectives
Uptake of R&I results	<p>+</p> <ul style="list-style-type: none"> <li>Uptake of results is good in parts of the FP and particularly good in policy-area, at least at EU level; still mixed across EU MS; weak link between FP and national/regional programmes; Missions expected to ensure uptake of R&amp;I results on the ground</li> <li>Uptake of publications in policymaking</li> <li>Mixed results in terms of involvement in private sector</li> </ul>	<p>++</p> <ul style="list-style-type: none"> <li>PEPRs instruments (Priority Research Equipment Programmes) is expected to allow the unlocking of scientific barriers (exploratory) or support scaling-up and -out (PEPRs linked to national acceleration strategies); however, it is yet too early to assess their effectiveness</li> </ul>	<p>o</p> <ul style="list-style-type: none"> <li>Uptake of R&amp;I results could improve according to bibliometric analysis</li> <li>Funded research well-embedded at local level but uptake not facilitated beyond the local level</li> </ul>	<p>++</p> <ul style="list-style-type: none"> <li>High degree of valorisation due to the close cooperation with the sectors</li> <li>Difficult to target SMEs (not targeted specifically)</li> </ul>	<p>++</p> <ul style="list-style-type: none"> <li>Programme could develop better structures to follow innovation projects after their financing period has ended, to ensure that the funded initiatives have led to the intended societal effect</li> <li>Has gathered public attention in Sweden and inspired similar initiatives in other countries and on the EU MS level (e.g. <i>Cities 2030</i> in ES)</li> </ul>
Effectiveness	<p>o</p> <ul style="list-style-type: none"> <li>Strong on stakeholder engagement for the</li> </ul>	<p>o</p> <ul style="list-style-type: none"> <li>Commitment of only €2.3 billion out of a total estimated budget</li> </ul>	<p>o</p> <ul style="list-style-type: none"> <li>CSIC has been effective in contributing to green</li> </ul>	<p>+</p> <ul style="list-style-type: none"> <li>Overall effectiveness is given, in terms of</li> </ul>	<p>+</p> <ul style="list-style-type: none"> <li>The Climate neutral cities initiative, which has received most of</li> </ul>

	<b>Horizon Europe (2020–2023)</b>	<b>France 2030 (FR)</b>	<b>CSIC (SP)</b>	<b>UKRI (UK)</b>	<b>Viable Cities/FORMAS (SWE)</b>
	<p>development of solutions</p> <ul style="list-style-type: none"> <li>• High complexity may reduce the results and outcome focus</li> <li>• No proper monitoring in place to assess the progress toward the green transition</li> <li>• Continuous focus of funding on innovation may weaken the research base over time</li> <li>• Successful in the environment and climate area, from the perspective of beneficiaries</li> <li>• Lack of success in R&amp;I infrastructure, from the perspective of beneficiaries</li> </ul>	<p>of €20.3 billion, after two years (out of five); i.e. it remains unsure whether the whole earmarked budget will be spent</p> <ul style="list-style-type: none"> <li>• Lack of logical framework to monitor and assess impact</li> <li>• Overall, 351 projects for 424 beneficiaries, spread over 37 procedures, are being evaluated for funding.</li> <li>• The France 2030 evaluation estimated that 46% of the resources allocated by the programme have a potentially favourable impact on the decarbonisation of the economy</li> </ul>	<p>efforts and transferring knowledge where most needed</p> <ul style="list-style-type: none"> <li>• Despite the PTIs, still lacks flexibility in both research structures and organisational structures</li> </ul>	<p>mobilising private funding</p> <ul style="list-style-type: none"> <li>• Since the launch of the ISCF in 2017, the fund which initially consisted of roughly 3.5B EUR of public money, has generated around 3.9B EUR in private investments</li> <li>• The fund has created over 2000 job opportunities and retained almost another 10,000</li> <li>• The Programme Board and the Challenge Directors demonstrate strong leadership of the programme, with an effective balance between the Challenge Director and Programme Board ensuring the programme is both flexible, innovative, and reflective of the needs of the programme</li> </ul>	<p>the allocated funds, has been a success</p> <ul style="list-style-type: none"> <li>• Effective in terms of involving the range of stakeholders necessary to implement its initiatives and goals</li> <li>• Effective in mobilising private funding, i.e. 47 % for the 2017-2025 period</li> </ul>

Source: Study team



### 3. Evidence of findings

This section provides findings relating to the different evaluative criteria. The evaluation matrix is provided in Appendix C.

#### 3.1. Relevance

##### 3.1.1. Relevance of the Framework Programme given stakeholder needs and significant issues

Horizon Europe is a **complex R&I programme that needs to be relevant from a range of perspectives**. It should address **broad policy priorities, needs of diverse groups**, as well as **emerging issues and challenges**. To tackle this task, different mechanisms have been put in place, such as analysis of programme economic feasibility, foresight scenarios, co-creation among DGs, online consultations, and stakeholder engagement exercises.

###### *3.1.1.1. Coverage of EU long-term needs and green policy priorities*

From the policy perspective, **the programme aims to accelerate the twin transition** (green and digital) and related transformations. They are defined by the EU priority for “Building a climate-neutral, green, fair and social Europe” and EC priority of the European Green Deal (EGD). The EGD is further broken into seven broad policy priorities, two other priorities and R&I, as one of key mechanisms to deliver on the EGD. **The programme structure closely mirrors the EGD priorities.**

**The policy priorities and identified needs that are directly relevant for the Green Transition are covered by 9 out of the 16 impact areas of Horizon Europe.** Addressing climate change and biodiversity loss are broad priorities for the programme, also reflected in specific Destinations. CL5 covers climate, transport, energy, and cross-cutting issues. CL6 Destinations on biodiversity and ecosystems, pollution, and climate action target environmental impacts while others have a more transversal focus on governance and necessary societal and structural developments. Green Transition topics are also present in other Clusters and parts of HE<sup>19</sup>. Pillar III work programmes highlight relevant breakthroughs<sup>20</sup>. The links to digital transition are well covered in HE work programmes, while references to just transition are less common (Appendix D).

**The findings of the Interim Evaluation of the JRC<sup>21</sup> indicate that the JRC contributed to developing a more holistic approach to climate and energy policies:** social justice elements were included in the assessments, as well as the dependence of the Green Transition on critical raw materials. Drivers in the food chain were added, and links were made with biodiversity targets, land-use and bioeconomy policies. The JRC has provided relevant input, for instance, to the green taxonomy debate, the development of the Carbon

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19 Cluster 4 Destination “innovative research on social and economic transformations” includes multiple calls relevant to the Green Transition, covering topics such as sustainable economic policy paradigms and tackling inequalities in the green and digital transitions, and sustainable jobs.

20 Examples of Green Transition topics covered by EIC 2022 and 2023 Work Programmes: EIC Pathfinder (carbon dioxide management cooling, precision nutrition), EIC Transition (green digital devices, environmental intelligence) and EIC Accelerator (energy storage, resilient agriculture, technologies ‘Fit for 55’)

21 Heuer, R., Florea, A.M., Herranz Soler, M., Janowski, T., Keskitalo, E.C.H., Maas, R., Oddou, J., Pálincás, J. and Wegener, H., Interim evaluation of the activities of the Joint Research Centre under Horizon Europe and Euratom 2021-2025 - Final report of the evaluation panel, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/63710, JRC134811.

Border Adjustment Mechanism (CBAM), and the Zero Pollution Action Plan (ZPAP) for Air, Water and Soil. The JRC's scientific work has been assessed to be in line with the Green Deal priorities, including a focus on Just Transition and sustainable investment.

### *3.1.1.2. Implementation of high-level mechanisms to integrate stakeholder needs*

**Stakeholder engagement processes at the EU level and in R&I agenda-setting are well connected.** The EC priority of the “New push for European Democracy” and the EGD highlight the importance of engagement and there are many platforms that help inform EGD priorities, including Have Your Say, Conference on the Future of Europe, European Citizen Panels, and Energy Stakeholder Dialogues (CS-15, Appendix F). Recent public consultations on EU policies tended to include questions on R&I, such as the consultation on a Critical Raw Materials Act in 2022<sup>22</sup>.

Engaging civil society is also a priority of R&I at the EU level. The policy agenda of ERA highlights the need to increase societal impact and build trust in science<sup>23</sup>, the Guiding Principles on Knowledge Valorisation mention the need for participatory approaches<sup>24</sup>, while the Common Policy Centre engages citizens to capture R&I needs. Societal engagement is also part of the excellence criterion under evaluation for RIAs, IAs and Co-Fund Calls.

Reflecting these priorities, **HE Strategic Plan 2021-2024 was created through iterative co-design and co-creation processes aiming to increase ownership and optimise impact of investments.** The live and online Research and Innovation Days, open-ended questions and contributions by various organisations and representatives of diverse groups made the programme more relevant to stakeholder needs (Appendix F).

Stakeholders such as Member States (MS), Partnerships and associations were consulted in drafting of the work programmes and calls. Together, these processes help inform, support, and refine programme priorities.<sup>25</sup>

### *3.1.1.3. Approaches to stakeholder engagement across HE instruments*

**Diverse engagement approaches are mainstreamed in HE at the operational level.** Some of the common ones are multi-actor approach, open science, citizen science, social sciences and humanities (SSH) involvement, science-policy interface, place-based engagement, communities of practice, knowledge transfer, and living labs, among many others (see case study (CS) 2, CS-7, CS-9, CS-10, CS-15). In select cases, such approaches address governance of complex multi-level interactions and innovative sharing of good participatory practices (e.g. network of living labs, CS-9). However, one-way communication and dissemination also remains common (CS-15).

Across and within instruments, **there are differences in stakeholder engagement priorities and methods that are often not aggregable at the Cluster level.** Destinations that focus on climate sciences, food and communities allocate more than half of their funding to projects that feature inputs of SSH, which also helps to better

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22 European Commission (2023). The Horizon Europe Strategic Plan 2025-2027 analysis: [Horizon Europe strategic plan 2025-2027 analysis - Publications Office of the EU \(europa.eu\)](https://commission.europa.eu/strategic-plans/horizon-europe-strategic-plan-2025-2027-analysis-publications-office-of-the-eu_en)

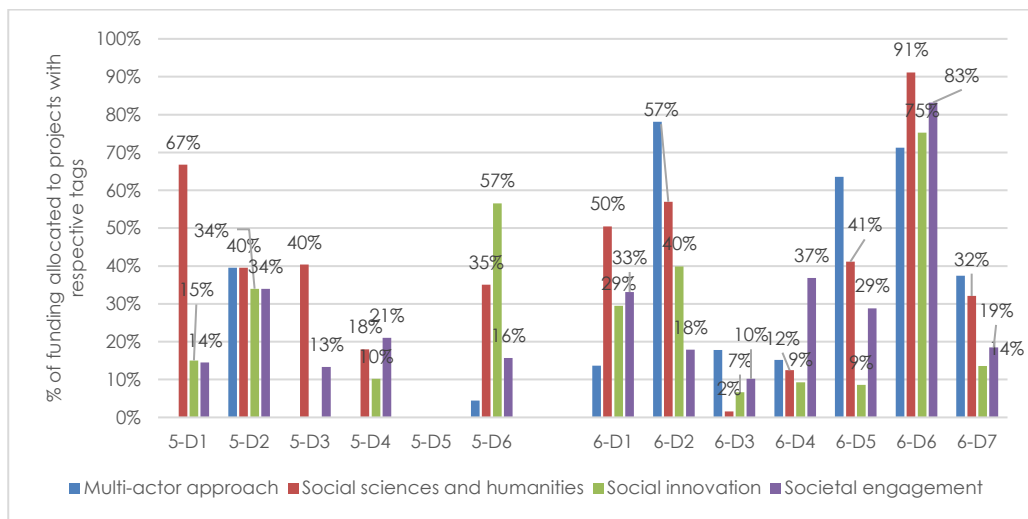
23 European Research Area Policy Agenda – Overview of actions for the period 2022-2024: [https://commission.europa.eu/system/files/2021-11/ec\\_rtd\\_era-policy-agenda-2021.pdf](https://commission.europa.eu/system/files/2021-11/ec_rtd_era-policy-agenda-2021.pdf)

24 European Commission (2023). Guiding Principles for Knowledge Valorisation implementing Codes of Practice. [Guiding Principles for Knowledge Valorisation implementing Codes of Practice \(europa.eu\)](https://commission.europa.eu/strategic-plans/guiding-principles-for-knowledge-valorisation-implementing-codes-of-practice_en)

<sup>25</sup> See the description in Appendix F and the description of co-design in Coherence chapter)

consider broader societal processes. Destinations covering areas of smart mobility and communities put particular emphasis on social innovation (see figure below).

Figure 1: EC Funding allocation to projects with different tags relevant to incorporation of stakeholders into R&I activities and consideration of their needs across Cluster 5 and Cluster 6 Destinations.



Source: Based on CORDA data from June 2023. See CS-15 for further analysis. It should be considered that not all topic tags make relevant activities for projects mandatory, and tagging may have been implemented differently across Destinations (e.g. some Destinations not using any or some of the considered tags).

### 3.1.1.4. Key target groups across types of actions and Clusters

**Different types of actions overall tend to prioritise different stakeholder groups.** IAs engage the most private for-profit entities, while RIAs are more geared towards higher or secondary education establishments, but fewer public bodies compared to other actions. Participatory processes are mostly covered by CSAs. They also feature three times more ‘other’ organisations than IAs and RIAs per project, which influences how and whose interests are represented. **Partnerships tend to put particular focus on industry engagement, while Missions involve more civil society and public authorities** (CS-15).

In terms of engaging diverse stakeholders, Clusters 5 and 6 feature most new participations from public, private and other organisations. Overall, new participations amounted for around 20% of the total participations in each cluster (5&6). Also, across the two Clusters, **more than 9 in 10 projects**<sup>26</sup> **feature at least one SME participant** (Appendix E).

**Most Destinations explicitly address target groups along thematic areas and objectives within each call.** Tagging of target groups within the CORDA database is implemented only in Cluster 6<sup>27</sup>. The largest share of EU contribution in Cluster 6 goes to projects targeting research organisations (48%), policy (38%) and end-users (38%), while projects targeting investors and standardisation receive the least funding (CS-15).

<sup>26</sup> 91% in Cluster 5 and 96% in Cluster 6 (Appendix E).

<sup>27</sup> Projects are tagged as targeting specific groups such as end-users, civil society, citizens, industry and business – overall 10 groups and one tag for “all” target groups.

HE Calls consistently mention relevant EC bodies, agencies and services, and institutional stakeholders such as National Contact Points (NCP) or established networks and platforms. In CL5, Destination 2 covers a wide set of different communities, including transport and mobility, energy, and cities, while the other Destinations are focused more on specific sectors and technologies. Cluster 6 embraces the more multifaceted approach across the Destinations. Calls also tend to highlight specific groups: e.g. involvement of cultural heritage stakeholders in projects targeting holistic renovations or coastal, urban, and rural communities within a dedicated Destination. In CL6, farmers and foresters are particularly important groups (Annex D). Some projects target specific groups as their core purpose: e.g. three projects in CL6 focusing on supporting women-led innovation in rural areas.

According to the survey data, **more than 50% of respondents indicated that they had plans to engage citizens, citizen representatives or end-users** in the co-creation of the R&I content of their Horizon Europe projects, with the highest rate for CSA projects (71%). There are differences in terms of citizen or end-user engagement, related to the differences in positioning of the instruments. Missions' projects have the highest level of participation, with around 70%, about 10 points higher than 'traditional' projects. At the other end of the spectrum, only one third of Partnerships projects foresee the participation of citizens or end-users, and 40% indicate they do not know or it is not applicable.

#### *3.1.1.5. Consideration of stakeholder needs and significant issues*

Findings from case studies, surveys and Partnership evaluations coincide on the **high relevance of HE to stakeholder needs**. Across the projects, stakeholder needs have been considered in diverse ways. For example, in mobility, lighter vehicles improve safety of users while reducing energy use (CS-5). Analysis of Calls and case study examples also highlight consideration of policy needs (CS-5, Annex D). Within most Destinations, and particularly in Cluster 6, there are projects specifically dedicated to developing more needs-oriented solutions, as well as inclusive and reflexive approaches to involving stakeholders.

In the field of climate science, emerging needs have been well addressed. These include the need for higher resolution and granular results, developing tools for preparedness and response to climate hazards, and improved attribution of impacts, including extreme events to climate change (CS-1). In projects targeting cities, knowledge sharing helps to better address common needs of municipalities (CS-2).

The nature-based-solutions area features projects that specifically cater to investor needs, as well as new technological innovations and more systemic solutions and integrative frameworks for understanding the value of biodiversity and ecosystems' services (CS-7). The consideration of needs and aspirations of rural residents and amplifying their voices is given high importance in CAP Strategic Plans (CS-10). The needs of smallholder farmers and producers are commonly considered via multi-actor collaborations, technological solutions, and capacity building (CS-9). Contribution to EU environmental leadership in soil health and agricultural innovation has been considered exemplary (CS-8). In the context of Earth observation, both societal and research needs have been considered, including the contribution to participatory decision-making and citizen empowerment (CS-11).

Needs-driven approaches were also mentioned beyond the scope of CL5 and CL6. A portfolio of projects aims to address capacity building and knowledge needs in support of Missions (CS-9). **Citizen engagement is strongly emphasised in the Missions' strategic**

**documents, Implementation Plans and Calls**<sup>28</sup>, which frequently mention the ambition to empower stakeholders and proactively engage them in addressing problems and developing solutions. **Overall, the implementation of Missions is still in the early stages and the evidence on the relevance of engagement is still to come.** Current analyses highlight that Missions need to look beyond deficit-filling assumptions and embrace the diversity of knowledge (non-expert, non-technological), as well as institutional and social factors that influence the desired processes of change<sup>29</sup>.

**Across Partnerships, the processes for devising Strategic Research and Innovation Agendas (SRIAs) were overall intended as collaborative and responsive towards the stakeholder needs.** Actors commonly engaged in strategic agenda-setting included research organisations, universities, Partnerships’ founding members (including the EC, Member States and/or National Funding Agencies), and private and public stakeholders (mainly industry and technology providers). Some Partnerships also included civil society and public authorities (e.g., DUT, B4P, CBE, CCAM and Water4All). KIC Urban Mobility and EIT Food put a particular focus on user and consumer needs (PE-EIT-UM, PE-EIT-Food). In some cases, Advisory bodies, States Representatives Groups, and members take active part in setting Partnership priorities and sustaining their relevance (PE-JR).

Aspects of social change, shortcomings of the current economic paradigm and contradictions between industry and ecosystem needs have been elaborated in detail only in select cases (CS-10, CS-2, CS-6, PE-SESAR). The challenge of meeting evolving and emerging needs should be better considered in some cases (CS-8) and is well addressed in others (PE-W4A).

**Table 8 Good practice of stakeholder engagement among European Partnerships**

Partnership	Good practice
EIT Urban Mobility	The EIT Urban Mobility KIC highlights that “successful stakeholder engagement will increase the ability to create, experiment, demonstrate, scale and deploy”. It aims to bring together the key players across the value chain of mobility with stakeholder-specific ambitions, engagement tools and channels in the strategic agenda. It also emphasises improved social interactions, inclusive design, social cohesion, and a sense of community in strategic objectives. Throughout implementation EIT Urban Mobility uses multiple mechanisms for engagement of relevant stakeholders, including Special interest groups, Arenas of innovation, Innovation sales enablement, City Club, as well as various educational programmes.

<sup>28</sup> European Commission (2023). COMMISSION STAFF WORKING DOCUMENT. EU Missions two years on: An assessment of progress in shaping the future we want and reporting on the review of Mission Areas and areas for institutionalised Partnerships based on Articles 185 and 187 TFEU. <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52023SC0260>

<sup>29</sup> Foulds, C., Valkenburg, G., Ryghaug, M., Suboticki, I., Skjølsvold, T. M., Korsnes, M., & Heidenreich, S. (2023). Implementing Mission-oriented Experiments: Recommendations on Epistemic Inclusion for City Stakeholders Working in Climate Change Initiatives. *Journal of City Climate Policy and Economy* 2(1), 55–76. <https://doi.org/10.3138/JCCPE-2022-0014>

Partnership	Good practice
CCAM	<p>The Partnership provides a list of 14 engagement steps taken during the SRIA co-creation process, including Information days, public consultations, email exchanges, online and offline workshops and other types of interactions with key stakeholders. Stakeholder engagement is overall present at all levels of CCAM objectives with a primary focus on increasing public acceptance, coordination and fostering trustworthy interactions. The implementation of CCAM is well aligned with objectives and features a versatile palette of engagement approaches, including a multi-stakeholder approach, need-based and user-oriented processes, common evaluation framework and methodologies, and dissemination and awareness raising activities.</p>

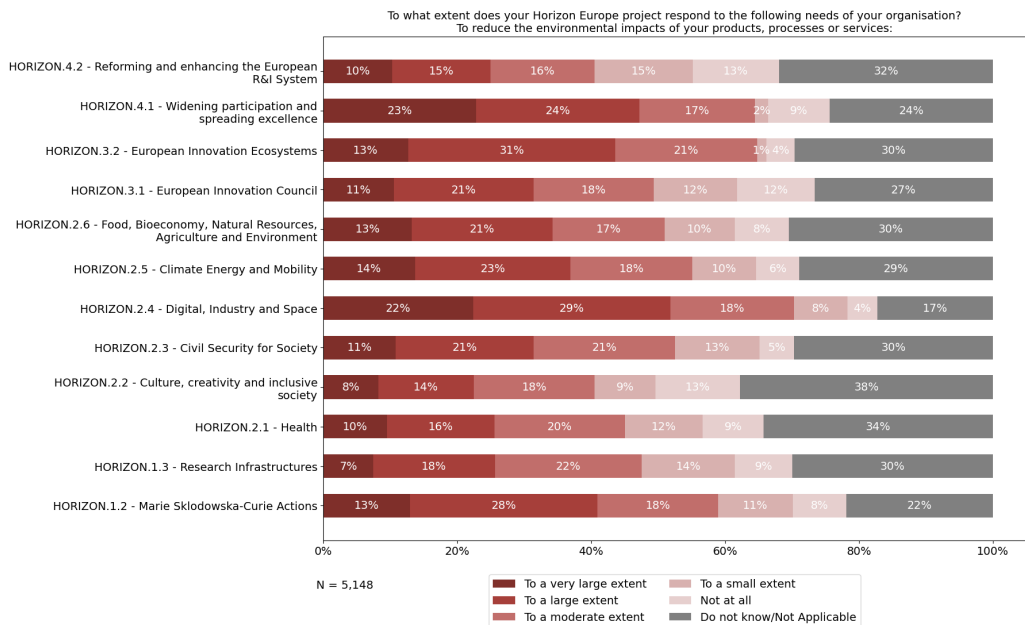
Source: CS-15, PE-CCAM, PE-EIT-UM

The case studies identified specific instances where **needs should be further considered**, which are of a horizontal nature with potential relevance for other programme parts of Horizon Europe. These include the **importance of transdisciplinary approaches** to tackling Green Transition challenges, **consideration of the speed of change** and **upskilling and reskilling needs** (CS-1). Stakeholder needs not being a priority is more common among projects focusing on specific scientific and technological advances, where risks and benefits of engagement may not be considered to a full extent in the absence of sufficient capacities or willingness to engage beyond usual suspects (CS-15, Annex D).

#### 3.1.1.6. *Consideration of organisational needs for reducing impacts and developing solutions*

The following figure illustrates the perception of respondents regarding the extent to which their Horizon Europe project addresses the organisational need to reduce the environmental impacts of their processes or services. As opposed to the numbers above, participants from the programme part 2.4 (digital, industry and space) were at the forefront, with 51% indicating a significant contribution (to a very large and to a large extent), with other environmental Clusters of the pillar (Cluster 5 and 6) falling behind, with merely 37% and 34% of respondents respectively agreeing to the statement to a very large or to a large extent.

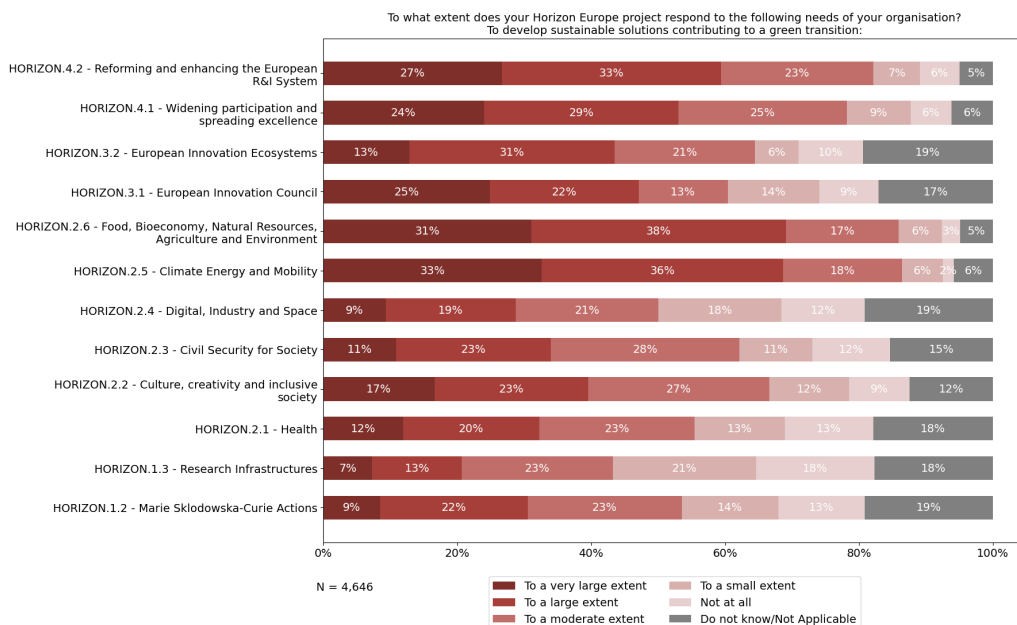
Figure 2: Q24: To what extent does your Horizon Europe project respond to the following needs of your organisation? (To reduce the environmental impacts of your products, processes, or services)



Source: Survey of beneficiaries and unsuccessful applicants, May-July 2023, All HE programme parts

Projects funded within those Clusters could be considered as less focused on the reduction of environmental impacts and more towards environmentally friendly innovation and the development of new sustainable products and services. However, negative environmental impact reduction and environmental shift in industry practices might be particularly relevant to industry. Participants from the programme parts 4.1 and 3.2 were among the followers in their perceived positive contribution with 47% and 41% respectively agreeing to a very large or to a large extent. Programme part 4.2 participants expressed the lowest perceived contribution.

Figure 3: Q24: To what extent does your Horizon Europe project respond to the following needs of your organisation? (To develop sustainable solutions contributing to a Green Transition)



Source: Survey of beneficiaries and unsuccessful applicants, May-July 2023, All HE programme parts

Based on analysing the perception of survey respondents regarding the extent to which their Horizon Europe project addresses the organisational need to develop sustainable solutions contributing to the Green Transition, Cluster 5 and Cluster 6 participants were at the forefront, with 69% indicating a significant contribution<sup>30</sup>. Participants in Cluster 4 ‘Digital, industry, and space’ showed the least expected contribution. Among Pillar 4 participants more than half of respondents consider that HE addresses relevant needs to a very large or to a large extent.

### 3.1.1.7. Ways to improve consideration of stakeholder needs

From the perspective of analysing participation patterns, **the current classification of organisations into five types may be expanded to a more granular level**. This would allow to distinguish between private companies and financial institutions, civil society and business associations, local and national authorities, etc.

The limitations and challenges related to consideration of stakeholder needs could be considered connected to the more broadly entrenched ‘regimes of techno-scientific control’<sup>31</sup> as the feature of the R&I system. The discourse of co-creation, as currently implemented, faces the challenge of integrating diverse values, aspirations and needs of different groups in EU policymaking. As one study noted, the EU’s approach to co-creation “blurs the line between self-motivated opportunity and democratic legitimacy” by commonly referring to citizens, end-users and consumers without sufficient differentiation between their scope and

<sup>30</sup> To a very large and to a large extent.

<sup>31</sup> Herberg, J., & Vilsmaier, U. (2020). Social and Epistemic Control in Collaborative Research — Reconfiguring the Interplay of Politics and Methodology. *Social Epistemology*, 34(4), 309–318. <https://doi.org/10.1080/02691728.2019.1706115>



meaning, and not sufficiently illuminating tensions between the different actors<sup>32</sup>. The critiques of the European Green Deal, related to injustice, power asymmetries and vested interests<sup>33</sup> require further attention to ensure genuine consideration of stakeholder needs.

### 3.1.2. Flexibility and response to developments at national, European, and international levels

**Design of various WPs during the programme lifetime provides opportunities to respond to new challenges with relevant topics.** Emerging needs and issues are thoroughly addressed across thematic areas, for example, the second WP (2023-2024) addresses dependencies unveiled by the Russian invasion of Ukraine, such as short-term food security, which was taken up in Cluster 6.

However, there are also **limitations** when it comes to fully grasping the emerging needs in evolving contexts. From an operational perspective, the fact that projects have been selected based on requirements defined in a specific topic text (which may already become outdated during the project's lifetime) limits the flexibility and **adaptability regarding new industry standards**. One example is the development of battery cells. The technological developments in this area are fast-paced (such as the potential current shift from lithium to sodium-ion batteries). Once selected projects have started, it is hard to adapt them during their course to changing circumstances and novel developments in the R&I sector and industries. There is a need for mechanisms to ensure responsivity towards such rapid developments going beyond current efforts to streamline and expediate processes.

In broader terms, the analysis of the intervention logics and activities (policy mix) identified **limited consideration of structural barriers and action gaps**, which may undermine the necessary pace of deployment. Broader trends like the increasing volatility of the Earth system, and the prospects of disorderly transitions may constrain the potential positive contribution of Cluster 5. **The broader issues of socio-cultural change, including aspects of governance, lifestyles and behaviour change have received limited attention**, and are mostly subsumed under D2 ('Cross-sectoral solutions'; mostly related to urban environment) and D4 ('Efficient, sustainable and inclusive energy use') in Cluster 5. In Cluster 6, structural barriers are observed regarding multistakeholder approaches to set up systemic interventions for the agricultural transition, which requires changes in deeply institutionalised production and consumption patterns. **It might require a more fundamental reflection on the definition on the role of R&I in supporting the transition dynamics beyond strengthening the necessary efforts, infrastructure change and general references to societal change, but towards more systemic and timelier reconfiguration of the economy and society.** Such reconfiguration requires strategic decisions to be taken for example in the Strategic Plan 2025-2027, because it would mean to (i) widen the understanding of innovation in a way that next to science and technology also social innovation would be accepted as a mode of innovation, and (ii) interdisciplinary approaches (i.e. including SSH) and transdisciplinary approaches (i.e. including those stakeholders, who represent the need of the solution to be developed) become the 'default option' for

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<sup>32</sup>Ruess, A. K., Müller, R., & Pfothner, S. M. (2023). Opportunity or responsibility? Tracing co-creation in the European policy discourse. *Science and Public Policy*, 50(3), 433–444. <https://doi.org/10.1093/SCIPOL/SCAC079>

<sup>33</sup> Vela Almeida, D., Kolinjivadi, V., Ferrando, T., Roy, B., Herrera, H., Vecchione Gonçalves, M., & Van Hecken, G. (2023). The "Greening" of Empire: The European Green Deal as the EU first agenda. *Political Geography*, 105, 102925. <https://doi.org/10.1016/J.POLGEO.2023.102925>

collaborative research. Next to these changes in the intervention logic and toolbox, **the research agendas of the Cluster programmes should put more weight on questions of social inequalities, behavioural change, skills needed for the various transition processes and citizen-centric policy approaches.**

While successful and unsuccessful applicants acknowledge **sufficient funding opportunities for technological applications in areas to address global challenges** (Climate Change, SDGs), within the scope of Green Transition orientations, **the predominant focus on technological solutions and applied research may come at the expense of more transformative orientations.** The current technology focus of Horizon Europe can also be captured by the opinions of survey respondents. In Cluster 5, 42% of the respondents consider the TRL approach as fully appropriate to capture the maturity level of the envisaged outputs of funded projects. 30% of respondents from Cluster 6 think accordingly, which indicates that the different approach taken here already manifests at the operational level. In both Clusters very few respondents consider the TRL approach as not at all applicable to the projects (4% and 5% respectively), indicating that **most projects still have a technology focus.** This includes several benefits, but also downsides as described in the paragraph above. For delivering on the European Green Deal, Clusters 5 and 6 do not sufficiently address solutions and aspects that go beyond standard TRL scope, such as societal readiness or possible disruptions to intended processes of change.

The distribution of funding across types of actions showcases this **major focus on enhanced production of marketable solutions and results, and on demonstration and deployment actions.** This can be observed by the high share of Innovation Action projects in Cluster 5 (62% in terms of EC contribution), and 38% in Cluster 6, which in line with its profile has to be expected to range at a lower level (for comparison: the share of IA projects in other Clusters: 59% in Cluster 3, 41% in Cluster 2, 40% in Cluster 4, and 1% in Cluster 1).

Overall, the focus on more market- and application-oriented solutions creates **a gap in collaborative early-stage knowledge generation.** Both short- and long-term R&I are needed to effectively harness the potential of both new and emerging solutions, as well as to better consider how the interplay of technological and non-technological solutions, and how specific technologies integrate with the changes in values, norms, and lifestyles. **More consideration should be given to the proper mix of phasing out activities, upscaling of necessary industries and down-scaling of the types of activities that are not compatible with the desired futures.** This challenge is pertinent given the fact that worldwide rapid growth in renewables has mainly been an add-on, given increasing demand, rather than an actual reorientation of the existing fossil-fuel based energy system<sup>34</sup>.

**The cross-cutting analysis of the Partnerships related to the Green Transition shows that these all have high relevance for the corresponding EU policy priorities, such as the EU Green Deal, and the challenges and needs addressed in the Framework Programme.** In their Strategic Research and Innovation Agendas for the period 2021-2027, the Partnerships have detailed their long-term vision, and based upon this vision put forward a mission, objectives, an outline of intended results and impacts. The Partnerships' visions underpin their transformative ambition related to the Green Transition, the EU objective to

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<sup>34</sup> DNV (2023). <https://www.dnv.com/news/energy-transition-outlook-renewables-still-not-replacing-fossil-fuels-in-the-global-energy-mix-247880>

become climate neutral, and delivering a Just Transition. The processes for setting up these agendas and work programmes are by large seen as flexible enough to allow for adaptation of priorities in a changing context<sup>35</sup>. Also, case studies highlighted responsivity to evolving needs, for example the priorities of the 2Zero Partnership have evolved in response to the changing needs of the road transport sector (CS-4).

### 3.1.3. Relevant areas of participation for international partners and associated countries

For the work programmes, Partnerships and Missions relevant for the Green Transition, **international cooperation is addressed to different degrees in the strategic statements**, with a mixed picture of participation of international partners. International partners comprise countries either formally associated to Horizon Europe or not associated (so-called 'third countries').

**International cooperation is necessary for tackling environmental challenges jointly.** Association of more countries, based on agreed principles and values, and the possibility of every country and researcher in the world to participate are particularly helpful. In light of the Green Transition, this is linked to strategic considerations for Europe, such as the establishment of relevant collaborations to achieve specific goals (e.g. resources urgently needed for the Green Transition, such as lithium and copper), improved perception of European actors vis-à-vis the world, and the attraction of talent.

Overall, the objective of EU-international cooperation in R&I includes strengthening the EU's excellence and attractiveness in R&I and its economic and industrial competitiveness, tackling global societal challenges, and supporting the EU's external policies. Although HE is open for collaboration to many countries around the world, there are **three global geographic areas that received extra attention in the Cluster 5 and 6 calls**, namely **Africa, China, and Latin America and Caribbean (LAC)**.

With regard to the Green Transition, both **EU and China agreed to jointly develop research flagship initiatives on Food and Agriculture, as well as Climate Change and Biodiversity**, which have been inserted in the current HE WP 2023-24. Overall, cooperation with China is seen as **significant in tackling the challenges** related to those topics. One core objective in this regard involves modulating cooperation based on the **commitment of third countries to shared values and interests, emphasising the development of common R&I principles** and strengthening ties with the developing south, especially Africa, as well as LAC Countries. EU and China are discussing a Joint Roadmap for the future of EU-China STI cooperation, aiming at developing a mutually beneficial R&I environment based on reciprocity, a level playing field, and respect for fundamental R&I values. Areas for cooperation are in the process of being identified, as well as a set of underlying framework conditions. In line with the EC's endeavour to move towards implementing a transactional and nuanced approach in the STI engagement with China, legal entities established in China are no longer eligible to participate in HE Innovation Actions (IA).

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<sup>35</sup> The complete synthesis on the Partnerships is to be found in the Appendix J on the Evaluation of the European Partnerships.

Concerning the cooperation between the **African and European Unions**, 2023 has seen the **adoption of the AU-EU Innovation Agenda** <sup>36</sup> which shapes STI collaboration for the next decade. It outlines **four priority areas, the Green Transition being one of them**.

The EU is also increasingly committed to strengthening R&I ties with **LAC**. HE offers **opportunities for joint research projects, knowledge sharing, and mobility programmes** between researchers and research organisations from both regions. The **New Agenda for Relations between the EU and LAC** <sup>37</sup> was adopted in 2023, aiming, among other things, at cooperating for a fair Green Transition, highlighting biodiversity, natural resources, and sustainable renewable energies.

When looking at project-level participation and financial contributions to third countries, particularly to LAC region and the African Union partners, an analysis of calls specifically geared towards international cooperation and the overall participation of third countries yields daunting results. **Participation of third-country partners is at an unprecedented low level**, and funding provided to these participants is even lower. Even within the specific calls for International Cooperation (CS-12), third-country partners had a negligible share of EC contribution going to just a few countries.

**Work programmes:** Programme data analysis reveals how the participation of associated countries and third countries unfolds in the Clusters (and other HE programme parts). Compared to other HE Clusters, **Cluster 6 is the most internationalised** after the Health Cluster. It has 16% of participants coming from non-EU-27 countries (19% in Cluster 1). Cluster 5 is with 13% of non-EU-27 partners at the same level as the rest of the Clusters. Splitting up the results into the participation of associated countries, the UK and of third countries the picture is as follows: the higher internationalisation of Cluster 6 (and Cluster 1 respectively) is due to relatively higher numbers of participants from third countries, whereas the patterns of participations from associated countries and the UK are quite even across the Clusters. According to the intervention logic analysis, the work programmes of almost all Destinations specifically ask for international cooperation and formulate expected outcomes and impacts related to international cooperation and positioning. Some Destinations – with stronger intensity in Cluster 6 – formulate expected outcomes more specific than others, e.g. Cluster 5 Destination 1 (Climate Neutrality) and Destination 5 (Transport), and in Cluster 6 Destination 2 (Food systems), Destination 4 (Zero pollution), and Destination 5 (Water). Whether the stronger formulation of expected impacts has a positive effect on third-party participation remains to be studied in the future.

As survey results reveal, the **cooperation with non-EU countries does not rank high among the motivations to apply for Horizon Europe funding**. Only 31% of the funded participants in Cluster 5 (and 39% in Cluster 6) were motivated to a large (or very large) extent by the possibility to conduct research with international partners coming from non-EU countries. Further, only 23% of the unsuccessful participants in Cluster 5 (and 38% in Cluster 6) are of the opinion that HE provides sufficient funding opportunities for research in collaboration with international partners coming from non-EU countries.

**Partnerships:** Partnerships show **mixed approaches to strategy setting and activities for international cooperation and positioning**. Many Partnerships are in principle open for

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<sup>36</sup> [https://research-and-innovation.ec.europa.eu/system/files/2023-07/ec\\_rtd\\_au-eu-innovation-agenda-final-version.pdf](https://research-and-innovation.ec.europa.eu/system/files/2023-07/ec_rtd_au-eu-innovation-agenda-final-version.pdf)

<sup>37</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023JC0017>

international co-operation, while some claim that their international role is limited by definition (e.g. in the case of Clean Hydrogen; evidence from policy workshop).

Clean Aviation and SESAR are two specific examples in which international positioning and international collaboration are being strongly pursued. For example, Europe's success in the aviation and air traffic management (ATM) industry is attributed, in part, to its strong contributions to global standards through the International Civil Aviation Organization (e.g., PE-CAJU and PE-SESAR). Clean Hydrogen has put the EU on the global hydrogen map and is advancing internationalisation through involvement of international actors in projects and the organisation of international events.

Some of the EIT-KICs show the most prominent internationalisation strategies, by engaging in international industry alliances outside the EU, international education programmes and matchmaking events. EIT InnoEnergy and EIT Climate KIC are prominent good examples in this regard. KICs operate with the HE eligibility rules, hence the EIT grant is available to the EU and countries that have signed association agreement with the HE (cf. the EIT Global Outreach Strategy).

Among the Co-funded Partnerships and the Co-programmed Partnerships participation of international partners is a challenge. Involvement from associated and third countries is significantly lower than the average of Cluster 5 and Cluster 6 in some of the Co-programmed Partnerships (e.g. BATT4EU, CSP, 2Zero). Efforts are on the way to establish some joint activities with international players. Among the Co-funded Partnerships CETP, Biodiversa+, and to some extent also DUT, all show a strong international orientation.

The **HE Missions** have focused in their setup phases on establishing governance structures and activities at European, national, regional, and local level, while the **cooperation with associated countries and third countries or international bodies did not rank as a first-order priority**. Nevertheless, Missions address environmental and societal challenges, which are of a global nature. Countries outside the EU have taken a mission-oriented approaches in similar ways, and for many topics, international bodies set relevant policy targets, such as the IPCC (Intergovernmental Panel for Climate Change). Thus, Mission governance and activities should encompass more the dimension of international cooperation, particularly regarding transboundary issues and that require such collaborative arrangements.

A notable highlight in this regard is the Cities Mission, which develops cross-cutting solutions towards climate neutrality for communities and cities. Compared to the HE WPs part of the portfolio analysed, more EU-13 and associated countries made it to the Top 15 participating countries in the Mission actions. Additionally, 12 cities in associated countries, or with the potential of being associated to HE, are participating in the Cities Mission. Taken together, the stronger role that associated countries play in the Mission underscores the leadership role that it is pursuing and ultimately its goal to advance carbon neutrality in cities globally. In fact, with the support of the Mission, the Commission co-leads the Urban Transitions mission to strengthen net-zero visions of 300 cities worldwide (CS-2, policy workshop).

The Ocean and Waters Mission has set up a governance structure for national, regional, and local level by dedicated basin-level lighthouses covering the Atlantic-Arctic basin, Mediterranean Sea basin, Danube River and Black Sea basin and Baltic and North Sea basins. The lighthouse mechanisms feature an explicit strategic internationalisation, as they include countries associated to HE and the outermost regions as an integral part of the mission initiatives. With its all-encompassing approach, the Mission is broader than other

initiatives around the globe, which “provides an opportunity for EU global leadership on this critical ‘grand challenge’ for all on Earth”.<sup>38</sup>

### 3.4. Coherence

#### 3.4.1. Coherence of the FP in delivering impact for the Green Transition

##### 3.4.1.1. Internal coherence in addressing the Green Transition

**Destinations of Clusters 5 and 6 are well-aligned with the overall objectives of Horizon Europe**, each tackling specific challenges of the Green Transition. The Cluster 5 Destinations contribute to achieving climate neutrality and a sustainable energy future. The Cluster 6 Destinations are connected by the common goal of promoting sustainability and reducing environmental degradation. When it comes to the approach for targeting the Green Transition challenges, Cluster 5 and Cluster 6 show diverse but complementary approaches to tackling these (see previous section on Relevance).

The Destinations of **Cluster 5 coherently aim to deliver tangible results** with prospects of being implemented on a large scale. Some differences in the scope and scale of activities exist: Destination 1 focuses on improving the knowledge base of climate change and the transformation towards climate neutrality, whereas the other Destinations are more focused on developing and implementing solutions in the energy and mobility sector.

The Destinations of Cluster 6 show a high degree of internal coherence as they address the need for transformative change within their innovation ecosystems. **Cluster 6 embraces the idea of research and innovation supporting transformative changes in society** (“transformative innovation policy”), therefore acknowledging a more systemic approach, including the engagement of more diverse stakeholder groups in the projects.

Apart from a strong coherence in targeting Green Transition challenges, the design of the Horizon Europe interventions within Cluster 5 and Cluster 6 follows a structured process and incorporates **a high degree of formal internal coherence**. For each Cluster of Horizon Europe, the programme defined a sequence of 1) Key Strategic Orientations, 2) intervention areas and impact areas, 3) expected impacts, and 4) contributions of the work programme’s Destinations and European Partnerships to the expected impacts.

The analysis of the work programmes of Cluster 5 and Cluster 6 shows that both Clusters exhibit a high degree of internal coherence based on the framing of outcomes across Destinations and intervention domains. **Complementarities between Destinations and instruments are outlined** with a broad focus on climate-neutrality priorities. It indicates a strong coherence of R&I objectives geared towards the Green Transition in relation to the legally binding overall Horizon Europe climate-mainstreaming target of 35%.

Cluster 5 and 6 encompass a broad spectrum of intervention areas. Cluster 5 tackles climate change, energy, and mobility while Cluster 6 addresses a wide range of environmental and sustainability concerns across sectors like agriculture, food systems, and the bioeconomy. The intervention areas of Cluster 5 and Cluster 6 involve complex challenges requiring specific expertise and diverse resources, but they are also strongly interconnected to support

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<sup>38</sup> European Commission, Directorate-General for Research and Innovation, EU missions assessment report – Mission Restore our Ocean and Waters assessment report, Publications Office of the European Union, 2023, <https://op.europa.eu/en/publication-detail/-/publication/2d6611cf-537f-11ee-9220-01aa75ed71a1/language-en>

the Green Transition. For addressing the comprehensive range of interlinked issues, strong coordination and prioritisation mechanisms need to be in place, as there the inherent risk of fragmentation of efforts and resources needed to achieve the ambitious goals set may exceed the available resources.

In terms of programming governance, **an important measure that increased the coherence** of the Framework Programme with other EU sectoral policies **was the implementation of the Commission-internal co-creation process**. To support the complex societal transition processes, the design of the work programme is now being done in a more collegiate and joint way, involving all Commission services with an interest in the Cluster/Destination in a level playing field, with a common budget envelope, under a steering board composed of director generals and a Directors' Group for each programme part (e.g., Cluster). Previously, topics were independently managed by single DGs (in a sometimes 'siloed' way). Now, other DGs co-create the framing of the programme by bringing forward their own priorities and topic ideas and influencing the drafting of topics. As a result, cross-thematic issues (e.g. biodiversity in agriculture, green skills) are seen as being better considered under Horizon Europe.

The co-creation process resulted in different approaches under the two Clusters: **for Cluster 5, an organisational division along topical areas** in several co-creation groups was set up, which partly reproduced a more technology-oriented and siloed-approach. **Cluster 6 follows an integrated approach in programme planning**, with fewer co-creation groups, each of them having a bigger scope than in Cluster 5. At least within a Destination, this may be more conducive to incorporating cross-sectoral approaches. For Cluster 6, relevant DGs involved in this co-creation process with RTD are AGRI and ENV, which are Cluster co-chairs, with DG CLIMA as part of the wider group of EC services interested. The engagement of DG CLIMA in the Framework Programme was particularly underlined as a positive development for the Green Transition.

Despite these differences, the interviews with representatives from various DGs during this study showed that this new programming approach led to an important internal change, with a recognition that **the Framework Programme is** no longer "DG RTD's" (though it has always been implemented by multiple DGs) but **the innovation programme of the European Union**, which aims to better support complex societal transition processes.

Overall, there is seen to be a **need for continued consistency in policy priorities and a development of a common understanding of the Green Transition**, but political priorities may potentially change and thus undermine the coherence and long-term effectiveness of the programme.

#### *3.4.1.2. Coherence of the project portfolio and synergies with instruments within Horizon Europe*

In terms of projects funded, **projects in the areas related to the Green Transition show a balanced mix** of projects that do not build upon research activities funded in the past (about 50% in Cluster 5 and Cluster 6) and projects that do build upon research activities funded through various R&I programmes at European and national levels (Q22). About 20% of the respondents indicated that their project is a continuation of H2020-funded research activity, a share significantly higher than for the national level (7%) and the level of other European funding schemes (4%).

Concerning potential synergies within the different parts of the Framework Programme, the data analysis shows that **significant shares of projects in other parts of the work**

**programme address the Green Transition**<sup>39</sup>. However, **most** survey respondents in both Clusters **have not planned any joint activities**, which could include mutual conferences, joint dissemination activities, workshops, joint publications, etc. with other projects. Those projects that have planned joint activities are focussing on projects within the same Cluster (42%). Within Cluster 5, only 7% of projects plan joint activities with Cluster 4 and 5% with Cluster 6. Similarly, in Cluster 6, 7% planned joint activities with Cluster 5. Despite having a comparatively high share of relevant projects for the Green Transition, only about 2% of projects seek joint activities with MSCA actions and the EIT, and 1% with European Innovation Council projects and Research Infrastructures. This low level of joint activities could be explained by an inconsistent approach to developing and activating knowledge-sharing. While individual projects develop their own plans (bottom-up approach), there is no corresponding effort from the programme management level (top-down approach) to coordinate knowledge sharing across different Clusters.

Regarding the portfolio of projects, **there are gaps regarding the management of the thematic portfolio of projects**, which cut across Destinations, Clusters, Partnerships, Missions, or other parts of the Framework Programme (e.g. CS-13). First, programme parts are implemented by different executive agencies (CINEA for Cluster 5, REA for Cluster 6). Within the executive agencies, project officers are responsible for managing projects funded within the delegated programme part. Currently, there are no mechanisms or resources dedicated to creating thematic project portfolios across agencies. For example, potentially relevant MSCA networks or EIC projects are not considered by CINEA or REA project officers when organising thematic workshops of their project portfolios. Secondly, activities of **the EIT-KICs and Co-Funded Partnerships are not included in the main project funding database CORDA**, which prevents the development of an evidence base for creating synergies between projects of similar scope between the different types of initiatives.

Concerning portfolio management, the Interim Evaluation of the JRC<sup>40</sup> noted **the highly important role of the JRC's new portfolio approach** to designing and managing the work programme, for which Cluster meetings with policy DGs appear to be a good way of both developing and communicating in a more integrated and multi-disciplinary way. According to the JRC evaluation panel the food systems portfolio evidenced a method for mapping how the JRC competencies match with a simplified but broad framework for analysing food systems. The JRC also highlighted a SWOT analysis illustrating how the portfolio approach must be developed.

In line with the findings of this study, the JRC evaluation panel concluded that **it seems relevant to extend this type of mapping approach across portfolios** to better understand knowledge gaps, including where additional information relevant to institutional analysis is needed. To pursue this more complex coordination and integration work that is being increasingly required from the JRC, the evaluation panel notes that it will be necessary not only to show the ability to work on various topics but also to gain access to and integrate information on relevant elements (including social aspects).

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<sup>39</sup> The data analysis shows that levels are 63% in EIT, 51% in Digital, Industry and Space, 36% in Research Infrastructures, and 30% in MSCA.

<sup>40</sup> Heuer, R., Florea, A.M., Herranz Soler, M., Janowski, T., Keskitalo, E.C.H., Maas, R., Oddou, J., Pálincás, J. and Wegener, H., Interim evaluation of the activities of the Joint Research Centre under Horizon Europe and Euratom 2021-2025 - Final report of the evaluation panel, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/63710, JRC134811.



### 3.4.1.3. Coherence of Horizon Europe and the Horizon Europe Missions

The HE Missions are designed to be a tool to demonstrate and scale up solutions with a strong focus on the regional and local level, and to provide not only the necessary technologies but also the required innovations in the governance of the underlying challenges and the social innovations needed to achieve societal impact and realise a Green Transition.

The study supporting the assessment of the EU Missions demonstrates that the societal relevance of the mission areas is not contested<sup>41</sup>. The Mission areas underline the systemic nature of the challenges they address and the need for concerted action to optimise synergies in implementing Missions. The scope of each area is sufficiently broad to stand the test of time to the 2030 horizon addressed by each respective Mission.

However, in all the Mission areas the report emphasises that there is a need **for an increased focus on interdisciplinary R&I**, including a greater integration of social science and humanities and a focus on behavioural change of actors addressed. This includes **R&I on inclusive governance** and **encouraging adoption of solutions** by specific user groups. And by doing so making HE a more **impact driven** programme. The assessment of the Mission on Adaptation to Climate Change (ACC) acknowledges that ACC has a broad coverage of key systems but emphasises the need to incorporate businesses as a target group. The Cities Mission assessment notes that R&I alone is insufficient and the main challenge for cities in transitioning to climate neutrality is in implementation and the assessment of the Soil Mission notes that R&I in agriculture, urban soils and forestry should take account of the practices supporting the adoption of new technologies and practices. Research on the factors influencing the adoption of innovations such as climate-smart agriculture practices is required.

Hence, **within each Mission area a key challenge seems to be the need for stronger emphasis on implementation, uptake, and behavioural change**. Compared with the other parts of the Framework Programme, there are only small differences between the scope of activities performed within the Horizon Europe Missions and the Clusters of Horizon Europe. As the Mission calls have to follow the Horizon Europe logic and regulations, there is also only a very limited opportunity for stronger differentiation. The reliance on the same type of projects (e.g. RIA, IA, CSA) does not help in singling out the Missions, although the prevalence of these various types of projects is different, as Missions use CSAs and IAs more than the WP. According to the survey of beneficiaries, there are also only small differences in expected results, though comparatively higher expected results regarding the multi-level perspective of contribution to the Green Transition is positive and needs to be further developed. At present, however, the Horizon Europe Mission calls tend to resemble the scope of the Clusters' work programmes. This may be detrimental to increasing the role of the Mission in its task to emphasise behavioural change and solve actual societal problems.

To account for the cross-cutting nature of the Horizon Europe Missions, the strategic governance structures of each Mission consist of a 'Mission Owner Group' (MOG) representing the various DGs involved in the Mission. The MOG is one of the co-creation streams in Horizon Europe programming, chaired by a mission manager appointed among the senior Commission management. The MOGs provide additional strategic insights, propose R&I priorities, develop the Mission's work programme, and explore how other EC instruments can contribute to the Mission's objectives. The study supporting the assessment

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<sup>41</sup> European Commission, Directorate-General for Research and Innovation, EU missions assessment – Mission areas review, Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2777/093217>

of the EU Missions found that the cross-DG management model enhances the coordination and synergies at organisational level, leveraging a more systemic and integrated form of governance to address the EU Missions' ambitious and complex challenges. The cross-DG collaboration has also been viewed positively by consulted stakeholders (ibid.). The role of the Mission Boards – consisting of 15 independent experts – in fulfilling an advisory role to the EC has been viewed positively, and the assessment's findings are largely positive on the role of the first wave of boards in shaping the mission objectives and planned activities.

The assessment findings further indicate that there is a need for further research to understand better the practicalities leading to a more collaborative operational approach, but all the Missions have developed mechanisms for ensuring vertical governance and coordination with the national, regional, and local levels. While Missions have adopted a bottom-up approach in implementing the Missions – via structured interactions with regions, city, and local representatives – the assessment findings conclude that a limiting factor remains insufficient coordination between national, regional, and local levels of governance and a need for greater EU and national political support for bottom-up experimentation. In the same vein, the mutual learning exercise on EU Missions implementation at national level<sup>42</sup> reports on a number of common challenges regarding the implementation of the EU Missions, including: a) holistic coordination and sectoral policies still not being fully mobilised; b) high complexity and high associated coordination costs, with a strong focus on implementation while leaving insufficient space for high-level reflection on progress, instrument design, and policy development; c) a need for political leadership including a clear signal to facilitate access to resources (including funding); and d) effective anchoring in national governance systems.

A main challenge for the EU Missions relates to pooling and leveraging funding from a variety of sources and levels, including EU, national, regional, and local levels and from public and private actors. The Mission assessment stresses that more needs to be done to leverage funding from beyond Horizon Europe, both through 'mainstreaming' Missions across other EU programmes and by pooling national and regional funding. The findings further suggest that private sector stakeholders are not yet sufficiently effectively engaged, which partly reflects the early stage of implementation. Specifically, the assessment of the Cities and Adaptation to Climate Change Missions calls for better integration of policies and funding programmes across different DGs, through which the EC can further demonstrate its commitment to innovative governance and foster synergies between various EU funds<sup>43</sup>. The report emphasises that **the implementation of the Missions will require a mix of R&I funding and funding for scalable investment projects**, with the emphasis on mobilising investment (experts estimate that around 80% of the solutions are already in place and ready to be scaled up), and that it is therefore also time to reflect on how the governance model is set up within the EC.

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<sup>42</sup> European Commission, Directorate-General for Research and Innovation, Uyarra, E., Creating national governance structures for the implementation of EU missions – Mutual learning exercise on EU missions implementation at national level – First thematic report, Uyarra, E. (editor), Publications Office of the European Union, 2024, <https://data.europa.eu/doi/10.2777/724815>

<sup>43</sup> European Commission, Directorate-General for Research and Innovation, EU missions assessment report – Mission Climate-Neutral and Smart Cities, Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2777/114682>

### 3.4.2. Positioning of the FP in the area of Green Transition in Europe and internationally

#### 3.5.1.1. *External coherence with other EU funding programmes and the national level*

**In the area related to the Green Transition, the positioning of the Framework Programme concerning R&I in the international landscape is highly relevant and complementary to national and/or regional funding alone.** Compared with activities at the EU Member State level, the R&I activities of Cluster 5 and 6 are unique as regards the dimension of targeting the innovation ecosystem actors across Europe. The public consultation on the Horizon Europe Strategic plan showed that the vast majority of respondents considered EU support extremely or moderately more impactful than national/and or regional support alone. At the national level, the evidence of the international benchmarking exercises shows that the analysed programmes in France, Spain and Sweden exhibit good external coherence with the European level and other international strategies including a purposeful alignment of national and European goals but sometimes overlap in the topics covered.

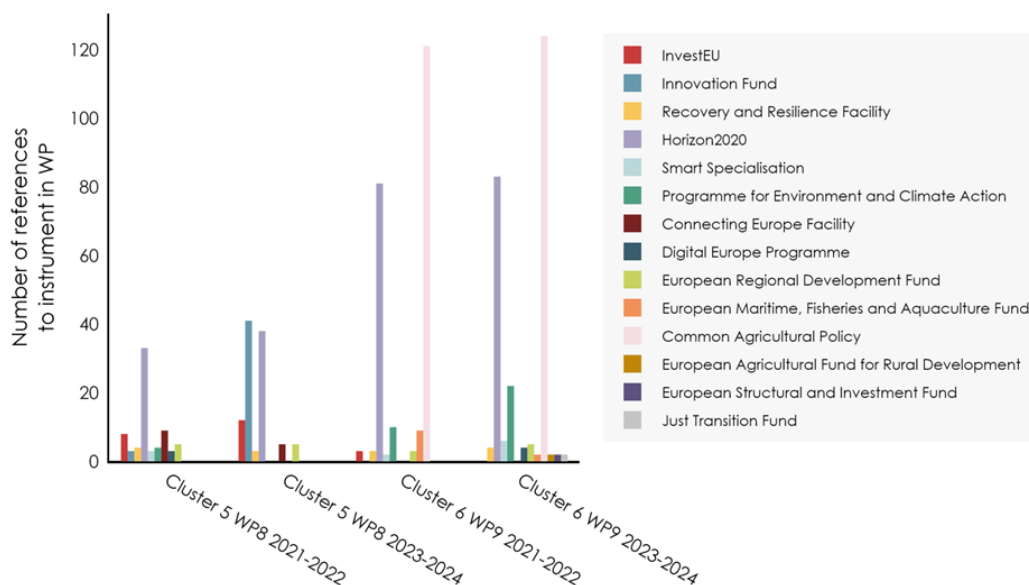
External coherence with other (EU) programmes has increased, as shown by the different legal bases setting out potential synergies as well as the Commission Notice ‘Synergies between Horizon Europe and ERDF programmes’<sup>44</sup>. The analysis of the Horizon Europe work programmes (see CS-14 for details) shows that the EC is promoting synergies in the work programme by creating a robust connection between Horizon Europe Destinations, calls and topics and various other EU funding instruments and policies. The WPs of Cluster 6 show a greater degree of planned synergies as compared to those of Cluster 5, suggesting that the development of the work programmes of Cluster 6 had a stronger emphasis on collaboration and shared objectives. Generally, the types of synergies mentioned for Cluster 6 are related to downstream synergies, whereas those for Cluster 5 are more related to possible additional funding sources. In this regard, it should be noted that in the case of Cluster 5 WP 2023-2024, actions were taken to integrate pre-programmed synergies in the Work Package.<sup>45</sup> Additional actions implemented to promote synergies across different DGs include knowledge sharing through two internal EC initiatives aimed at knowledge-sharing on synergies, external knowledge sharing sessions, the Horizon Results Booster, the Horizon Results Platform and the inclusion of cross-programme references in the evaluation criteria of other Programmes.

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<sup>44</sup> [https://ec.europa.eu/regional\\_policy/information-sources/publications/communications/2022/synergies-between-erdf-programmes-and-horizon-europe\\_en](https://ec.europa.eu/regional_policy/information-sources/publications/communications/2022/synergies-between-erdf-programmes-and-horizon-europe_en)

<sup>45</sup> A standard sentence was added to relevant topics to encourage applicants to include in their Horizon Europe proposals a business case strategy and feasibility study, which can be seen as a stepping stone for possible future applications to the Innovation Fund.

Figure 4: References in work programmes to other EU instruments and policies



Source: text analysis of the work programmes. Instruments with less than 2 references are excluded from the figure for sake of readability.

A key need in relation to the Green Transition is to support the scale-up of expected achievements of Horizon Europe from the demonstration level to large-scale implementation. For targeting the Green Transition on a broad scale, **priorities for fields of action, linkages to large-scale investment programmes outside the Framework Programme, and a stronger focus on implementing new regulations, standards and norms that spur the Green Transition are needed.**

For both Clusters 5 and 6, some synergy creation mechanisms have been taken, but room for enhancement exists. Out of the 20 programmes listed in Annex IV of the Horizon Europe regulation, for which potential synergies with Horizon Europe have been listed, the following have specific synergy creation mechanisms incorporated related to the area of the Green Transition:

Related to Cluster 6, synergy activities concerned the CAP and the EMFF:

- The CAP is well taken into account in Cluster 6 WPs, which has been developed with a strong involvement from DG AGRI (see case study 14) and some Horizon Europe projects are aiming to provide the tools to create synergies. A good example is the Tools4CAP project, which has the ambition to support the design, implementation and monitoring of the CAP Strategic Plans through innovative methods and tools that could be replicated across the EU-27<sup>46</sup>. In addition, 18 out of 28 EU member states have incorporated the Soil Mission into their CAP strategic plans, creating a link between innovative soil management practices and the allocation of CAP funds. For creating

<sup>46</sup> See: <https://www.tools4cap.eu/>

synergies, the CAP Network founded in 2023 provides awareness raising related to Horizon Europe Cluster 6, including the provision of Network Brokerage events <sup>47</sup>.

- In the framework of the EMFF stakeholder workshops and networking took place in the maritime forum, and a referencing in call documents and an inclusion in the evaluation criteria took place.

Related to Cluster 5, limited synergy creation activities with other instruments have been found. Activities comprised cross-referencing of calls and knowledge exchange activities. Incentive mechanisms such as consideration of previous EU-funded projects in evaluation criteria and coordinated joint call and programming activities have been rare. Specific synergy creation activities have been detected for:

- The Connecting Europe Facility and Cluster 5 prioritize similar themes like clean hydrogen, smart grids, and sustainable transport systems. This alignment ensures that research advancements target solutions directly relevant to CEF's deployment objectives. The Clean Hydrogen JU continues exploring synergies with the CEF and will facilitate the implementation of synergies between the ongoing JU project H2Accelerate TRUCKS2 (Large scale deployment project to accelerate the uptake of Hydrogen Trucks in Europe) and (but not only) the CEF-T supported project Greater4H <sup>48</sup>.
- SESAR recognize the potential of space-based solutions for improving ATM. They collaborate on research and development activities to explore how satellite data and communication can enhance air traffic management functionalities and aims to sign a Memorandum of Cooperation with the European Union Agency for the Space Programme (EUSPA) in 2024 <sup>49</sup>.
- The LIFE Climate Change Adaptation Programme awards 2 bonus points in the proposal evaluation if the project builds upon results of another EU programme, and thereby provides an incentive mechanisms which creates an opportunity for promising results stemming from Horizon Europe <sup>50</sup>.
- In the case of the Innovation Fund, exchange on projects and their progress, collaboration on call design, and inclusion of staff in the evaluation processes took place.

Key challenges related to synergy creation opportunities in the area of the Green Transition persist. Timelines, eligibility, and evaluation criteria between the programmes are very different. To facilitate synergies, active coordination and steering going beyond the core project management task are needed. Funds, like the ERDF, that should support the deployment of results from R&I projects, including for the EU Missions, face specific challenges as regards programme coordination (centralisation/shared management). In addition, evident time lags between the delivery of R&I results and further enhancement of implementation have not been accounted for. Furthermore, Important Projects of Common

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<sup>47</sup> The network replaced some activities of the European Innovation Partnership for Agricultural Productivity founded in 2012. On its activities, see: [https://eu-cap-network.ec.europa.eu/horizon-europe-creating-knowledge-and-innovation-sustainable-agriculture-forestry-and-rural\\_en](https://eu-cap-network.ec.europa.eu/horizon-europe-creating-knowledge-and-innovation-sustainable-agriculture-forestry-and-rural_en)

<sup>48</sup> See: Clean Hydrogen JU WORK PROGRAMME 2024, [https://www.clean-hydrogen.europa.eu/system/files/2024-01/Clean%20Hydrogen%20JU%20AWP%202024%20-%20all%20chapters\\_Final\\_For\\_Publication.pdf](https://www.clean-hydrogen.europa.eu/system/files/2024-01/Clean%20Hydrogen%20JU%20AWP%202024%20-%20all%20chapters_Final_For_Publication.pdf)

<sup>49</sup> See: SESAR 3 Joint Undertaking – Biannual Work Programme 2024-2025, <https://www.sesarju.eu/sites/default/files/documents/reports/Bi-Annual%20Work%20Programme%20for%20years%202024-2025%20First%20Amendment.pdf>

<sup>50</sup> At the time of the evaluation, the number/share of projects receiving the bonus was not available.

European Interest (IPCEIs) enable MS to design and implement national investments targeting significant market failures or societal challenges that could not otherwise be addressed, for example in Green Transition areas of Batteries and Hydrogen. While potential synergies between these IPCEIs and Horizon Europe are acknowledged<sup>51</sup>, **no coordination mechanisms between IPCEIs, Horizon Europe and the relevant EU Partnerships exist.**

Leveraging these additional potentials will be crucial for achieving the objectives of the Green Deal, as there is a need to scale up new technological solutions fast. It will be necessary to monitor the business case for certain technologies (in terms of cost-efficiency) and establish the linkages to relevant funding programmes for the latest developments. In this regard, the funding of CSAs that link projects from Clusters 4 and 5 with the Innovation Fund are promising developments that should be enhanced. Overall, CSAs are positively assessed in terms of facilitating the uptake of research findings into innovations, notably for industry-academia collaborative research and networking opportunities (Appendix G).

The project data analysis, survey analysis, and interview findings indicate that **co-funding and cross-fertilisation of projects between Horizon Europe and other European instruments is limited.** The Policy Monitoring Metadata do not provide reliable information on synergies with other EU programmes. As regards project monitoring, it is currently unclear why, when and who flags the Synergies-data category in the Policy Monitoring Metadata for cross-cutting policy issues database. As for CORDA-data, follow-up projects of Horizon 2020 are not flagged accordingly.<sup>52</sup>

**In terms of searching for complementary funding opportunities, most respondents are not exploring potential synergies.** According to the evaluation survey, in Cluster 5 and 6, about 70% did not seek funding from other sources. Only 4% of respondents have applied for complementary European funding sources, whereas national sources have been addressed by 14% of respondents.

A complementary analysis of entities funded by at least two EU-funding programmes (see CS-14) shows that a substantial share of 27% of Cluster 5 (27%) and Cluster 6 organisations (30%) received funding from other EU sources.<sup>53</sup> In both Clusters, more than 70% of Higher Education Institutions, about 40% of Public Research Organisations (REC) and a third of Public Institutions received funding from other sources. The **most prominent funding instruments** are 1) the **ERASMUS+ 2021- 2027** programme, focusing on education and training, youth, and sport; 2) the **DIGITAL Programme**, aimed at bringing digital technology to businesses, citizens, and public administrations; and 3) the **LIFE 2027 programme**, Europe's multi-annual financial instrument for the environment and climate action.

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<sup>51</sup> See: European Parliament (2022), Briefing: Important Projects of common European Interest: State of Play, [https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/729402/EPRS\\_BRI\(2022\)729402\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/729402/EPRS_BRI(2022)729402_EN.pdf)

<sup>52</sup> With this strong caveat, the projects in Clusters 5 and 6 are showing relatively high potential for synergies. The tracking of projects in the Policy Monitoring Metadata indicates that 56% of Cluster 6 projects (n=220) have been tagged to have synergies with other EU programmes and 17% of Cluster 5 projects (n=92). About 32% of Cluster 6 projects that have been tagged show synergies with the LIFE Programme (n=123), 28% with the EU programmes for agriculture (n=113), 22% with the ERDF (n=87), 13% with the EMFF (n=51) and 12% with the RRF (n=47). Within Cluster 5, about 8% of the projects exhibit synergies with the LIFE programme (n=42), 8% with the ERDF (n=42), and 4% with the RRF (n=23).

<sup>53</sup> Please note, that no clear linkages between projects funded by Horizon Europe and organisational funding from other programmes can be drawn from this analysis. The level of granularity does not allow to know whether the funding received from the other programme is related to the HE project in Cluster 5 or 6, neither whether it addresses a green transition topic.

### 3.5.2. Coherence of Partnerships: internally and concerning other FP activities

The individual Partnership evaluations underline that **Partnerships are highly effective instruments to increase the coherence of activities within a certain field of action.** Within their field of action, the Partnerships are an effective means to align the coordination and collaboration among relevant stakeholders in Europe, including partners from academia, industry, policymakers, and civil society to a certain extent. This involves providing a platform and a structured framework to nurture collaboration and ensure the alignment of activities among these pertinent stakeholders. Compared with Horizon 2020, the co-development and consultation processes during the development phase of the SRIA served as an effective instrument for creating internal coherence and embodying a synergistic approach.

The cross-cutting analysis of the Partnerships shows that collaboration and the creation of synergies among the Partnerships are largely driven by the proximity of the Partnerships' activities in terms of their thematic orientation. The foundations for collaborative efforts and synergies among Partnerships have taken shape. Specific working groups and activity plans have been developed and first actions are being pursued. For example, several joint calls have been implemented or are being issued in the mobility sector. **Collaboration and synergy creation are observed mainly between the same Partnerships' typologies.** The limited creation of synergies between Partnership types lies mainly in data exchange barriers (needing agreements) and different timeframes between Partnership roadmaps.

The rationalisation of the Partnership landscape operationalised primarily via **the new Partnership instrument of Co-Funded Partnerships contributed to developing more coherent approaches in many Partnership areas, which also helped to significantly increase public funding from EU Member States** and strengthen collaboration with the EU level. One example is the creation of the European Clean Energy Transition Partnership<sup>54</sup>, which was developed via a successful EU cross-sectoral cooperation through the SET Plan<sup>55</sup>. According to the EC, thanks to the Partnership, EUR 500m in national funding was pooled to support jointly agreed R&I priorities, six times more than under Horizon 2020, and exhibiting complementarity with the activities funded by the HE programme in the energy domain, notably within Cluster 5 (climate, energy, and mobility) and Cluster 4 (industry and digital). Furthermore, the SET plan has developed an integrated approach to positive energy districts, which led key stakeholders and the European Commission to develop the Driving Urban Transition Partnership, co-funded under Horizon Europe. However, the number of Partnerships in bioeconomy (7) is seen as **difficult for stakeholders to respond to and to prioritise the call that is most important** and relevant for them, due to overlaps (e.g. in deadlines)<sup>56</sup>.

The planning and cooperation processes with the EC are well-coordinated between the EC (as one partner) and the other Partnership members for the Co-programmed Partnerships and the Institutionalised Partnerships. The Co-Funded Partnerships highlight a strong desire for strategic cooperation frameworks and proactive involvement from the EC to facilitate the creation of synergies. They emphasise the need for a dedicated "playing field" that fosters discussions on thematic scopes, joint efforts, and strategic dialogues to better increase

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<sup>54</sup> <https://cetpartnership.eu/>

<sup>55</sup> European Commission (2023), COM(2023) 634 final: [https://research-and-innovation.ec.europa.eu/system/files/2023-10/com\\_2023\\_634\\_1\\_en\\_act\\_part1.pdf](https://research-and-innovation.ec.europa.eu/system/files/2023-10/com_2023_634_1_en_act_part1.pdf)

<sup>56</sup> See Annex J: Partnership synthesis report, which provides an overview on the Partnerships related to the Green Transition.

alignment and foster synergies. This platform would enhance coherence, relevance, and alignment among the Partnerships and the Framework Programme activities.

Synergy creation processes with other EU funding programmes have been initiated by many Partnerships. The latest BMR survey data from 2023 show that in the area related to the Green Transition, synergy creation mechanisms with other EU funding programmes focused primarily on the Connecting Europe Facility (8), the LIFE Programme (7), the Digital Europe Programme (4), ERASMUS+ (4), the InvestEU Programme (4), and the EU Space Programme (2). No synergy creation mechanisms have been mentioned with the European Regional Development Fund<sup>57</sup>.

With regard to the Horizon Europe Missions, the assessment of the EU Missions indicates that by establishing strong links between the Mission process and industry-oriented Partnerships, mobilisation of private sector could become more effective. At present, joint activities between Horizon Europe Missions and the Partnerships are extremely rare. According to the assessment report, the Mission secretariats and implementation platforms have begun to work on mapping portfolios of projects but stronger ties still need to be built.

### 3.6. Effectiveness

3.6.1. The contribution of intended results, outcomes and impacts to the FP objectives, EU priorities and the SDGs

#### Main results and expected outcome of projects

The overall rationale behind the anticipated impacts of Cluster 5 and Cluster 6 and linkages to the Key Strategic Outcomes are based on the HE Strategic Plan 2021-2024.

For **Cluster 5**, these impacts are based on results and outcomes that make the energy and transport sectors more climate and environment-friendly, more efficient and competitive, smarter, safer, and more resilient.

Whereas for **Cluster 6**, the impacts are based on results and outcomes that reduce environmental degradation, halt/reverse the decline of biodiversity and ecosystems, and better manage natural resources.

The **policy drivers for both Clusters notably include the European Green Deal** whereby their results and outcomes broadly support the design, implementation, and evaluation of initiatives within the scope of the EGD (and alongside contributing to the SDGs). In addition, and where the contribution of Cluster 5 is particularly prominent, the European Climate Law requires the EU economy and society to become climate-neutral by 2050 and, as an intermediate target, to reduce net GHG emissions by at least 55% by 2030 to deliver on these targets (and where the Commission has proposed 'Fit for 55' legislative packages). Furthermore, the Cluster 6 calls and their results and outcomes also notably contribute to the implementation of the Zero Pollution Action Plan, Biodiversity Strategy 2030, and the Circular Economy Action Plan.

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<sup>57</sup> Ibid.



Concerning the Partnerships, the first report on the performance of European Partnerships under HE (May 2022),<sup>58</sup> has shown that **European Partnerships are a significant contributor to the Green Transition** (and to the Digital Transition) and to the achievement of different UN SDGs to a varying extent (e.g., contribution to gender equality was found to be close to zero). Whereas for the Missions, a set of assessment reports (July 2023),<sup>59</sup> have shown that the **EU Missions have been established and are expected to provide broader contributions to the Green Transition**, whereby:

- Mission Adaptation to Climate Change: The Adaptation Mission has been found through the assessment report to be a "timely, positive and promising initiative" which has "ignited enthusiasm from regional and local authorities and put climate change adaptation higher up their policy agendas".
- Mission Restore our Ocean and Waters: While the objectives of the Ocean and Waters Mission have been assessed as being very and perhaps "extremely ambitious", they are found to be aligned with the European Green Deal and reflective of the "urgency and scale of the challenge". However, despite there being indications that not all the objectives of the Mission may be reached by 2030, important achievements are noted with respect to "joined-up policies, instruments and solutions that put Europe on an accelerated track to achieving the vast majority of the outlined goals".
- Mission Climate-Neutral and Smart Cities: The Cities Mission has been found through the assessment report to have brought together 112 MS and associated country cities (and with more cities noted as to be added shortly through a 'twinning' programme). A transnational NetZeroCities platform has been established and a set of initial climate cities contracts have been published that detail "city-level transformation pathways and investment plans to achieve climate neutrality by 2030". Some MS have also set up their own platforms and programmes in support of the mission to extend support to non-selected cities. However, the assessment report does note that to date the support from Horizon Europe has been that of a "forward-looking, pump-priming nature with emphasis on demonstrator type actions to encourage dissemination of relevant innovations, as well as some focus on system innovation". With relatively small-scale, short-duration projects and investment volumes that are not seen as being at the level required to achieve the mission objectives and with some "lack of clarity as to what the cities can expect from 2024 onwards".
- Mission "A Soil Deal for Europe": The Soil Mission is found to be proceeding as planned towards its objectives. It has been assessed as both ambitious and well positioned for "initiating, mobilising and aligning EU and national/regional policy efforts for counteracting soil degradation".<sup>60</sup> The assessment report further notes that the implementation of actions for the Soil Mission is on schedule with a high level of interest

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<sup>58</sup> [https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/first-report-performance-european-Partnerships-under-horizon-europe-2022-05-16\\_en](https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/first-report-performance-european-Partnerships-under-horizon-europe-2022-05-16_en)

<sup>59</sup> The progress of the EU Missions towards meeting their objectives has been assessed separately through a set of specific assessment reports:

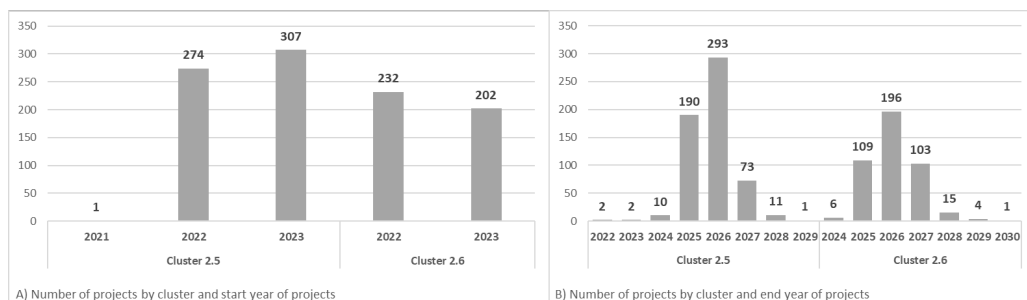
- Adaptation to Climate Change (assessment report July 2023, <https://op.europa.eu/s/y2CL>).
- Restore our Ocean & Waters (assessment report July 2023, <https://op.europa.eu/s/y2CJ>).
- Climate-Neutral & Smart Cities (assessment report July 2023, <https://op.europa.eu/s/y9A2>).
- Soil Deal for Europe (assessment report July 2023, <https://op.europa.eu/s/y2CK>).

<sup>60</sup> And where there has been notably insufficient progress to date on soil health, which is a broad transversal topic where faster action is urgently required.

in the calls and with the potential for a broadening of the community of researchers involved in soil science.

Assessing the main results and (expected) outcomes and impacts of the Cluster 5 and Cluster 6 projects supported towards achieving the FP objectives is difficult at this stage. The challenge is illustrated below in Figure 5. As the majority of HE projects launched in 2022 and 2023 will only be completed by 2026 or 2027, it is not possible to provide a comprehensive assessment of the effectiveness dimension of these subsets of projects as this would only become realistic from around 2029.

Figure 5: Distribution of projects by start (A) and end (B) year



Source: CORDA database, version June 2023

However, as indicated in section 9 of this report on the State of Play, the total climate-related spending at the payment level for HE between 2021 and 2027 stands at EUR 31,342.6 million and at 34% of the envelope (as of June 2023), which is clearly in line with the 35%, legally-binding, climate target. Using keyword-based queries, it was found that, for all HE current projects, respectively 26% and 8% are thematically aligned with the climate and biodiversity policy priorities (representing 38% and 12% of the overall HE EC contributions, Appendix E).

As described in the State of Play,<sup>61</sup> the distribution of projects in each Cluster that have already been signed and included in CORDA include 582 projects within Cluster 5 and 434 projects within Cluster 6. As shown below in Table 8, and as could be expected given the scope of Cluster 5 and priority areas for R&I, 298 of the projects are focussed on transport & mobility and 199 projects are focussed on energy. Whereas in Cluster 6 clearly the largest number of projects are focussed on agriculture, forestry, and rural areas (see also Appendix E Table 1).

<sup>61</sup> See Table 5: Number of projects, EC contributions and participations by Destinations and .

**Table 9: Distribution of projects by sector area in Cluster 5 and Cluster 6 <sup>62</sup>**

Cluster	Sector / Area		Nb. Projects
Cluster 5 – Climate, Energy and Mobility	Transport & Mobility	Clean, Safe and Accessible Transport & Mobility	154
		Industrial Competitiveness in Transport	81
		Smart Mobility	63
	Energy - infrastructure	Energy Supply	98
		Energy Systems and Grids	52
		Energy Storage	49
	Climate Science and Solutions		65
	Buildings and Industrial Facilities in Energy Transition		35
Communities and Cities		1	
			582
Cluster 6 – Food, Bioeconomy, Natural Resources, Agriculture and Environment	Agriculture, Forestry and Rural Areas		119
	Bio-based Innovation Systems in the EU Bioeconomy		56
	Circular Systems		41
	Seas, Oceans, and Inland Waters		34
	Biodiversity and Natural Resources		33
	Food Systems		30
	Environmental Observation		23
			434

Source: CORDA database, version June 2023

With a diverse portfolio of intended results and outcomes, **most Destinations in Cluster 5 strongly emphasise scientific, technological close-to-market outputs, and technology & innovation outcomes** (Destination 2, 3, 5, 6).<sup>63</sup> Systemic, policy and coordination aspects both at the output and outcome levels are also present albeit to a lesser degree (see also Appendix D and intervention logic analysis for Cluster 5). While specific calls provide in-depth detail on the latter, there are many other calls which address these aspects only to a limited degree. However overall, the former three domains still stand out as clear priorities.

<sup>62</sup> Note the numbers of projects shown in this table (which also includes projects funded by the JUs) are based on the Clusters and sector area linked to each project in CORDA. While all projects are linked to at least 1 Cluster, some projects are not linked to any specific sector area (and some are linked to multiple areas). The totals here for each Cluster then refer to a deduplicated set of projects linked to the corresponding Cluster and its sector areas, including the cases where projects could not be associated with any sector area. See also Appendix E Table 1.

<sup>63</sup> Destination 2 – Cross-sectoral solutions for the climate transition; Destination 3 – Sustainable, secure, and competitive energy supply; Destination 5 – Clean and competitive solutions for all transport modes; Destination 6 – Safe Resilient Transport and Smart Mobility services for passengers and goods.

Cluster 6 provides for a broad range of results across its seven Destinations.<sup>64</sup> These include coverage of topics across biodiversity and ecosystems, 'farm to fork', circular economy, bioeconomy, zero pollution, climate action (land, ocean, and water), communities and governance. As set out in Appendix D and the intervention logic analysis for Cluster 6, the breadth and depth of the outcomes from these results are considered to provide a **sufficient structural approach to support the acceleration of the transition as required by the European Green Deal to achieve climate neutrality by 2050, alongside opportunities to strengthen and balance environmental, social, and economic goals on a path towards sustainability.**

Indications of the specific types of Cluster 5 and 6 results from projects and their relative focus can be identified from the survey (Appendix G, Q26), which shows:

- There is a close similarity between the Clusters and prominence of the knowledge & capacity outcome domain, with 79% of respondents for Cluster 5 and 81% for Cluster 6 indicating that their projects have or are likely to result in **research publications**.
- A slightly differing level of focus is found between the Clusters on the policy side of the policies and standards domain, with 56% of respondents for Cluster 5 and a higher 71% for Cluster 6 indicating that their projects have or are likely to result in **recommendations for policymakers/inputs to national or EU policies**. A considerably lower level of focus is seen as may be expected on the **standards** side however, with 18% of respondents for Cluster 5 and a similar 17% for Cluster 6 indicating that their projects have or are likely to result in pre-standards/standards.
- A lower level but similar degree of focus is found between the Clusters on the market & business outcome domain. A close similarity between the Clusters but low level of prominence is seen for large-scale product validation and market replication-based project outputs, with 17% of Cluster 5 respondents and 15% of Cluster 6 indicating that their projects have or are likely to result in these types of results.

While a **prominence of knowledge & capacity-based outputs is found for both Cluster 5 and Cluster 6, there is less focus on recommendation and input-to-policy-based outcomes for policy makers in Cluster 5 and a stronger focus on testing, demonstrating and piloting-based results**, as could be expected given that Cluster 5 has a technology-orientation (see also Appendix D). A considerable **prominence of recommendation and input-to-policy-based outputs for policy makers as well as knowledge & capacity-based results is found for Cluster 6** – with projects providing research publications, as well as for skills, knowledge, and competence of researchers, and for increasing international visibility and action through collaboration. A **lower prominence of market and business and product- or patent-based outputs and results is also found for Cluster 6** (e.g., where projects focus on entry to new markets and global value chains, strengthened capacity to attract public/private funding, patents, business development activity, and product validation & market replication, etc.) – which would be expected given the nature and stage of the issues being addressed.

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<sup>64</sup> Destination 1 – Biodiversity and Ecosystem Services; Destination 2 - Fair, Healthy and Environmentally-friendly Food Systems from Primary Production to Consumption; Destination 3 - Circular Economy and Bioeconomy Sectors; Destination 4 - Clean Environment and Zero Pollution; Destination 5 - Land, Oceans and Water for Climate Action; Destination 6 - Resilient, Inclusive, Healthy and Green Rural, Coastal and Urban Communities; Destination 7 - Innovative Governance, Environmental Observations and Digital Solutions in Support of the Green Deal.

Furthermore, there is a relatively high level of (lower TRL) RIA type actions within both Clusters, with close to 50% of projects in each involving RIAs (there are also 50% more RIAs by number in Cluster 5, Appendix E). While there is a considerably lower level of (higher TRL) IA type actions, with broadly around a third of projects in each Cluster being IAs (there are also around two thirds more IAs by number in Cluster 5). The **differences between the nature of the innovation activities being pursued by each of the Clusters** is also notably demonstrated by the differing (and low) level of focus between the Clusters on patents, with 20% of respondents for Cluster 5 and only 10% for Cluster 6 indicating that their projects have or are likely to result in patent-based outputs is also found.<sup>65</sup>

Concerning the Partnerships,<sup>66</sup> findings within the context of Cluster 6 show that most projects under the CBE (Circular Bio-based Europe JU) have reached their key project objectives; and that for the EIT Food-KIC the support for entrepreneurs is considered as very successful and that overall, the KPIs appear to be met. Findings also show that other Partnerships within the context of Cluster 5, such as EIT KIC Urban Mobility and Cluster 6 (SBEP) are at the beginning/very early stages of their activities. While others such as Built4People, funded 6 projects under the 2021 calls and 9 projects under the 2022 calls.

The Partnerships with a Cluster 6 focus (e.g., CBE, EIT KIC-Food) and the Missions also have strong thematic linkages and have gained high importance in the areas of Food, Bioeconomy, Natural Resources, Agriculture and Environment. For example, in terms of achieving outcomes and impacts, the BBI JU/CBE JU Partnership is found to have made significant achievements, such as the establishment of new types of biorefineries across Europe, which combines the efforts of the public and private sectors. This development has had a significant impact on the bioeconomy and contributes to the goals of the Partnership. Additionally, the BBI JU/CBE JU Partnership has successfully facilitated networking and system structuring, bringing together industry and university representatives to discuss collaboration and address industry requirements. In addition, with a total of 4,720 collaborations overall, the EIT KIC-Food has brought together more beneficiaries than the other KICs. In its annual reports, the EIT remarks that the KIC-Food had properly identified the challenges currently faced by the food sector. KIC-Food's strategic approach is seen as comprehensive and adequate with a proper focus on knowledge triangle integration and placing consumers at the centre. Other Partnerships with a Cluster 5 focus, such as FCH 2 JU and CH JU also show strong thematic linkages as well as the ability to effectively progress substantively towards their objectives (e.g., 50% of the CH JU budget has been committed in the first two years). FCH 2 JU and CH JU are found from interviewees to have consolidated and organised a previously scattered and fragmented hydrogen ecosystem, while attracting some of the biggest industrial players in the field and leading to an increased private R&D funding. The Partnership is noted as the most authoritative source of knowledge in Europe for FCH technology – although there is seen to be a significant margin for improvement of knowledge management and the presentation and capitalisation of project results.

It should also be noted that the findings of the Interim Evaluation of the JRC<sup>67</sup> highlights that 'environment and climate change' stand out as the research area where the JRC has provided the most output through the publishing of scientific articles. At the same time, the policy impact of the JRC is evidenced in many publications. According to the findings of the Interim Evaluation, the JRC also positively contributed to the more challenge-led than growth-focused innovation policy of the EC. The JRC played a visible role in discussions within the

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<sup>65</sup> See Appendix G: Survey results – Effectiveness Q26.

<sup>66</sup> See also Appendix J: Overall assessment of the contribution to this area of the different types of Partnerships under Horizon Europe.

<sup>67</sup> <https://publications.jrc.ec.europa.eu/repository/handle/JRC134811>

EU on 'Going beyond GDP'. However, the JRC evaluation panel also notes that the JRC studies – although excellent – continue to focus more on technologies, data, materials and impacts as more traditionally conceived in the JRC, and less on behaviour, demand-limiting factors, and broadly institutional factors; this constitutes a limitation in scope and breadth of its policy advice. For instance, the work on critical raw materials does not look at the behavioural aspects of recycling. Similarly, work on climate adaptation seems to focus more on impacts, risks, and technical measures than on behavioural and institutional changes.<sup>68</sup>

### 3.6.1.1. Contribution to the Framework Programme objectives

The **outcomes for Cluster 5 and Cluster 6 are expected by stakeholders consulted through this study to be more visible as compared to H2020**, including through the Horizon Results Platform.<sup>69</sup>

- Destination 2 on Cross-sectoral solutions for the climate transition indicates a technological openness through its budget allocation to different battery technology topics.
- Destination 3 on Sustainable, Secure and Competitive Energy Supply and Destination 4 on Efficient, Sustainable and Inclusive Energy Use feature a more limited consideration of the factors that can influence effectiveness beyond technological advances and where stakeholder engagement and enhancing uptake are considered.
- Destination 4 places an emphasis on an accelerated transition, resilience (energy flexibility, future-proof historical buildings) and consideration of geopolitical and supply chain dimensions (energy independence, climate-resilient built environment) with ambitious framings of transformation towards sustainable living, holistic renovations, and building bridges between different domains.
- Destination 5 on Clean and Competitive Solutions for All Transport Modes and Destination 6 on Safe Resilient Transport and Smart Mobility Services for Passengers and Goods results in Cluster 5 emphasising technological and scientific outcomes. Systemic aspects address the integration of transport modes and integration with other sectors as well as a focus on policies & standards, creating a good basis to achieve the intended outcomes and impacts.

The results of Cluster 6 provide a wide range of outcomes through the WP calls which support the requirement (and underlying paradigm of Cluster 6) for a **transformative change in the EU economy and society** (Appendix D). The outcomes and expected impacts range from the reduction of environmental degradation to halting and reversing the decline of biodiversity and to better management of natural resources while meeting the EU's climate objectives and helping ensure food and water security. While appreciating that the Green Transition requires not only new technologies but also solutions that go beyond the provision of new technologies, the Destinations of **Cluster 6 place a strong emphasis on a transition that goes beyond technological progress alone and includes broad and ambitious**

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<sup>68</sup> Heuer, R., Florea, A.M., Herranz Soler, M., Janowski, T., Keskitalo, E.C.H., Maas, R., Oddou, J., Pálincás, J. and Wegener, H., Interim evaluation of the activities of the Joint Research Centre under Horizon Europe and Euratom 2021-2025 - Final report of the evaluation panel, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/63710, JRC134811.

<sup>69</sup> <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform>

**framings of transformation towards sustainability** (while social change and new social practices are incorporated in Cluster 5, they are notably more templated and less elaborated).

- For example, Destination 2 on Fair, Healthy and Environmentally friendly Food Systems from Primary Production to Consumption indicates an openness to different technologies and the technology & innovation domain.
- Whereas Destination 3 on Circular Economy and Bioeconomy Sectors and Destination 4 on Clean Environment and Zero Pollution consider the factors that can influence effectiveness beyond technological advances and the coordination & collaboration domain, with stakeholder engagement and enhancing uptake included among others.
- Destination 3 also includes broad and ambitious strategies towards implementing circularity across value chains and product manufacturing and focuses on the reduction in the use of primary non-renewable materials and the introduction of a just circular economy and bioeconomy.
- Destination 4 places a strong emphasis on halting and eliminating pollution to help enable clean and healthy soils, air, fresh and marine water for all and it aims to advance the knowledge of pollution sources and pathways to enable preventative and remedial measures.
- In addition, Destination 7 on Innovative Governance, Environmental Observations and Digital Solutions in Support of the Green Deal enables a complementary advancement in the design of innovative governance models.

#### *3.6.1.2. Key Impact Pathways*

The three pillars of the Key Impact Pathways (scientific, societal, and economic) each have significant implications for the Green Transition and the KIPs framework has both strengths and limitations when it comes to capturing HE contributions to the Green Transition.<sup>70</sup> By building on the introduction of KPIs and cross-cutting topics in H2020, the KIPs of HE have been established to capture long-term and wider effects on society and the economy, including impacts in relation to the European Green Deal.

#### *Analysis of KIP indicators*

Data on KIP indicators were extracted from CORDA on 10 October 2023. It covered 9,288 ongoing projects, amongst which 323 reported on their initial results. There were 653 ongoing projects in Cluster 5 and 402 ongoing projects in Cluster 6, however only three projects in Cluster 5 and no projects in Cluster 6 submitted at least one periodic report. Results for each indicator at the programme level are highlighted below (represented foremost by projects of European Innovation Council - 183, European innovation ecosystems – 50, and MSCA – 57, as well as several projects in other programme parts).

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<sup>70</sup> See discussion in Appendix K (Analysis of Key Impact Pathways and Specific Issues).

**Table 10: Key Impact Pathways short-term indicators and implications for the Green Transition**

Key Impact Pathways	Short-term indicator	Implications for the Green Transition
KIP1 High-quality knowledge	0.5% of projects contained publication data, featuring in total 241 publications, 46 out which could be matched to Scopus.	High-quality knowledge allows to understand opportunities, risks and vulnerabilities related to environmental change and the Green Transition, roadmap transition pathways, assess options, prioritize actions, and develop necessary skills.
KIP 2 The development of human capital in R&I	36.24% out of 134 201 participating researchers benefited from upskilling activities. This included 44.5% female, 55.4% male and 0.1% non-binary researchers.	Development of human capital enhances the capacity to generate and exchange relevant knowledge, including enabling researchers to be more effective knowledge brokers and agents of change.
KIP 3 Knowledge diffusion and open science (KIP 3)	KIP 3: 85.2% of publications and 25% of datasets were in open access.	KIP 3 provides a basis for making knowledge about the Green Transition a shared asset and can help address disparities in the capacities of different actors to take part in the transition and benefit from it.
KIP 4 EU policy priorities and SDGs (KIP 4)	Data on EU policy priorities was available for 3 151 projects (33.92%), out of which 47.95% contribute to the EGD, higher than any other priority and close to Economy that works for people (44.94%).	KIP represents high-level top-down agendas relevant for the Green Transitions. There may be both complementarities and tensions between those priorities, requiring careful consideration of the level of aggregation.
KIP 5 Benefits and impact of R&I Missions	Not yet available excluding initial data on calls / funding.	Depending on data availability, this KIP may allow for an in-depth view at the relevant interlinkages in the context of Green Transition priorities, particularly considering the thematic scope of Missions.
KIP 6 Uptake of R&I in society	111 periodic reports contained citizen/end-user engagement data. Citizens were engaged in 35 of those projects, equal to 10.8%.	The KIP is significant for monitoring participatory elements of the Transition, however references to actors in are constrained by its focus primarily on the contribution “of citizens, workers and other end users”.
KIP 7 Innovation-based growth	157 innovative products, processes and methods were reported, but these excluded designs, business models and services.	While innovative solutions are at the core of the Green Transition the wider societal debates on the limitation of possibility and desirability of limitless growth are not tackled within KIP 7 framing and indicators.
KIP 8 More and better jobs	525 FTEs jobs were created and maintained	Contribution to the Green Transition within KIP 8 remains unspecified, as sustainable jobs are not explicitly delineated from the overall corpus of more and better jobs.
KIP 9 Investment in R&I	Co-investment amounted to EUR 6.99 billion (19.45% of HE investment so far), excluding EIC data.	The KIP does not allow to track necessary shift towards sustainable investment and finance. Linkages to the EU taxonomy or other classification of sustainable activities might help better connect KIP 9 to the Green Transition.

The data outlines a rather incomplete picture on the short-term results. The absence of governance, institutional and societal change considerations within the KIPs framework



brings to light limited conceptualisation on steering and orchestration of the programme, and its broader strategic role in delivering on the European Green Deal. Available reporting within the Green Transition area is scarce and thus generalisable conclusions are not possible at this point. IT development of the short-term KIP indicators was considered as still in progress at the time results were extracted. Contribution to EU policy priorities and to the SDGs

Additional analysis has been conducted regarding KIP4 given its cross-cutting scope. Societal Impact is framed through KIP 4<sup>71</sup> on EU policy priorities and SDGs and the broad framing of KIP 4 (and KIP 5) makes it significantly wider in scope compared to the other two impact pathways, while the granulation by the SDGs, EU policy priorities and Missions creates multiple overlaps with other KIPs.

The ex-post evaluation of H2020 during Phase 1 of this study has shown that the programme has advanced in corresponding to the requirements of the Green Transition over time (in particular for the climate, environment, and natural resources). **For achieving effective results and outcomes for the Green Transition, HE needs to improve its management and governance capacities that go beyond the R&I policy level.** The governance of HE should be able to coordinate across different policy areas and organisational boundaries to steer stakeholder actions and achieve broader changes in the right direction.

Cluster 5 researchers' past publications were characterised by a very high level of thematic alignment with one or more SDGs, with 81% of these articles considered SDG-aligned. This compared to the three benchmarks' scores ranging between 45% and 51%. Overall though, **the tension between the need or decisions to advance specific technologies and the potential for lock-ins and a more disorderly Green Transition is found through interview to be addressed to a limited extent in Cluster 5.** While this is addressed in the programming phase and its prioritisation, it still can play a role – and where it is not an issue on which projects are funded. For example, in Destination 3 on Sustainable, Secure and Competitive Energy Supply – while appreciating that carbon capture utilisation and storage (CCUS) activities would most likely target 'hard-to-abate' industry sectors and process-related GHG emissions based on the present status of electrification solutions for these process emissions – the limitations of CCUS and their potential to contribute to carbon lock-ins are considered rather briefly compared to the overall volume of calls focusing on specific technological developments. In most cases, solutions are expected to be demonstrated and validated across diverse contexts, however, limited consideration is given to the challenges and opportunities that are influenced by differences between the structure of economies of Member States, including different capacities to integrate new technologies into existing infrastructure.

Cluster 5 is ambitious in its scope for its Destinations and a forward-looking analysis of WP 2021-2022<sup>72</sup> has previously raised **some questions on whether the long-term targets can be met with the approach that has been taken.**<sup>73</sup> For example, experts were notably sceptical that substantial emissions reductions could be seen for Destination 3 on Sustainable, Secure and Competitive Energy Supply within reasonable time horizons – and

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<sup>71</sup> And related Missions (KIP 5), complemented by the societal uptake (KIP 6)

<sup>72</sup> European Commission, Directorate-General for Research and Innovation, Warnke, P., Gutknecht, R., Könölä, T., Expectations and assumptions for the future in the work programme 2021-2022 of Horizon Europe – Foresight on demand (FoD), Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2777/91116>, p. 190ff.

<sup>73</sup> An important point to note here though is that HE is not designed to deliver the long-term targets. HE facilitates the development of technologies and solutions and where the wide-scale deployment of these is beyond the scope of HE. Furthermore, there are many critical external factors that influence the achievement of the long-term targets.

with the consequence that efforts on the energy demand side may need to be reinforced.<sup>74</sup> Furthermore, the decarbonisation of the waterborne sector is a policy priority, and the WPs include the removal of GHG emissions from the water-based transport sector. However, reaching such an objective presents a significant challenge. For example, concerning the development of biodiesel from algae, the analysis suggests that for future WPs it could be useful to carefully consider whether the goals align with anticipated developments in motor technology and especially electrification. In addition, external cooperation with other regions outside of the EU could be explored that may have conditions for advancement in this domain.

For Cluster 6, one notable aspect indicated by policy and project beneficiary stakeholders is based on **citizen observatories being seen as playing a vital role in SDG-based policy design by making observation data available for the Global South**. This aids in the advancement of key goals such as SDG 13 (Climate Action), SDG 6 (Clean Air and Water), and SDG 11 (Sustainable Cities), contributing to global sustainability and environmental stewardship. Citizen science in marine observation is seen to specifically support Mission Ocean and Waters, with some experts saying it is possible to collect up to 20-30% of the data needed with the help of citizens, while others estimate the potential share of citizen science to be lower. This finding is further supported by insight from the survey, with 69.4% of respondents agreeing with engaging citizen representatives/end-users in the co-creation of R&I content of their project.

Not all projects can feed into specific initiatives or policy developments (e.g., some projects have a longer lifetime, legacy). There is then perhaps a need to reinforce the science-policy interface for Cluster 5 and Cluster 6 – and where perhaps the building of 'learning & experimentation platforms' would ideally be an obligatory component (and noting the Missions are notably moving into this direction).

### 3.6.2. The impact of internal and external factors on the success of programme interventions

#### 3.7.1.1. *Internal factors that influence progress / impact or lack of it*

The considerable extent of the **calls and topics within Cluster 5 and Cluster 6 across multiple different WPs and types of projects (i.e., IAs, RIAs, CSAs) increases the complexity and may dilute/reduce the results and overall outcome focus**. An assessment and rationalisation of the instruments could potentially help to reduce complexity here and the risks of overlaps/duplications (and as the Cluster calls, Partnerships and Missions have the same types of projects across the instruments).<sup>75</sup> Although, the indications of a high level and excellence of research within Cluster 6 do provide an example of a strong basis for the scientific, societal, and technological impact of its projects.

The scoping undertaken as part of this study indicates that the **Horizon monitoring system is not seen by some stakeholders to be sufficient for the task for which it is intended**. Although, while it is not able to spot the TRL levels and for indicating how far the development of critical technologies has progressed to be in line with the requirements of a 55% reduction

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<sup>74</sup> and while appreciating that HE is an R&I programme with projects potentially not providing impacts until the longer term (10-15 years) and subject to an appropriate external environment.

<sup>75</sup> See also Relevance chapter.

scenario,<sup>76</sup> and it is unable to provide an indication on the extent to which a technology will reduce costs for industry, etc. it should be noted that this degree of monitoring may not be realistic. Reliable cost assessments would require access to (and disclosure of) confidential business data and furthermore, a highly sophisticated level of modelling would be necessary. Furthermore, while R&I activity may often not deliver what was expected, it can provide significant learning opportunities. A systematic process to identify and utilise learnings from projects that have not progressed/delivered as expected does not exist at present in a structured way (it is done on an ad-hoc basis and while there may be some learnings shared between projects, it refers more to the general implementation of projects, such as the sharing of best practice).

**The development of sustainable solutions contributing to a Green Transition is a highly anticipated result for Cluster 5.** Bringing different actors (including groups from different countries, contexts, and levels), themes and issues under one roof provides an unprecedented platform for collaboration and exchange. This contributes to the building of interfaces between citizens, society and solutions around energy, climate and transport, networking, and mutual learning.

**Within Cluster 6, the TRL approach is considered to only work to a limited extent.** Some of its Destinations and sub-destinations are dedicated to social change and social innovation in addition to science-driven technological development. Only the combination of both is seen as an impactful way towards a Green Transition. Which is in line with the implementation of actions for Cluster 6, where an analysis of WP 2021-2022 shows a prominence of 'earlier TRL' RIA – with the following number of topics per type of action: RIA (42), IA (21), CSA (13).<sup>77</sup> The indications found through interviews of a high level and excellence of research within Cluster 6 provides a strong basis, however, for the scientific, societal, and technological impact of its projects (and where it is not clear to which extent this perception also applies to Cluster 5). In addition, analysis of Destination 3 suggests a degree of inherent implementation risk given its broad range of priorities. Which may be applicable in a similar sense more broadly across Cluster 6 (i.e., innovation for the blue economy, biotechnology value chains, safeguarding Europe's forests, bioeconomy, etc.) Without a clear prioritisation, there could be a limit in the overall effectiveness of the results and overall outcomes that are ultimately seen.

Indications of the extent to which barriers have provided challenges within Cluster 5 and Cluster 6 for project implementation have been found through the survey,<sup>78</sup> with the factor 'heavy research, teaching, managerial or business overloads of the researchers from the participating organisations' recognised as constituting the most significant barrier by respondents – if the first three levels of respondent answers (to a very large, large, and to some extent) are combined – with 39% here for Cluster 5 and 35% for Cluster 6). For Cluster 6, this is followed by the Covid-19 pandemic (29%) and an insufficient amount of project funding received (26%). Whereas for Cluster 5 it is followed by an insufficient amount of project funding received (30%) and a lack of organisational administrative support (28%).

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<sup>76</sup> Which is essential for defining if a specific technology is important to reach the -55% target – and recalling that the European Climate Law requires the EU economy and society to become climate-neutral by 2050 and, as an intermediate target, to reduce net GHG emissions by at least 55% by 2030 to deliver on these targets (and where the Commission has proposed 'Fit for 55' legislative packages).

<sup>77</sup> As well as co-funded Partnerships based on a climate-neutral, sustainable, and productive blue economy and on biodiversity.

<sup>78</sup> It should be noted that across all the factors quite a high share of the respondents selected to respond with a 'not at all' answer option which suggests that some of the barriers are quite specific to some beneficiaries and not universal for all. See also Appendix G: Survey results – Effectiveness.

**The strong focus on stakeholder engagement and multi-actor processes within Cluster 6 (including gender and inclusivity considerations) are expected to lead to greater societal embedding of innovations and business opportunities.**

The case study (CS-2) finds that stakeholders addressed by the portfolio (e.g., local authorities, urban stakeholders, etc.) experience challenges still when it comes to understanding and navigating funding instruments such as HE.

Effective mechanisms to enable a speedy uptake of results can be observed in transport. Clean Aviation and EU Rail work closely with the respective certification organisations European Aviation Safety Agency (EASA) and the European Union Agency for Railways. Consulting them early on ensures compliance with existing technical specifications and safety regulations. By allowing certification processes that would previously have started at the end of technology development to take place in parallel, time-to-market is significantly reduced. In addition, certification bodies are building up relevant knowledge early on which allows for a smooth transition to new technologies. The case study (CS-5) demonstrates that full access to the whole supply chain is important as well as closely working with urban planning authorities.

*External factors that influence progress / impact or lack of it*

**An increase in the absorption capacity of relevant stakeholders for project results in the post-outcome space is identified as a particular challenge** (and for Cluster 6 through interviews and a policy workshop) for the more comprehensive processing of results, informing policy/design of future activities and providing enhanced outcomes and greater impact.

The case study on stakeholder engagement (CS-15) sees a need to consider the differences between individual and collective agency,<sup>79</sup> and between individual agency and broader forces that shape the behaviour of actors – with HE calls focusing strongly on changing individual behaviours rather than addressing the sociocultural contexts that shape them. With **stakeholder engagement widely acknowledged as a significant enabling factor in the achievement of project results**, there is a broad need to better acknowledge the complexity and differences in perspectives among stakeholder groups when it comes to the Framework Programme objectives. A better recognition of different capacities and a willingness of actors to engage with pre-defined objectives is then important. Well-written proposals do not always lead to actual engagement if the project leaders and participants do not have the in-house capacity to effectively steer stakeholder engagement processes.

Concerning the Partnerships, the focus on innovation can create potential research gaps for lower TRLs and consequently weaken the scientific and technological base in the medium term, as many solutions to achieve climate neutrality are still to be found and developed. Furthermore, for the Partnerships (and taking the ‘TRL boundaries’ of HE into account, i.e., up to TRL8), the presence of **market implementation challenges** has been identified and linked to limited funding for validation and testing, the conservative nature of national regulations & standards, and the mismatch between ambitions and needs versus current policy and regulations. It should also be noted here that Cluster 5 has a very high funding share for higher TRL actions (and increasing this further could crowd out lower TRL actions).

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<sup>79</sup> <https://egusphere.copernicus.org/preprints/2023/egusphere-2023-1533/egusphere-2023-1533.pdf>

Therefore, a focus on the full research chain from basic research to large demos and beyond to market uptake should be in place to optimise the results and ultimate impacts.

The **Partnerships with industry are expected to enable the roll-out or scaling-up of results and solutions**. However, a judgement is not able to be made as part of this study on the extent to which any external commitments from industry to follow up on this achievement will go. However, the scoping interviews have found that the design of the calls, in the case of the Partnerships, is overly determined by industry players and that this should be further balanced by the European Commission and with broader societal needs. At an overall R&I programme level though, a stronger emphasis should be considered for the Partnerships to advance international standardisation, wider national uptake, the integration of technological developments, and consolidation of fragmented landscapes. As an example, for SESAR 3 an important external success factor is that SESAR closely collaborates with standards-making organisations (i.e., EUROCAE and EASCG) to ensure its R&I outputs align with standards development. The solutions developed by SESAR therefore adhere fully to the Global Air Navigation Plan (GANP) and the International Civil Aviation Organization (ICAO), making them applicable to ATM environments worldwide.

In terms of cooperation with existing networks, while this is found to work for the EIT KIC Urban Mobility, the network (i.e., the Partnership as such) would still benefit from more breadth. Not all relevant countries are integrated. While on the other hand, it is somewhat striking that countries that tend to not be leading innovators in Europe are quite active in the EIT KIC Urban Mobility and in this respect it fulfils an important role.

Concerning the EU Missions, the Ocean and Waters Mission and its Charter have now collectively committed EUR 4.8 billion,<sup>80</sup> with a strong leverage on external actions. However, as the Missions also depend upon national activities,<sup>81</sup> with specific commitments and governance structures, the degree of setting these structures up is found to differ strongly between countries.

### 3.9.2. The effectiveness of dissemination, exploitation, and communication

On a more positive note, Commission and project beneficiary stakeholders indicate that for both Clusters the WPs have provided a good approach for developing tools for policy implementation (as discussed above) and in **bringing different MS together**. Having a breadth and depth of co-production and dissemination-focused partners that can appropriately engage with policy makers and stakeholders in an effective manner is clearly a useful attribute.

The soil case study (CS-8) finds dissemination, exploitation, and communication measures have **acted as important bridges to connect projects to their target audiences**. Although, while existing measures have created awareness, enhancements could be made to ensure that knowledge translates into action.<sup>82</sup> The climate resilience and restoring nature case study (CS-6) further finds that **communications between projects/coordinators and the EC could be improved and in order to increase the uptake of results from projects** and where there appears to be a need to streamline communications between projects as they

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<sup>80</sup> Although the amount for the pledges should be contrasted to the HE budget (i.e., around EUR 117 million per year for the 3 first years).

<sup>81</sup> and where the Missions are designed to bridge the R&I-impact gap in the regions.

<sup>82</sup> For example, for projects such as those involving living labs (which have recently commenced), these labs are expected to be significant in disseminating solutions directly to end-users, such as farmers. Key factors that enable progress will include the generation of user-friendly solutions and an integrated vision that brings together different stakeholders and policies under the Mission's umbrella.

are being developed and the EC (and agencies). In addition, as part of the Earth Observation case study (CS-11), it was identified that providing **more funding to projects for collaboration could be a way to further enhance the effectiveness of dissemination and exploitation**, as this is often seen as insufficient to establish good networking and joint dissemination by projects. This could also be an important mechanism of a portfolio approach.

The communities and cities case study (CS-2) also notes that while dissemination, exploitation and communication measures were found to be appropriate in the portfolio and with a stronger focus on citizen engagement and mobilisation evident in the cities mission actions, communications should better accentuate the positive implications and benefits for citizens, facilitating the widespread adoption of innovative solutions. However, it should also be noted here that the climate resilience and restoring nature case study (CS-6) finds that communications with broader stakeholders and the general public highlight a positive advancement within the fields of ocean literacy and community engagement.

**A high level of online policy-related uptake of researchers' prior publications** is found to be a distinct enabling strength in the researchers' track records for Cluster 5 and Cluster 6. More than twice the expected share of funded researchers' prior publications received one or more online policy-related citations.<sup>83</sup> Cluster 5 researchers' prior publications were cited by online policy-related documents 12.1 percentage points above the expected 5.0%. Cluster 5 investigators' prior publications were mentioned on Wikipedia 3.8 percentage points above the expected level of 1.8%, an achievement well above the benchmarking range. Cluster 5 investigator past research was mentioned in trade and journalistic news 4.3 percentage points above the expected level of 3.2%, which was slightly above the highest benchmark, and well above the other two benchmarks.

When a HE project is completed, it is often 'archived' (with many just ending up on a website) unless it is seen as particularly significant and picked up on by industry. Which is not an optimal situation when considering the pressures and needs of, for example the EGD, etc. **The requirement and burden should not be on industry alone (and without scrutiny) to decide on which mature and publicly funded projects to discontinue and which to propose for follow up finance** (e.g., Innovation Fund, IPCEIs). To this effect, a more joined up and transparent means could be created and implemented for projects for which there is a business case, through a standardised approach.

Concerning the Partnerships overall, these appear to have been addressing and engaging relevant stakeholders and putting forward joint R&I agendas and roadmaps. For example, in developing areas such as hydrogen and the circular economy, the Partnerships have been seen to **consolidate and build on activities within existing ecosystems** which were previously somewhat fragmented. For example, a consolidation and organisation of a previously scattered and fragmented hydrogen ecosystem has been seen for both the FCH 2 JU and CH JU Partnerships. Furthermore, in addition to providing a vision to the hydrogen sector in Europe, the FCH 2 JU / CH JU are noted as having attracted some of the largest industrial players in the field and where this has led to an increase in private R&D funding. However, it should be noted that while the FCH 2 JU is notably seen as the most authoritative source of knowledge in Europe for FCH technology, a significant margin for improvement of knowledge management and the presentation and capitalisation of project results is identified.

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<sup>83</sup> See Appendix E Chapter 2 for explanation of bibliometric assessment of pre- Horizon Europe track record of Cluster 5 and Cluster 6 researchers on enabling factors for project effectiveness.

All the Partnerships are found to have **established various mechanisms for participation to increase the involvement of new members**, engage a broad landscape of stakeholders, and to allow for feedback loops. For example, the CBE JU Partnership has successfully facilitated networking and system structuring, bringing together industry and university representatives to discuss collaboration and to help with the addressing of industry requirements.

In terms of communication and outreach, the BBI JU/CBE JU has notably implemented a range of strategies to raise awareness of bio-based industries and to promote participation in their programmes. Communication activities have targeted different stakeholder groups, aiming to disseminate information, engage stakeholders, and encourage their active involvement. By organising events, conferences, and workshops, the Partnerships have fostered knowledge exchange, networking, and collaboration among stakeholders. The EIT Urban Mobility (UM) notably places a particular emphasis on supporting dissemination, exploitation, and communication. Extra structures and instruments have been created for this purpose, such as the RAPTOR scheme, the Action Impact Groups, etc. In this way, EIT-UM stands out positively from the dissemination, exploitation and communication often pursued only at project level in the Framework Programme.

The **adaptability** of the Climate KIC should also be highlighted, whereby access to accelerated innovation and an on-the-ground presence has contributed to its success (the linkages between the EU Mission Adaptation to Climate Change and the Climate KIC are also noteworthy here). By transforming its Theory of Change to a 'Demand-led strategy' during its early stages the Climate KIC has leveraged its role as an EU agency and accessed a broad partner network and where the sharing of insights has been integral to Climate KIC mission as evidenced by the dissemination of impact goal reports within its 'community'. All 12 of these impact goal reports were shared widely within the Climate KIC community and beyond to help others to capitalise on good practice and results (and noting that a key KPI for EIT has been 'success stories' to showcase outstanding results and impacts that have wider resonance).

### 3.9.3. The impact of international cooperation and association of third countries

In the Relevance and Coherence chapters above, the relevance and coherency of the FP in relation to relevant international initiatives has been assessed with respect to delivering the green transition. This Effectiveness chapter assesses the extent to which international cooperation and the association of third countries to the FP has made a difference in achieving the objectives.

Within Cluster 5 and Cluster 6, there are 91 relevant projects with participation from organisations located in non-EU and non-associated countries that have been funded by the EC with a net contribution of EUR 562 million. Of these projects, 29 have involved African partners (with 121 participations) and 16 have involved LAC partners (with 26 participations). The top MS collaborators in terms of projects and participations are found to be Germany, Spain, Italy, and France (the UK is also one of the top collaborators). Whereas the top third-country collaborators in terms of projects and participations are found to include Kenya, South Africa, Uganda, and Ghana, as well as Brazil and Chile. Although, it should be noted that there are **no examples of project coordination led by a country in Africa or the LAC region**. Moreover, the EC net financial contribution involving LAC participants is noted to be especially low, given the region's significance in meeting climate- and biodiversity-related challenges.

Quantitative analysis of the Clusters shows that for Cluster 5, researcher track records on the share of international co-publications falls towards the high end of the benchmarking

range at 53% and that for Cluster 6 the share is 61% (and with the EU-27 overall average being 44% and at the low end of the benchmarking range). The slightly higher share for Cluster 6 could be due to its more international scope and an indication of a high level and excellence of research which provides a strong basis for global scientific, societal, technological impact from its projects.

The climate resilience and restoring nature case study (CS-6) finds that international collaboration is highlighted as one of the main contributors to impact generation in this field, contributing to knowledge transfer, capacity building and research networks, though as compared to H2020, the participation of third countries and Associated Countries decreased in the portfolio analysed. Furthermore, the International R&I cooperation case study (CS-12) notes from the survey that for third-country participants, the FP key contributions include the achievement of an open-mindedness of established actors for new ideas (60% strongly, largely agree), followed by an opening of the system to new ideas (50%) and the breaking up of outdated processes (50%).

The soil case study (CS-8) shows that **collaborations with countries outside the EU have already shown the value such Partnerships can bring**. Moreover, the association of third countries to HE (and H2020) projects has offered fresh perspectives, shared resources, and a broader understanding of global soil health dynamics. Such collaborative endeavours not only drive the desired impact within Europe but also lay the foundation for global change.

Concerning the Partnerships, the BBI JU/CBE JU has played an important role in strengthening the Africa-EU Partnership, particularly in the field of the bio-based economy. The focus on food security and sustainable agriculture within the Africa-EU Partnership aligns with the priorities of the BBI JU/CBE JU, creating synergies and opportunities for joint progress. By developing the African bio-based economy and upgrading residues, industrial by-products, and wastes into higher value-added products, the Partnership has contributed to Green Transitions, sustainable growth, employment, and addressing shared challenges like migration and mobility. The efforts and approach of the BBI JU/CBE JU towards international cooperation have then been significant, although there may be room for further development and exploration. While some stakeholders note limited collaborations outside of Europe promoted by the BBI JU/CBE JU, there is a recognition of the importance of establishing collaborations on research projects and aligning research objectives with the understanding that the bioeconomy extends beyond Europe. The Partnership has also made efforts to inform stakeholders about relevant international opportunities and events. These initiatives contributed to reinforcing the EU's relative positioning in the bioeconomy by expanding collaborations, attracting international investments, and promoting knowledge exchange on a global scale.

## 3.10. Efficiency

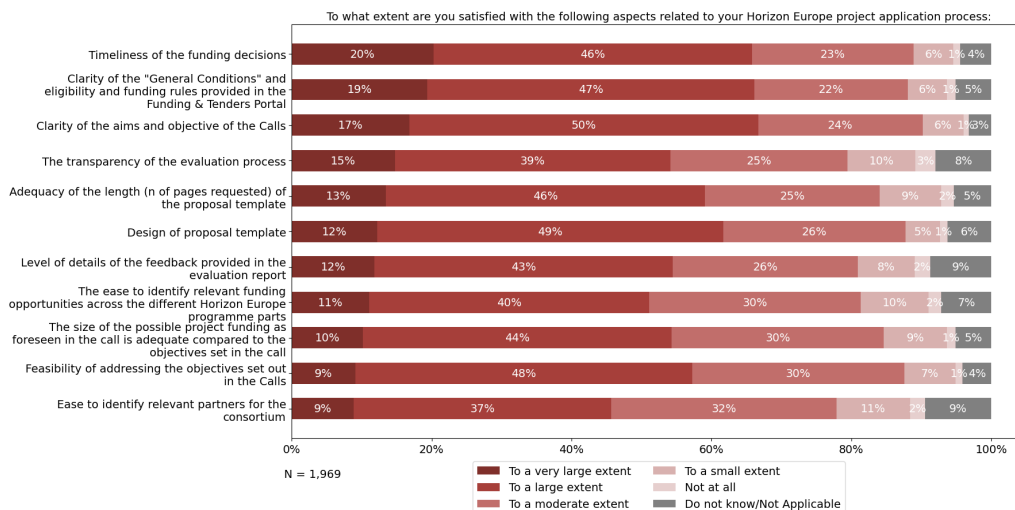
### 3.10.1. Efficiency of administration and implementation across the project cycle

#### 3.10.1.1. Efficient implementation processes

Overall, the administration and implementation across the project cycle was considered efficient. For instance, most **survey respondents across Cluster 5 and Cluster 6 were satisfied (to a very large and large extent) with the application process**. They were least satisfied with the ease to identify relevant partners for the consortium (45-46%) (see Figure 6).



Figure 6: Q5. To what extent are you satisfied with the following aspects related to your HE project application process?



Source: Survey of Horizon Europe beneficiaries, conducted in May-July 2023 (successful applicants survey), Cluster 5 and Cluster 6

**The effort to prepare and submit the HE project proposal was considered satisfactory** (Appendix G Q9). The number of person days spent on the proposal varied for each organisation, based not only on their allocated budget and role in the project (partner or lead), but also based on their type of organisation. Across both Clusters, public bodies, private for-profit entities, and other organisations tended to spend less time on the proposal (62-68% under 25 days) than research organisations and higher or secondary education establishments (45-50% under 25 days). While this higher application cost for research organisations and higher education establishments may be expected, given that they are more often coordinators,<sup>84</sup> their average budget is not proportionally higher in Cluster 5 than for private companies, which receive on average a similar amount to research organisations (507,400 and 512,000 respectively) and more than higher education establishments (359,000).

However, the efforts needed in proportion with the chances of securing funding was considered the least satisfactory across beneficiaries (43-44%) and unsuccessful applicants (23-29%). Additionally, unsuccessful respondents were not satisfied with the overall effort to prepare a HE proposal (31-32%), which is to be anticipated as they were not selected.

**The majority or near majority of respondents are satisfied with the administrative and management processes** of a HE project (Appendix G Q7). Respondents had the lowest satisfaction rate with the support in case of technical issues with the online platform (34-39% satisfaction rate) and were most dissatisfied with the proportionality of the burden of administrative requirements for the granting procedure (17-18% dissatisfaction rate).

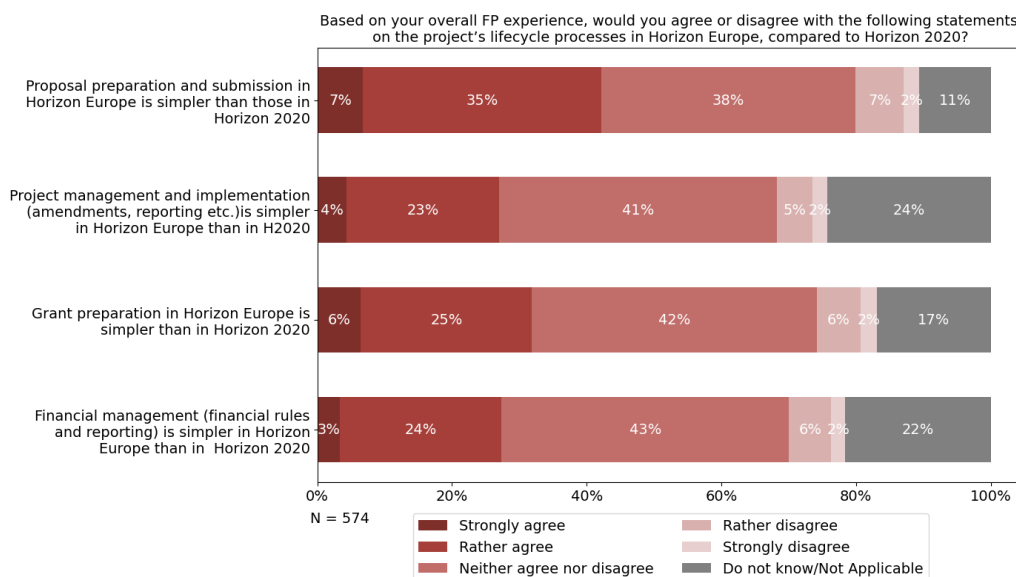
Cluster 6 is slightly administratively heavier than Cluster 5. 25% of Cluster 6 respondents spent 16% or more of their budget on administrative tasks, in comparison to 19% of Cluster 5 respondents. Across both Clusters, however, the survey results show that the number of

<sup>84</sup> 46% of Cluster 5 & 6 projects are led by research organisations and 25% (Cluster 5) and 33% Cluster 6 by higher education establishments, in comparison to 20% (Cluster 5) and 13% (Cluster 6) coordinated by private companies.

consortium members, the size of the organisation’s budgets<sup>85</sup> and the duration of the project do not have significant impacts on the percentage of budget spent on administration tasks. This result shows the efficiency of the administrative and management processes across different types of beneficiaries.

The **lifecycle process**,<sup>86</sup> compared to H2020, is well received or neutrally received (satisfaction rate of 27-42%, with an indifference – neither satisfied nor dissatisfied – rate of 38-44%) (see Figure 7). The time-to-grant has also remained similar to H2020 (229 days for Cluster 5 and 243 for Cluster 6 versus 225 days for H2020 green transition proposals). Finally, the **various changes in the application process**, compared to H2020, are well received (satisfaction rate of approx. 40-50% and dissatisfaction rate of only 10%) (Appendix G Q6).

Figure 7: Q18: Based on your overall FP experience, would you agree or disagree with the following statements on the project’s lifecycle processes in HE, compared to Horizon 2020?



Source: Survey of Horizon Europe beneficiaries, conducted in May-July 2023 (successful applicants survey), Cluster 5

Overall, it can be concluded that **efficient implementation processes contribute positively to enabling R&I for the Green Transition**. This overall satisfaction with implementation processes reflects positively on the role of the executive agencies, who have taken over these processes for Horizon 2020 and Horizon Europe. In the following sub-section, however, it is noted that this delegation to the agencies has negative effects on efficiency in terms of feedback to policy (see sub-section Feedback to policy).

As developed in the sub-section Implementation needs, drivers, and barriers: learning from applicants and participants below, it must be noted that there still may be barriers for certain

<sup>85</sup> The result was compared to individual organisations’ budgets, rather than the project budget, as the survey question asked about the percentage of time each organisation spent on administrative tasks.

<sup>86</sup> Including proposal preparation and submission; project management and implementation; grant preparation and financial management

types of applicants due to heavy application processes and Framework Programme complexity.

### *3.10.1.2. Implementation processes by type of Partnership*

**For the institutionalised and co-programmed Partnerships, the implementation processes in the Partnership evaluations have been assessed to be very efficient.** Administration and management of the initiatives by large build upon the work of their predecessors or learned from related Partnerships.

In the case of **institutionalised Partnerships**, there is noted to be a significant simplification of administrative processes and expenditure control associated with projects. The programming offices consistently meet targets for timely information dissemination, granting decisions, pre-financing payments, and periodic payments, although for one Partnership (EIT Food) no performance data in this regard existed. The joint undertakings, for instance, take less time to grant on average than Cluster 5 (229 days) and Cluster 6 (243 days), ranging from 180 days for the CSA actions to 219 days for the RIA actions. For one institutionalised Partnership (SESAR), the ambition to further increase administrative efficiency and reduce personnel from SESAR 2020 to SESAR 3 has led to significant pressures on operations and furthermore, impacted on the well-being of staff, as the need for actions concerning certain EU regulations such as cybersecurity have increased. One of the institutionalised Partnerships acknowledged the need to simplify management and administrative aspects, in particular for SMEs (EU-Rail).

For **co-programmed Partnerships**, there are streamlined structures and efficient and coordinated governance processes. For instance, for CCAM, there is good engagement in the General Assessment and the States Representative Group, which has shared learning around national regulations and testing facilities between more and less experienced MSs (CSP, CCAM). The executive agencies implement both the co-programmed projects and the non-partnership projects. The implementation processes of these projects are considered efficient, as presented in the results in the sub-section Efficient implementation processes above.

**Efficiency of co-funded Partnerships was seen as higher for those Partnerships that were able to build on previous activities and where communities continued to work together.** At first, some of the Co-funded Partnerships had difficulties with administration, particularly grant management. For Water4all and CEPT, different national funding requirements resulted in longer periods for call implementation. For Biodiversa+, the increase in funding and scale and added administrative complexity requires more time and staff resources, balanced only by the expertise of the people involved in the Partnership.

As highlighted by some interviewees, the **coordination between the European Commission and the Partnerships also needs to be further improved.** For instance, coordination with the European Commission on work programme preparation (BATT4EU, 2Zero) could be improved in terms of communication and timing the involvement of relevant actors and in terms of avoiding contradictory feedback from different individuals of the EC (Biodiversa+).

### 3.10.2. Implementation needs, drivers, and barriers: learning from applicants and participants

#### 3.11.1.1. Co-design process of Horizon Europe

As mentioned in sub-section Internal coherence in addressing the Green Transition, the **co-creation process can be considered a positive change**, given the ability to address policy priorities. There is, however, seen to be certain **inefficiencies in the co-design process**, causing delays, due to the **administrative heaviness of coordination** (increased level of dialogue, building efficient coordination mechanisms and shared ways of working) which is, to some extent, expected from a major change.

#### 3.11.1.2. Flexibility of Horizon Europe

In general, the **Framework Programme is considered flexible**. Survey respondents, across Cluster 5 and Cluster 6, consider that the European Commission is sufficiently flexible, both in respect to changes in the project consortium (5-6% dissatisfaction rate) and in terms of adapting the project objectives because of changed circumstances (8-9% dissatisfaction rate). For Cluster 6, however, some interviews indicate a broader need for **anticipation and foresight of future events**, such as the current geopolitical crises (to the extent possible), and their impacts and influence on the Green Transition, sustainability, and sustainable production.

Meanwhile, several co-programmed and institutionalised Partnerships are considered to be **adequately responding to changing market needs**, via the role of relevant stakeholders (e.g., widening membership of industry players, increased integration of Member States, EC) in designing the strategy and work programmes, as well as in adapting to changes in project direction / consortium. For instance, SESAR interviewees highlighted the flexibility in response to the Covid-19 pandemic; CSP highlighted the importance of enhanced cooperation with the Member States to achieve Partnership objectives. Similarly, EIT InnoEnergy's established network structure has allowed a quick reaction to new topics through investment activities, education measures, business creation and acceleration, and the support of industry alliances, responding to current policy priorities.

#### 3.11.1.3. Barriers to new applicants, particularly SMEs

The CORDA data shows that **only 19% of Cluster 5 and 21% of Cluster 6 organisations did not participate in Horizon 2020**. New participation is higher, however, for private companies (31% Cluster 5, 41% Cluster 6), public authorities (30% Cluster 5, 32% Cluster 6) and other types of organisations (30% Cluster 5, 37% Cluster 6). This higher new participation rate is to be expected, as universities and research organisations are likely to have already participated in the Framework Programme (only 2-5% new participation rate). Nevertheless, the new participation rate for private companies, public authorities and other types of organisations could be improved. With regards to private companies, the participation of SMEs could also be improved particularly in Cluster 5, as they only make up 47% of Cluster 5 and 68% of Cluster 6 private company participations, while they make up approximately 99% of all private companies across the EU market. It should be noted, however, that the vast majority of projects included at least one SME participant (91% for Cluster 5, and 96% for Cluster 6). Potential causes for the rate of new and SME participation are addressed in the paragraphs below.

Across both Clusters, there is a **need for more straightforward entry points for target groups linking different pillars of HE across thematic areas**. There are many overlapping programme parts (observed in Cluster 5 Destination 4 (Efficient, sustainable and inclusive

energy use), Cluster 6 Destination 2 (Fair, healthy and environmentally friendly food systems from primary production to consumption), Destination 3 (Circular Economy and Bioeconomy), Destination 4 (Clean Environment and Zero Pollution)). This complexity makes it difficult for stakeholders to identify which calls to apply for when calls are open and how to apply for them. **This difficulty of understanding the Framework Programme favours participants with previous familiarity with the Framework Programme and participants from larger organisations** who can familiarise themselves with new calls for participation.

Additionally, **consortiums are often developed via established networks**, according to interviews, which favours organisations with established connections. This tendency is to be expected given the complexity of putting together an application, often with a high number of partners, and the risks of involving partners with which a working relationship is not yet established. This finding is backed by the survey, which finds that applicants were least satisfied with the ease to identify relevant partners for the consortium (45-46%), as mentioned in the previous sub-section.

The **long time-to-grant** (229 days for Cluster 5, 243 for Cluster 6, slightly longer than for the 221 to 229 days for relevant green transition Societal Challenges in Horizon 2020) is noted as another barrier for many applicants, including SMEs, who may have difficulty in this long funding delay.

In general, **there is also a consideration to reducing project size, particularly in Cluster 6, to promote SMEs**. Multiple stakeholders consulted highlighted the project size as a barrier for SMEs, due to the inappropriate scale (average EC contribution to Cluster 5 projects at EUR 7.4 million, and to Cluster 6 at EUR 6.0 million). Particularly, across the scope of this green transition evaluation, institutionalised Partnership projects falling under Cluster 5 had the highest average EC contribution at EUR 13.7 million, given the focus on technological high-TLR solutions, while it was only EUR 5.5 million for Cluster 6 institutionalised Partnerships.

As verified through interviews, the amount of time required to write a proposal also discourages SMEs. Similarly, the survey results highlight the amount of support required to win a HE proposal: **successful applicants tend to receive more support than unsuccessful applicants**, with small positive differences in support received from external consultancies or experts (Cluster 5 and Cluster 6) and national contact points (Cluster 6) and more substantial positive differences from dedicated departments within their organisation (Cluster 6). This may lend credence to the consideration that larger organisations tend to perform better on Cluster 6 calls. Additionally, for Cluster 5 and 6, when successful projects paid the consultancy firm/expert, the amount tended to be higher than the amount paid by unsuccessful projects. Larger organisations may find it more feasible to mobilise this type of support than smaller organisations.

While Horizon Europe has introduced financial support to third parties (lump funding), which may help address this issue of SME participation, this data is not in CORDA and thus cannot be analysed (addressed in the following sub-section Monitoring & evaluation systems at project & programme levels). Similarly, the data on SME participation is limited. Currently, there are many false positives, including many non-private organisations that are identifying themselves as SMEs – who were filtered out in the analysis conducted on Cordis data. There would need to be, however, an independent database on SMEs to verify whether all private organisations who identify as such are SMEs.

**While the Framework Programme is open to new applicants and does attract new participants, in general, the complexity and the size of the projects of the Framework**

**Programme parts could be reduced to promote new applicants' and SMEs' participation.** (This recommendation is also true for Partnerships, and further detailed in the following sub-section Lack of alignment and implementation barriers specific to Partnerships).

#### *3.11.1.4. Lack of alignment and implementation barriers specific to Partnerships*

**Programme implementation challenges remain, based on the differences of application and implementation processes across different types of Partnerships.**

While all types of Partnerships apply the HE award criteria, only the Co-programmed Partnerships are completely implemented via the Horizon Europe work programme. For example, the institutionalised Partnerships (in line with the HE rules) can deviate from the maximum length of proposals for HE proposals (e.g. 120 pages in the case of Clean Aviation), and in the selection process they may also undergo a consensus phase, and topic-panel reviews. This is not fully exclusive to Partnerships - even the work programme projects can diverge for the standard number of pages (e.g., in the case of IA topics in the Cluster 5 WP 2021-2022). For the Co-Funded Partnerships, selection processes for proposals must make selection through a two-step procedure including 1) a review at national or transnational level (including national eligibility checks), and 2) single international peer review. Additionally, for the China flagship projects (co-funding mechanism on Food, Agriculture and Biotechnology (FAB flagship) and Climate Change and Biodiversity (CCB flagship)), the double requirements between EU and Chinese partners, including the need for two applications, is seen to create inefficiencies. Overall, the different application processes complicate the funding landscape and create additional barriers for applicants, including for SMEs who can have difficulty in finding the capacity to identify all relevant funding sources and adapt to their diverse application procedures.

Additionally, **reporting systems are considered demanding for Partnership participants**, according to both Partnership interviews and independent reviews of monitoring and reporting processes. Particularly, Partnership specific requirements are being placed on top of the requirements of HE. In addition, national requirements may come on top of the Partnership specific criteria. Furthermore, **there is no common set of indicators to monitor their performance.**

In the case of EIT Food, financial reporting is already seen as a major issue in some cases, given that for some companies, this reporting can drive significant administrative requirements and costs. The switch from a one-year to a three-year budget cycle is well considered in this respect.

As in the section on the challenges in alignment by thematic area, the **complexity of Partnership implementation processes and double reporting systems are seen by various stakeholders to discourage new participants, particularly SMEs.**

In terms of the Partnerships, **open call procedures are in place and efforts to engage a wider range of stakeholders are ongoing.** While in most cases, this has enabled a widening of participation, following Partnership efforts (further presented in the Partnership-specific criteria), there are some difficulties. In SESAR, the open call procedures have become more challenging for some partners, such as air navigation service providers, who are not accustomed to the competitive nature, while research and technology organisations find their experience with competitive calls advantageous.

### 3.11.1.5. Implications of market-oriented and stakeholder engagement focuses

Regarding Cluster 5 and 6, **a degree of discrepancy is noted between the policy approach of the Horizon Europe funding** (i.e., more impact orientation) **and project formation**, where the research logic dominates. There are difficulties to include industry (e.g., biodiversity), new actors (e.g., agriculture, farmers) and communication professionals in the proposals. In CS-6, for instance, it was noted that consortiums had difficulty to engage professionals in dissemination. Interviews also highlighted the shift to higher TRL funding which was seen as discouraging participation of universities (EU Rail, Clean Aviation).

In both cases, the involvement of new types of applicants should be encouraged, **given the moves towards market-ready solutions and stakeholder engagement in HE.**

### 3.11.1.6. Geographical discrepancies

Regarding the **co-funded Partnerships**, however, interviews and data show that **not all MS have the resources to participate in all the Partnerships** and where (as seen previously in H2020) countries with more developed markets (typically, EU-14) in the given sector are able to participate more. In other types of Partnerships, this finding is similar for industry participants and members who in most cases tend to be concentrated in EU-14 countries. This **geographical discrepancy** is further addressed in other evaluation criteria (see the section EU added value) but **is a key barrier to Framework Programme applications**. To some extent, the impact-driven approach may also discourage the participation of EU-13 countries.

## 3.11.2. Cost-effectiveness and proportionality of efforts

### 3.12.1.1. Leverage factor

In many cases, the **cost efficiency cannot yet be determined due to the interim stage of this evaluation**. To some extent, the leverage factor<sup>87</sup> of HE can be considered for its cost efficiency. For Cluster 5, excluding Partnerships, the leverage factor was 0.141 and for Cluster 5 co-programmed Partnerships, the leverage factor was 0.185. Financing was leveraged principally for IA actions (leverage factor 0.240 for non-partnership, leverage factor 0.449 for co-programmed). For Cluster 6, excluding Partnerships, it was 0.051, similarly principally for IA actions (0.130) (see table below for more information). Meanwhile, institutionalised Partnerships have higher leverage factors, for Cluster 5, 0.428 (0.503 for IA actions) and for Cluster 6, 0.227 (0.433 for IA actions). **Cluster 5 institutionalised Partnerships have a higher leverage factor, given the increased concentration on IA.** A push towards higher TRL research, predominantly conducted in IA, can be observed in Cluster 5 Destination 2 (Cross-Sectoral Solutions), Destination 4 (Efficient, sustainable and inclusive energy use) and Destination 5 (Clean and competitive solutions for all transport modes). This might reflect the strong representation of expected outcomes and impacts in the work programmes. As for non-partnership projects, funding is leveraged principally for IA (0.487 for Cluster 5, 0.433 for Cluster 6).

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<sup>87</sup> The Direct Leverage Factor corresponds to the difference between Total Eligible Costs and EU Contributions divided by EU Contribution

**Table 10 Overview of leverage effects of Horizon Europe of non-partnership projects**

Cluster	Action type	Total Eligible Cost	EU contribution	Direct leverage	Funding rate	Direct leverage factor
Cluster 5 - Climate, Energy and Mobility						
	CSA	146.4	140.3	6.1	0.958	0.044
Cluster 5: except Partnerships	IA	1,417.3	1,143.2	274.1	0.807	0.240
	RIA	784.8	775.2	9.7	0.988	0.012
	Any action type	2,348.5	2,058.3	289.9	0.877	0.141
Cluster 5: Institutionalised Partnerships	CSA	6.6	6.1	0.5	0.929	0.077
	IA	1,178.0	783.9	394.1	0.665	0.503
	RIA	169.1	157.8	11.3	0.933	0.071
Cluster 5: Co-programmed Partnerships	Any action type	1,353.7	947.9	405.8	0.700	0.428
	CSA	11.7	11.3	0.4	0.966	0.035
	IA	467.3	322.6	144.7	0.690	0.449
Cluster 5: Co-programmed Partnerships	RIA	510.9	500.1	10.9	0.979	0.022
	Any action type	989.9	833.9	156.0	0.842	0.187
	Cluster 6 - Food, Bioeconomy Natural Resources, Agriculture and Environment					
	CSA	289.8	282.1	7.7	0.973	0.027
Cluster 6: except Partnerships	IA	740.4	655.1	85.3	0.885	0.130
	RIA	1,128.5	1,116.4	12.1	0.989	0.011
	Any action type	2,158.7	2,053.6	105.1	0.951	0.051
Cluster 6: Institutionalised Partnerships	CSA	2.9	2.9	0	1.000	0.000
	IA	98.6	68.8	29.8	0.698	0.433
	RIA	47.0	44.6	2.4	0.949	0.053
	Any action type	148.4	116.3	32.2	0.783	0.277

NOTES: Data on EU contribution and Total Eligible Cost was extracted from CORDA (table participants)  
Direct Leverage corresponds to the difference between Total Eligible Costs and EU Contributions  
Funding Rate is the share of EU contributions on the Total Eligible Cost  
Direct Leverage Factor corresponds to (Direct Leverage)/EU Contribution  
Each project was assigned to one single Cluster, based on the main programme part.

SOURCE: CORDA database, version June 2023

### 3.12.1.2. Cost-efficiency goes beyond leverage factor

For most Partnerships, particularly institutionalised Partnerships, the implementation processes in the Partnership evaluations have been thus-far assessed to be cost-effective, as shown in section

Efficiency of administration and implementation across the project cycle. In many cases the cost-effectiveness of a Partnership is seen as more than the efficiency of these processes. In one case of an institutionalised Partnership (SESAR), the valuable advice and network nodes of project officers is greatly appreciated.

Amongst the EIT KICs, the management costs ranged from 10.5-15% of the budget. While there are no targets for the efficiency of operations, these management costs are not particularly high (it should be noted that is generally considered a good practice to dedicate reasonable amounts to operations, as insufficient funding undermines the efficiency and impact of operations). Particularly, EIT InnoEnergy is considered efficient in its investment and other kinds of support (e.g., its network), while EIT Climate KIC has been considered efficient in its implementation processes but there is concern on its ability to diversify from EIT funding.



### 3.12.1.3. Proportionality of efforts

In terms of cost-effectiveness, a **disproportionate relation between ambition with strategic planning versus budget allocation** has been noted, leading to a reduction of activities relevant to the Green Transition. For example, the original budget request in EU-Rail's first proposal to the EC was twice as high as the eventual allocation of funds. In comparison, the final scope of EU-Rail was reduced in activities in areas of important interest for the Green Transition, such as the integration and anchoring of rail in the multimodal transport system.

The **effort to prepare and submit the HE projects were considered in general satisfactory**, as mentioned in the prior sub-section Efficient implementation processes. However, the **efforts needed in proportion with the chances of securing funding was considered the least satisfactory** across both beneficiaries (43-44% satisfaction rate) and unsuccessful applicants (23-29% satisfaction rate). Only 25% of Cluster 5 and 6 applications were accepted: with over 1,080 high-quality applications for Cluster 5 out of 417 accepted and 809 out of 296 in Cluster 6. Similarly, interviews have highlighted that the low success rate for high-quality projects is a limitation of the Framework Programme. In Circular Bio-based Europe, interviews highlighted the limited budget and thus success rate, resulting in non-acceptance of deserving projects. In SESAR, beneficiaries raised concerns that lower funding rates for industrial research and demonstrator streams create barriers for participation, especially for smaller organisations. In the same vein, also in the Co-Programmed Partnership of Clean Steel and Low Carbon Steelmaking budget allocation was seen as a main challenge, with an insufficient amount of funding in HE projects dedicated for demonstration projects.

In one case, interviews suggest that the selection of projects should further consider how the proposal fits with and builds on what has already been achieved in the area so far (Batteries). To some extent, however, the work programme approach, in defining specific topic areas, ensures complementarity between projects. The complementarity of projects is considered when accepting projects off the reserve list. Overall, however, the non-consideration of complementarity can be considered a trade-off in the current selection approach which prioritises excellence.

According to the Cluster 5 & Cluster 6 beneficiary surveys, however, the **project ambitions were seen as feasible financially**. There was a 54% satisfaction rate with the size of the potential budget being comparable to the objectives set in the call and a 57-58% satisfaction rate with the feasibility of addressing the objectives set out in the call.

## 3.12.2. Efficiency of monitoring and evaluation systems and feedback to policy processes

### 3.13.1.1. Monitoring & evaluation systems at project & programme levels

At programme level, **there is an insufficient translation of the SDG and other societal objectives stemming from key EU policy strategies into the Key Impact Pathways**. Notably, KIPs 4 and 5 (EU policy priorities & SDGs) have multiple overlaps with the other KIPs and the impact towards them may not always be traceable (e.g. in the case of behavioural change). While KIPs capture certain dimensions of the green transition, the actual impact of HE on it is more diverse, complex, and multifaceted.

The Commission additionally **monitors the expenditure of HE related to climate and biodiversity ex-ante and ex-post**, to monitor its mainstreaming commitments. This monitoring is essential in tracking the contribution of HE to the green transition.

In general, the **project monitoring and evaluation systems are improved** in comparison to H2020, to integrate dissemination and exploitation, including feedback to policy aspects. From the proposal phase on, almost all HE projects require a communication, dissemination, and exploitation plan. Results must then be reported on, with reinforced reporting requirements for these aspects.

A basic but foundational challenge is that **participant data and participations for both EIT-KICs and Co-funded Partnerships are not yet integrated into CORDA**, rendering it virtually impossible to provide up-to-date overviews about funding, participating stakeholders, and their engagement in different parts of the HE programme. For instance, one Partnership (ZEWT) highlighted the need for monitoring data shared between relevant Partnerships to better inform synergies. Similarly, **data on financial support to third parties**, a change introduced under Horizon Europe, **is not available**. **The development of an effective monitoring of stakeholder groups participating in European Partnerships and the HE work programmes is essential for elaborating project-portfolio strategies and further enhancement of valorisation strategies**. Finally, there are **difficulties in monitoring linkages across relevant instruments** (further addressed in the sub-section external coherence with other EU funding programmes and the national level). For instance, it cannot be determined whether an Innovation Fund project came from Horizon Europe results.

### *3.13.1.2. Dissemination and exploitation of results*

As per the survey, respondents felt that their **HE projects will perform very well in terms of their contribution to the Green Transition**, including in expanding and mainstreaming niches (most closely related to exploitation). These results are presented in detail in the section “Multi-level perspective of the Green Transition: Contribution of the Framework Programme to the Green Transition”.

While there are positive changes seen since Horizon 2020, there is an **ongoing need to reinforce dissemination and particularly exploitation**<sup>88</sup> of results in both Cluster 5 and 6, as presented in the effectiveness sub-section “The contribution of intended results, outcomes and impacts to the FP objectives, EU priorities and the SDGs”.

Current measures to support dissemination and exploitation are notably the Horizon Results Booster and Horizon Results Platform, in addition to the required project plans presented above and the European Intellectual Property Helpdesk.

The **Horizon Results Booster** focuses on exploitation and particularly dissemination by providing free of charge services, such as coaching on portfolio dissemination & exploitation strategy, business plan development and go to market. As of August 2023, 3,299 beneficiaries and 8,387 organisations have benefitted from these services. In general, the **Booster has potential for higher usage**, but positive feedback on the Booster itself was received by interviewees and by survey results (see below). A new tender has been launched for the exploitation of this service past 2024. As per the tender specifications, four main services will be provided: dissemination support, applied research support, market support and policy support. Additional tailored services can be provided based on project needs. This tender for the continuation of the Horizon Results Booster aims to increased relevant exploitation of Horizon Europe projects – whether in the market, in applied research or in policy. It also will organise and facilitate access to matchmaking events between Horizon Europe projects and relevant stakeholders, including investors.

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<sup>88</sup> Outside of feedback to policy, separately addressed below.

The **Horizon Results Platform (HRP)**, meanwhile, focuses particularly on exploitation. As per beneficiaries' grant agreements, Horizon Europe beneficiaries must either exploit their results within a year or search for interested partners to exploit the results using the Platform. **The Horizon Results Platform has potential for higher usage in terms of uploading results.** The number of visits to the platform, however, has increased from 2020 to 2022 from 21,283 to 37,650 annual visitors because of thematic events organised by HRP for beneficiaries and new Partnerships with networks such as Solar Impulse Foundation (SIF), EU IP Helpdesk, Enterprise Europe Network (EEN) and others. The usage of this platform may still increase, considering this requirement was only introduced under Horizon Europe and Horizon Europe projects are still developing their project results. There is, however, a difficulty in enforcing this requirement, as it is after the grant agreement has ended.

The survey finds that **EC platforms and measures aimed at facilitating exploitation (e.g. Horizon Results Booster, Horizon Results Platform, IPR Helpdesk) help facilitate the uptake of project's research findings.** 35-40% of respondents report these platforms and measures help to a large or very large extent and only 14-18% to a small extent or not at all, which is similar in comparison to other activities and support actions for uptake of results (e.g., open science).

As highlighted by interviews, there seems to be a need to **increase project proximity to investors.** There are efforts by the European Commission to provide these services through the Framework Programme, both through organising events with investors (via the Horizon Results Booster as aforementioned) and developing an interactive marketplace or virtual one-stop shop (further evolving the Horizon Results Platform), as per the European Commission's New European Innovation Agenda Action 14. Such efforts are to be encouraged to increase exploitation rate.

In terms of Partnerships, results tend to be well disseminated. In particular, Partnerships benefit from the participation of a wide range of members and the sharing of results (which, if conducted by individual industry actors, would not be published) between these members and more broadly via events, online presence, etc. There is a need, however, to increase the exploitation of these results.

Additionally, to improve exploitation, the **link between research results should be improved between relevant Partnerships and parts of the Framework Programme.** While, as stated in the section on coherence, the design of the Framework Programme is coherent internally, knowledge circulation is limited. For instance, this difficulty is highlighted in two of the Partnership evaluations (DUT and EU Rail), as well as CS-10 Research and Innovation for making rural areas stronger, connected, resilient and prosperous. One method to do so could be to develop CSAs for different Destinations that coordinate activities and share results across that Destination. Similar to a Partnership, the CSA could also fund projects directly for cross-project coordination (as mentioned in sub-section The effectiveness of dissemination, exploitation, and communication). These CSAs could also link results to policy, as per the feedback to policy framework being implemented, mentioned in the following sub-section Feedback to policy.

Finally, the interviews conducted for CS-6 Achieving climate resilience and restoring nature with regards to oceans and water also suggest that there is a need to **incentivise capacity building within projects, and to engage more with young researchers and PhDs.** The legacy of projects, which can be considered a form of exploitation, should be considered from the perspective of involving young researchers and maintaining the research momentum.

### 3.13.1.3. Feedback to policy

Overall, there is evidence that **HE projects feed-back into policy**, particularly for Cluster 6 at EU level. These results are presented in the Effectiveness section, which cites survey results that a higher percentage of Cluster 6 projects (71% vs. 56% for Cluster 5) expect their projects to result in recommendations for policymakers/inputs to national or EU policies. While there are important **barriers to this feedback**, as presented below, **a framework for feedback to policy is being implemented** to address these barriers.

Interviews suggested that there are two main **barriers to feedback into policy**, such as the **increased distance of projects to policy formulation**, due to the delegation of programme implementation to the agencies. In addition, there is **perceived need for additional staff within the Directorate-Generals across the Framework Programme**. The increased distance of projects to policy making is due to the new role of the executive agencies in implementing the Framework Programme. They have a direct access to the knowledge created by projects, but as they do not formulate policy, there is an added layer of distance between project results and policy formation. The need for additional staff is both due to a shift of certain experienced staff from the European Commission to the Partnerships and executive agencies and the lack of sufficient staff in all DGs dedicated for each policy area (e.g., only two staff dedicated to HE coordination in DG CLIMA).

These barriers are in part addressed by the **feedback to policy framework** being implemented, based on best practices. Under the framework, for almost all the programme, joint teams between executive agencies and DGs have been established and then a joint plan for feedback to policy is created on a yearly basis, considering needs from the policy perspective and actions to address these needs. The Partnership Joint Undertakings, however, have been said to be difficult to integrate into this feedback to policy framework.

## 3.14. EU added value

Horizon Europe still represents the largest and most open multinational R&I framework in the world. While it is **too early to evaluate the outcomes and impacts of funded projects**, the activities in Cluster 5 and 6 harbour the potential for high EU added value. They contribute to “generate economies of scale for a **wide range of solutions**”, to provide “**more informed and evidence-based policymaking**”, as well as to “**create new economic ecosystems**”, to foster “**enhanced competitiveness**”, and to support the “**economic transition in line with the SGDs**”. While this EU added value arises for all topics, the type of impact and contribution differs partly across the Clusters and Destinations:

- For Cluster 5, interdisciplinary research advances understanding of climate impacts, risks and vulnerabilities and provides solutions for **climate, mobility and energy transitions**. Energy and transport systems require European wide, systemic solutions which cannot be achieved at a national level only. EU added value is high in building necessary interfaces between society and solutions around energy, climate, and transport, as well as in networking, mutual learning and tackling cross-border regulatory and standardisation challenges.
- For Cluster 6, there is an urgency to halting and reversing the decline of biodiversity and ecosystem services. As this is a boundary-spanning topic, the potential added value for actions at EU level is high. The added value of Horizon Europe to the **Green Transition** covers the expansive geographical focus and broad spectrum of interventions. In addition, various Destinations provide support for integrative, inclusive policy-making processes across sectors and countries.

Another impact is the **enhanced international opportunities for researcher mobility** In Horizon Europe, although some challenges may still arise in practice, such as project delays due to missing funding by partner countries. Moreover, the Clusters and Partnerships are successful in bringing different actors (including groups from different countries and contexts), themes and issues together. This provides a unique platform for collaboration and exchange. Similarly, joint efforts across Member States **build a shared background and enhance coordination** in key thematic areas.

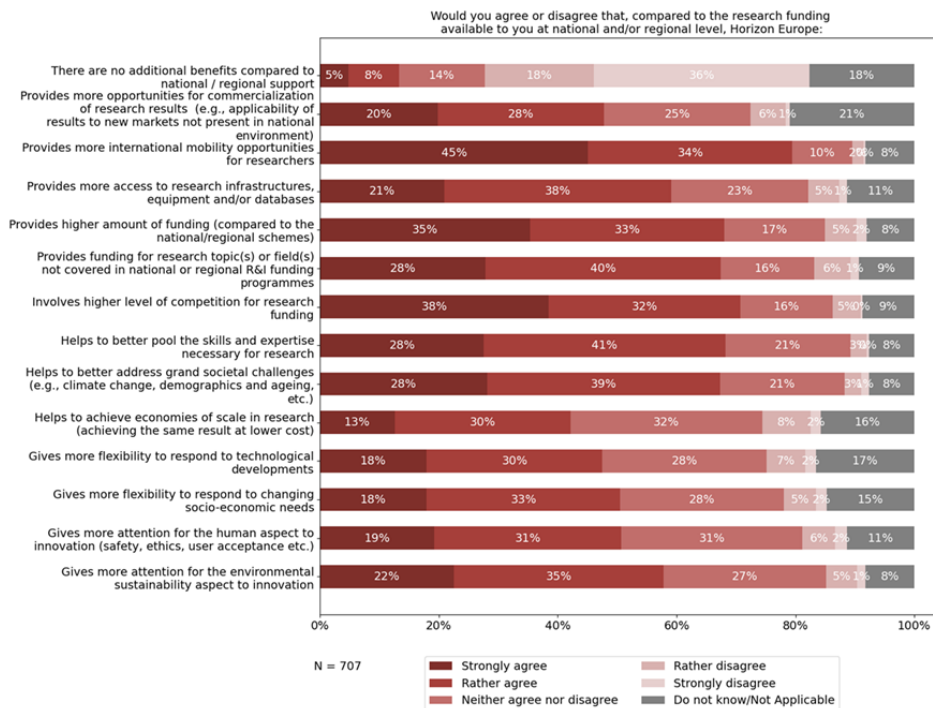
The Case Studies provide numerous examples of different value added. Horizon Europe enables collaboration and creation of networks across Member States or regions in key topics for the Green Transition which otherwise wouldn't exist. For example, it enables European-wide networks to develop R&D&I on nature-based solutions or solutions for safer transport and expands data information and access to Earth Observation. Moreover, stakeholder engagement is fostered. Different cultures of participation across countries and differences in national frameworks have been noted as limiting factors for social engagement. Here, Horizon Europe acts as a balancing force that allows for social engagement to happen where it would not have otherwise, as well as facilitating the exchange of experience on engagement between countries.

Findings from the **survey** back up the evidence on the EU added value of Horizon Europe. As the figure below for Cluster 6 indicates, a high number of respondents (79% agree to a large or very large extent) state that HE provides more **international opportunities for mobility for researchers** than other funding sources available at national or regional level; almost identical results can be found for Cluster 5<sup>89</sup>. The four following statements are also supported by more than 60% of respondents: HE helps to **better pool skills and expertise necessary for research** (69%); HE provides higher **amounts of funding** compared to national or regional funding schemes (68%); HE provides funding for **research topics or fields not covered in national or regional R&I funding programmes** (68%); HE helps to better address **grand societal challenges** (67%). This shows a clear European added value and steering effect regarding the setting of topics and the available budgets compared to national or regional funding. It is also notable that **only 13%** of respondents consider that HE does **not have additional benefits compared to national/regional funding**.

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<sup>89</sup> For all cited percentages for Cluster 6, the results for Cluster 5 deviate less than 3 %-points.

Figure 8: Would you agree or disagree that compared to the research funding available to you at national and/or regional level, Horizon Europe:



Source: Survey of Horizon Europe beneficiaries, conducted in May-July 2023 (successful applicants survey), Cluster 5

All this said, there is **no monitoring in place to assess factors which could potentially limit – or boost – the EU added value**, which is why the EC may lack evidence to make course corrections if necessary. However, 18% of survey respondents agreed with the statement that laws and regulations in one of the Member States (e.g. barriers to mobility, intersectoral cooperation) constituted challenges in the implementation of the project. 15% mentioned cultural or language barriers in the consortium as an obstacle.

**Partnerships and Missions** concentrate their efforts on areas with high EU added value. Many Partnerships’ (e.g. the EIT KICs or JUs) focus funding particularly on activities closer to the market and industrial activities, and they **enable investment expansion beyond regional and national levels**. The Partnership analyses indicate that their **multinational nature is often beneficial** for projects at higher Technology Readiness Levels (TRLs) or where national/regional implementation is ‘impossible’. An important element of European added value is learning from more experienced Member States (e.g. in transport and mobility). Moreover, the Partnerships contribute to the **mobilisation and coordination of resources** and attracting substantial financial investments from both public and private sources, enabling the implementation of large-scale projects. In addition, Partnerships as well as Missions present a **vehicle for the definition of long-term strategic R&I objectives**, as well as a **platform for collaboration along the value chain** for European industry.

**Table 11 Good practice for EU value added generation among European Partnerships.**

Partnership	Good practice
Clean Hydrogen	<p>FCH2 JU has made significant progress in eliminating the fragmentation that previously existed in EU support for FCH technologies that had been dispersed between several support programmes within FP7 and its predecessors. The FCH JU provided a common ground for interaction between beneficiaries of national, regional, and European projects, effectively contributing to overcoming the fragmentation of the sector and reinforcing synergies between stakeholders. From the point of view of Horizon Europe Research, without the Partnership, Europe would not have been a global leader in Hydrogen. The Partnership has been a game changer and managed to create a community and bring together the researchers. Currently, they are well-organised and coordinated and the same is valid for industry. The shift has been from ideas to products and now the industry is ready to produce and deploy. Hydrogen is already an integral part of the energy solution for industry to decarbonise and EU industry to develop. Moreover, the Partnership also facilitate a coherent collaboration with partners from third countries.</p>
Circular Bio-based Europe (CBE)	<p>Without the BBI JU/EU framework of cooperation and funding, the implementation of research and innovation projects in the bio-based area would have been challenging, if not impossible. The BBI JU provides funding that incorporates industry priorities, creating added value for universities and research institutions by aligning their work with industry expectations. Moreover, the BBI JU acted as a catalyst for collaboration, forcing actors to consider the entire value chain and seek optimal cooperation partners on an international scale. This led to the creation of new networks and the integration of companies into value chains, fostering innovation and enabling them to find suitable partners and clients even after the projects.</p>
CCAM	<p>The newly established CCAM Partnership should be able to create significant added value such as improving technical interoperability between Member States. Prior to the CCAM Partnership, there was only fragmented investment in CCAM R&amp;I across the EU leading to overlaps and inefficiencies. National funding streams are too small to tackle this issue. It would also be difficult to innovate in a coordinated way across Member States and Associated countries without the CCAM Partnership because the Partnership coordinates and focuses R&amp;I on the basis of shared goals. The newly established SRG already proves to be beneficial by sharing learning around national regulations and testing facilities for CCAM between more advanced and less experienced Member States.</p>

Source: PE-CH, PE-CBE, PE-CCAM

A **key challenge** regarding value creation for the Clusters as well as Partnerships is the **balanced realisation of benefits across the whole EU**. The distribution of participation of countries is often still skewed, with a rather limited participation of Member States from Central and Eastern Europe. This is the case for both Clusters and Partnerships. More generally, many calls within the Clusters demand a broad engagement across value chains, sectors, and levels that can leverage public and private contributions to R&I aligned with EU priorities. However, the EU added value could be constrained through a narrower focus on specific technological interventions with limited consideration of capabilities and needs of different countries and regions. This applies especially to Cluster 6, as many activities and outputs are location-specific: e.g. specific resources from land, coast or industrial residues are used in local value chains, partly underlying specific national regulations. This makes replication to other contexts an important task, which is often still missing.

Still, many value chains – e.g. those in which circular economy approaches are needed most (e.g. Cluster 6 Destination 3) – function well across MS and, indeed, globally. Hence, it will be of key importance to leverage knowledge exchange and learning effects as much as possible across the regions to realise the impact across the whole EU. However, this issue does not apply to all topics and Destinations in the same way. First, some industrial value chains are relevant for many countries and this issue does not apply. Second, some value chains in Cluster 5 (e.g. photovoltaics, transport) can be EU-wide or global, so more direct transfer of the results is possible. Here more localised effects can be observed, where the EU added value is to bring EU-wide research insights to local government to support adaptation or mitigation of climate change, for example adjustments in transport infrastructure and town planning. Case Studies show that the adoption of new, climate protecting technologies in transport are enabled by EU-wide research. The EU added value here is that Local Governments in each country can adjust to the new circumstances while still realising that new rules and adjustments have to be applicable across the EU.

## 4. The contribution of the framework programme to the Green Transition

Horizon Europe represents one of the European Commission's key mechanisms for attaining a Green Transition, as indicated in the European Green Deal. To this end, HE regulation requires that 35% of expenditure be dedicated to climate objectives (legally binding) and the EU has agreed that, overall, 7.5% (in 2024) and 10% (in 2026 and 2027) of expenditure should be dedicated to biodiversity objectives.

### 4.1. Analysis of projects' contribution to the Green Transition

As part of this evaluation, an analysis of all HE projects' contribution to the Green Transition was conducted. Keyword-based queries developed to classify scientific publications into Green Transition thematic areas were applied to titles and abstracts of supported projects under Horizon Europe. Table 12 presents the share of projects under each programme part thematically aligned with the Green Transition topic. Additionally, the share of projects under each programme part aligned with different aspects of the Green Transition (e.g. food) was also analysed, as they were developed during the evaluation of H2020 supported publications.

This analysis shows a strong alignment of Cluster 5 and 6 with the Green Transition: close to 90% of projects were captured by these queries, suggesting that the recall rate of these queries applied to project-level descriptors from CORDA is high (i.e. only around 10% of relevant projects may be missed by this approach). **Around 28% of Horizon Europe projects outside Clusters 5 and 6 were thematically aligned with the Green Transition topics.** These figures suggest **indirect contributions from the Horizon Europe programme to the Green Transition that go beyond the projects assigned to Clusters 5 and 6**, as 1,883 additional projects were thematically aligned to Green Transition, based on keywords from their titles and abstracts, representing **an additional EUR 4.8 billion of investments** (i.e. 32% of EUR 14.9 billion in overall Horizon Europe EC contributions outside of Cluster 5 and 6) with potential indirect effect on the Green Transition challenges.

The shares of projects in each programme part thematically aligned with Green Transition topics ranged from 13%, on Health, to 63%, on EIT. Given their intersection, clear linkages between health and the Green Transition could be further supported. The high contribution of digital, industry and space topics to the Green Transition (51%) must also be noted,



highlighting the **role of HE in pursuing the dual transitions**. These indirect contributions are quite equally distributed between food (12%), energy (10%) and climate (15%). Indirect contributions are rare in the field of transport (3%), a topic concentrated in Cluster 5.

**Table 12: Share of projects contributing to aspects of the Green Transition**

Main programme part	Share of total projects in programme part (total, by societal challenge dataset)						Share of total EC contributions in programme part (total, by societal challenge dataset)					
	Total (No. Projects)	GT*	Food	Energy	Transp.	Clima.	Total (EUR million)	GT*	Food	Energy	Transp.	Clima.
ERC	2,061	18%	8%	5%	2%	8%	3,575	18%	8%	5%	2%	10%
MSCA	2,493	30%	13%	10%	3%	17%	1,074	31%	13%	11%	5%	16%
Research infrastructures	78	36%	28%	4%	1%	18%	511	32%	27%	2%	1%	17%
Health	288	13%	5%	0%	2%	7%	2,211	10%	4%	0%	2%	6%
Culture	143	20%	8%	2%	0%	13%	420	21%	9%	2%	0%	13%
Civil Security	54	22%	11%	2%	4%	13%	229	22%	11%	2%	4%	14%
DIT	579	51%	16%	26%	8%	27%	3,583	53%	15%	28%	10%	29%
Climate	543	86%	15%	50%	35%	46%	4,073	89%	14%	52%	44%	49%
Food	391	89%	80%	7%	1%	52%	2,170	90%	83%	8%	0%	52%
EIC	589	33%	13%	15%	5%	15%	1,489	32%	12%	14%	5%	15%
EIE	99	32%	20%	4%	7%	13%	109	15%	12%	1%	1%	4%
EIT	16	63%	44%	19%	13%	31%	891	65%	43%	40%	20%	57%
Widening	244	39%	19%	10%	2%	24%	677	31%	16%	9%	5%	18%
Reforming enhancing	53	25%	21%	0%	0%	4%	118	23%	19%	0%	0%	4%
Horizon Europe Clusters 5 and 6	934	87%	42%	32%	21%	49%	6,243	89%	38%	37%	29%	50%
Horizon Europe, excepting 5 and 6	6,697	28%	12%	10%	3%	15%	14,886	32%	13%	13%	5%	19%
Horizon Europe overall	7,631	35%	16%	12%	5%	19%	21,129	49%	20%	20%	12%	28%
H2020 SC 2 to 5	3,334	74%	23%	37%	21%	33%	16,480	81%	29%	40%	25%	39%
H2020, excluding SC 2 to 5	28,123	21%	9%	7%	2%	9%	49,646	23%	9%	9%	3%	9%
H2020 overall	31,457	26%	11%	11%	4%	12%	66,126	38%	14%	17%	9%	16%

The classification of HE projects as thematically aligned with Green Transitions was based on keyword queries applied on title and abstract of projects.

SOURCE: CORDA database, version June 2023

## 4.2. Results of case studies and Partnerships on the Green Transitions

Overall, the parts of HE covered by this evaluation highly contribute to the Green Transition, as shown by the surveys, case studies and Partnership studies. The **results of the case studies focusing on (sub-)Destinations confirm the relevance of the studied parts of the Framework Programme to the Green Transition**. For instance, biodiversity and ecosystems is much further integrated into HE, in comparison with H2020. In the case of rural

areas, however, it should be noted that fragmentation across the FP is seen to cause an insufficient integration of environmental aspects (CS-10).

The **case studies focusing on (sub-)Destinations also highlight that Horizon Europe addresses emerging themes in each area.** For instance, the consideration of meat consumption and social health (CS-8), and the consideration of emerging topics, such as improving understanding of climate impacts with higher resolution and granularity (CS-6), are viewed positively. However, the timeliness (e.g. agri-PV) and integration of certain emerging topics (e.g. concentrated solar power) could be improved (CS-3).

One additional recommendation to improve the contribution to the European Green Deal is to align international cooperation interventions with key topics of the Green Transition and supply chain concerns, such as forestry and ocean and waterways and agriculture.

It must be underlined, however, that there is a **perceived threat to achieving the Green Transition if policy priorities change over time or if there is a lack of common understanding of what a Green Transition implies.** Both continued political prioritisation of the Green Transition and co-creation processes are necessary.

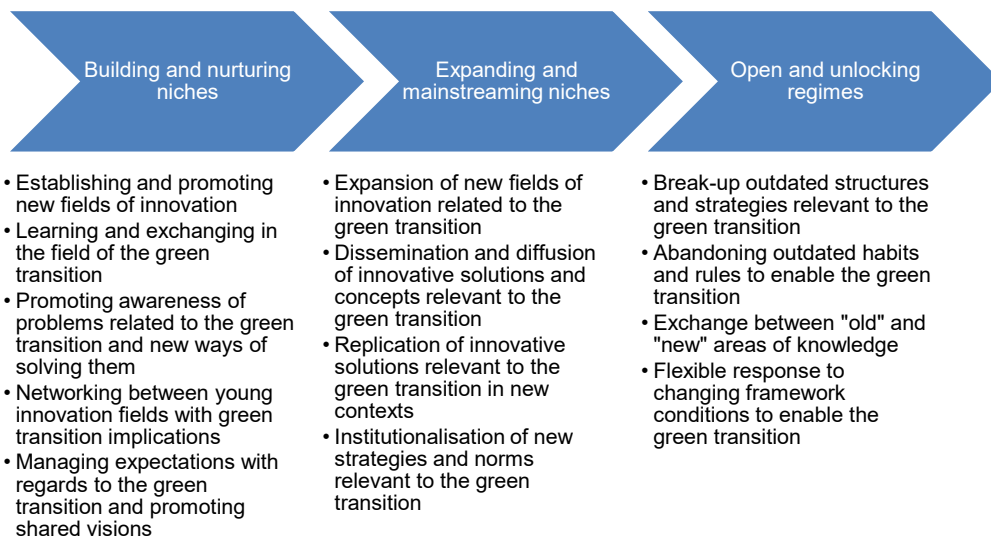
In the case of Partnerships, the **Partnership evaluations underline that all have a high relevance for the corresponding EU policy priorities, such as the European Green Deal, and the challenges and needs addressed in the Framework Programme.** It should be noted, however, that in the case of SESAR, environmental objectives are an extra layer on top of SESAR's main policy objectives. For CCAM, Green Transition is explicitly recognised as one of the (long-term) objectives of CCAM but is not, however, in the foreground.

**The Partnerships support key thematic areas for the Green Transition. They address long-term future needs** such as securing European energy security through potentially disruptive technologies, forming Europe's circular biobased economy, and providing R&I for the sustainability transition of the European mobility and transport systems. At the same time, they need to focus on a specific topic which in some cases means omitting relevant areas in need of consideration for the Green Transition.

### 4.3. Multi-level perspective of the Green Transition

Similarly to phase 1 (H2020), beneficiaries from HE Clusters 5 and 6 were asked specific questions related to contribution of the project to the Green Transition according to the Multi-Level Perspective (MLP) and the embedded concept of transformative outcomes (Figure 9). Most respondents felt that their **HE projects will perform very well in terms of their contribution to the Green Transition**, particularly to the macro-processes of building and nurturing niches and expanding and mainstreaming niches. To a lesser extent, projects were anticipated to perform well in the macro-process of opening and unlocking regimes. The results were **extremely similar across Cluster 5 and 6** (thus, the results below apply to both Clusters unless otherwise specified). In general, the **anticipated results exceed the results from H2020**, however the survey results are not fully comparable due to the different assessment scales used (five levels in HE surveys vs. four levels in H2020 surveys) and the fact that for HE the survey refers to anticipated results and not to achieved results. It must also be noted that the H2020 survey had higher levels of "do not know" responses (up to 32%), across this part of the survey.

Figure 9: Multi-Level Perspective of the Green Transition



#### 4.3.1. Building and Nurturing Niches

According to respondents, **the majority or near majority of Horizon Europe projects are anticipated to contribute to a large or very large extent to most categories relevant to building and nurturing niches:** establishing and promoting new fields of innovation (36-63%, dependent on question); learning and exchanging in the field of the Green Transition (47-81%); promoting awareness of problems related to the Green Transition and new ways of solving them (49-70%); networking between young innovation fields with Green Transition implications (48-60%); and managing expectations with regards to the Green Transition and promoting shared visions (46-67%). In most cases, a fifth or less of projects are anticipated to have limited or no contribution across these categories. The results are similar to or have improved upon the results from Horizon 2020 across the board: the results of which showed a majority or near majority of projects (46-83%) were fully or partially sufficient in most categories relevant to building and nurturing niches.

**Successful examples in delivering this transition phase include the BATT4EU Partnership and the Clean Hydrogen Partnership,** given the role of the associated technologies in accelerating the Green Transition. For instance, the BATT4EU Partnership is key to both the electrification of the transport sector and the switch to renewable energy. It not only funds traditional calls but fosters collaboration across scales (EU/national/regional and private) and provides information key to developing new business models and informed decision making.

Horizon Europe projects performed particularly well in certain sub-categories **learning and exchanging in the field of the Green Transition.** Three quarters of respondents anticipate that their project will contribute to a large or very large extent to in the following ways: exchange of experience on innovation solutions (79-81%, dependent on Cluster); reflection on new solutions and their application (78%); and learning about subject-specific problems (74-75%).

In two sub-categories of **establishing and promoting new fields of innovation,** the anticipated impact is slightly lower. Approximately a quarter of respondents believe their project will have limited or no contribution to protecting new fields of innovation from dominant

interests (23-25%, dependent on Cluster) and protecting new fields of innovation from market influences (28-34%) (though more than a third of respondents anticipate impacts of large or very large extent in these same sub-categories).

#### 4.3.2. Expanding and mainstreaming niches

Similarly, **most Horizon Europe projects are anticipated to contribute to a large or very large extent to expanding and mainstreaming niches**. These results are fairly similar across the expansion of new fields of innovation relevant to the Green Transition (46-64%, dependent on the question); dissemination and diffusion of innovative solutions and concepts relevant to the Green Transition (51-73%); and replication of innovative solutions relevant to the Green Transition in new contexts (46-64%). **These anticipated results are similar or better than Horizon 2020**, whose results showed a full or partial agreement from most respondents (50-60%, dependent on the question) in terms of replicating innovative solutions relevant to the Green Transition and expansion of new fields of innovation and a full or partial agreement from half to three-quarters of respondents (52-74%) in terms of dissemination and diffusion.

However, in terms of **institutionalisation of new strategies and norms** relevant to the Green Transition, only approximately a third to half of HE projects (31-47%, dependent on the question) anticipate contribution to a large or very large extent and up to a fifth of respondents (12-21%) anticipate their project will contribute to a limited extent or not at all. These results are similar or better than those from H2020, where only a third to half of responders (36-44%) consider that their project had a sufficient or partially sufficient contribution to institutionalisation of new strategies and norms.

However, the **institutionalisation of new strategies and norms is a key value added of the 2Zero Partnership**. The Partnership is taking a systemic approach, linking the vehicle, mobility solutions, the charging infrastructures, and its interactions with the grid. Due to the integrated system approach, the Partnership's activities include a variety of actors from different sectors and are designed to be transversal, allowing the consideration of different aspects of the challenges of the decarbonisation of road transport. Besides addressing aspects such as technologies, process, operational and business model innovation or circularity and life-cycle analysis, the Partnership tackles infrastructure aspects of data sharing for vehicle charging, which require a European approach to ensure interoperability, including through standardisation.

#### 4.3.3. Opening and unlocking regimes

In terms of contribution to the Green Transition, **respondents estimated their contribution to the macro-process 'opening and unlocking niches' lower than the other transition processes but still highly**. Approximately a third to a half anticipate a large or very large contribution to this macro-process, fairly equal across the four categories: 'breaking up outdated structures and strategies relevant to the Green Transition' (27-54%, dependent on question); 'abandoning outdated habits and rules to enable the Green Transition' (30-47%); 'exchange between "old" and "new" areas of knowledge' (38-50%); and 'flexible response to changing framework conditions to enable the Green Transition' (29-47%). Notably, the **rate of non-response was 10-25% across this transition phase**, suggesting that respondents did not know how to respond to this section. These anticipated results seem similar to those of Horizon 2020, for which a majority or near majority of respondents (40-61%, dependent on question) found that Horizon 2020 contributed fully or partially sufficiently to the different categories of this macro-process.

There were small differences across this category. For 'breaking up outdated structures and strategies relevant to the Green Transition', a higher proportion of respondents (up to a quarter) believed their contribution would be limited or non-existent for two sub-categories: 'breaking up outdated processes' (18-20%) and 'shaking up the established system through radical innovation' (23-25%). The category of 'flexible response to changing framework conditions to enable the Green Transition', meanwhile, faced the lowest response rates (from 16-26%). While this result is to some extent to be expected for an R&I programme focusing on developing and testing new solutions, it can also be concluded that more research into transitioning processes and abandoning existing rules and practices to achieve the Green Transition is needed.

## 5. Overall conclusions

### 5.1. Relevance

**Horizon Europe exhibits a high relevance for the Green Transition. Nonetheless, the programme must address more complex societal aspects and structural barriers to achieve the Green Transition.**

Horizon Europe has taken multiple measures to ensure that the programme is relevant for the Green Transition. **The programme builds on an interplay of top-down, horizontal, and bottom-up elements to integrate policy priorities, sectoral needs, and stakeholder inputs.** Throughout its duration, Horizon Europe has been responsive to many emerging issues, however, the time gap between Call drafting and project start undermines relevance and responsivity under rapid change.

Furthermore, there is a need for **greater clarity regarding the scale of the desired contribution from Horizon Europe to the Green Transition.** Screening for directionality, use of the Do No Harm principle, application of cross-cutting specific issues and impact-orientation are sound guideposts. However, positioning of Horizon Europe in the context of delivering on the European Green Deal does not sufficiently address aspects of scale, building of necessary pipelines of solutions, and societal readiness. **The impact-orientation of the Framework Programme creates a gap in collaborative early-stage knowledge generation.**

Given the complexity of Green Transition challenges, **there is a need for more fundamental reflection on the programme's impact** (within the scope of Cluster 5 and 6) **beyond technological and market foci, and towards systemic and timely reconfiguration of the economy and society.** Many Calls feature transformative aspects but realising the full potential of R&I may require more ambitious questioning and reframing of the programme orientations. Issues such as societal and structural barriers to transition, irreversible loss and damage, potential for path dependencies, and embedding of R&I in the discourse of growth require further consideration.

**The programme uses collaborative approaches and engages a wide range of actors, featuring both achievements and gaps in terms of inclusivity.** Mainstreaming of diverse collaborative approaches and increased focus on knowledge valorisation help ensure that the programme is relevant given broad societal needs. Strong focus on acceptance and uptake, use of the same types of actions across instruments, and prioritisation of certain groups may not fully consider diverse stakeholder needs in the context of Green Transition.

Compared with Horizon 2020, Horizon Europe uses a more targeted approach to international cooperation, but its overall level is rather low. The focus on enhancing strategic autonomy while jointly tackling climate challenges helps navigate geopolitical instability but does not foster collaborations at scale. As a result, EC contributions and participation by third countries and associated countries represent a negligible share of the total EC funding.

## 5.2. Coherence

The **internal coherence of the Framework Programme is high**, and **Cluster 5 and 6 Destinations are well aligned with the overall objectives of Horizon Europe and the European Green Deal**. With the new Horizon Europe programming approach (co-creation) engaging several DGs, the internal coherence of the Framework Programme improved significantly. The new approach led to an important internal change, with a recognition that the Framework Programme is now the research and innovation programme of the European Union.

In the area related to the Green Transition, a thematic project-portfolio management considering projects of different Destinations, Clusters, Partnerships, and Missions is missing. Such an approach could further increase internal coherence. As a pre-requisite, the main project funding database, CORDA, should integrate project data from all implementation modes (including Co-Funded Partnerships and EIT KICs).

In terms of instruments, the Horizon Europe Missions articulated objectives that are highly complementary to the activities at the Cluster level. A shift of 'traditional' R&I activities from Cluster work programmes to the Mission work programme is a barrier against targeting the EU Mission objectives, which need resources for replication and upscaling solutions, citizen and business engagement, and different types of instruments to pursue their objectives. Rationalising the Partnership landscape contributed to developing more coherent approaches in many Partnership areas. This helped to significantly increase public funding from EU Member States for Co-Funded Partnerships and strengthen collaboration at the Framework Programme level. For the Co-Funded Partnerships, strategic cooperation frameworks and proactive involvement from the EC to facilitate the creation of synergies are needed.

The Horizon Europe Missions and the European Partnerships have been the main tools to increase the external coherence between the Framework Programme activities and EU Member State activities. Nonetheless, challenges for increasing the **external coherence in the area related to the Green Transition and other funding Programmes persist**. To realise the Green Transition, there is a need to better support the transfer of results from demonstration to large-scale implementation. This requires strengthening the linkages between Horizon Europe projects and other funding mechanisms and monitoring the options for upscaling solutions. The HE regulation outlines **desirable synergies** with 20 EU funds/programmes – out of those, this evaluation found only evidence for some synergy creation mechanisms related to the Green Transition – in particular CAP, EMFF, CEF, and the LIFE Climate Change Adaptation Programme. The evaluation found only rare cases of active coordination that aim to overcome challenges of different timelines, approaches, and evaluation criteria. Among the partnerships in the area related to the Green Transitions, established and planned synergy creation with other EU funding programmes focused primarily on the Connecting Europe Facility (8), the LIFE Programme (7), the Digital Europe

Programme (4), ERASMUS+ (4), the InvestEU Programme (4), and the EU Space Programme (2)<sup>90</sup>.

Despite their potential to unlock synergies with national and EU programmes (2022 regulation), the EU Missions need significant progress on implementation to achieve this goal.<sup>91</sup> Nevertheless the expert group supporting the monitoring of Missions concluded that “in cases where the Mission’s objectives are closely aligned to pre-existing European and national policy strategies, and when the introduction of EU Missions has overlapped with national policy planning cycles, faster and deeper integration of Missions with national systems and processes has occurred (e.g. upcoming Soil Directive in the Common Agricultural Policies, the national sustainable cities programmes, the national climate change adaptation plans)”<sup>92</sup>.

International cooperation is necessary for tackling climate change and environmental challenges jointly. In Clusters 5 and 6, three global geographic areas received specific attention: Africa, China, Latin America and the Caribbean. With all three regions, specific Science, Technology, Innovation (STI) cooperation agendas have been set in 2023, enabling cooperation with higher directionality in the coming years. While Horizon Europe set the foundations for cooperation on a level playing field, the strategic approach towards international cooperation still needs to deliver results.

### 5.3. Effectiveness

Assessing the main results and (expected) outcomes and impacts of the Cluster 5 and Cluster 6 projects in terms of achieving the FP objectives is difficult at this stage. As the majority of HE projects launched in 2022 and 2023 will only be completed by 2026 or 2027, it is **not possible to provide a comprehensive assessment of the effectiveness dimension**.

The main findings for effectiveness are the following:

- The evaluation noted that a prominence of knowledge and capacity-based outputs is seen in Cluster 5 (with a stronger focus on testing-, demonstrating- and piloting-based outcomes), as well as for input to policy-based and recommendation-orientated results in Cluster 6 for policy makers, and for knowledge and capacity. A lower prominence of market- and business-oriented and product- or patent-based outputs and results is seen in both Clusters.
- Horizon Europe shows a strong thematic alignment with climate and biodiversity policy priorities, with respectively 26% and 8% of all current HE projects.
- Tensions exist between advancing specific technologies. Potential for lock-ins and a more disorderly Green Transition is only addressed to a limited extent (e.g. Cluster 5).

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<sup>90</sup> Results from the latest BMR survey conducted in 2023.

<sup>91</sup>See: Karo, E., Barajas, A., Sarvaranta, L. et al., Commission Expert Group to support the monitoring of EU missions (2024): “targeted contributions and pooling of significant financial and non-financial resources from the public sector, community actions and private initiatives towards the achievements of the objectives of EU Missions have not yet synergized (p. 5).

<sup>92</sup> Karo, E., Barajas, A., Sarvaranta, L. et al., Commission Expert Group to support the monitoring of EU missions – Final report of the EG, Publications Office of the European Union, 2024, p. 7, <https://data.europa.eu/doi/10.2777/076494>.

Unclear whether long-term targets can be sufficiently met with approach taken and where the absorption capacity of project results is seen as insufficient.

- While complexity and potential for overlaps or duplications of results is seen to exist, the outcomes for Cluster 5 and Cluster 6 are expected to be more visible as compared to H2020. Stakeholder engagement is widely acknowledged as a significant enabling factor for achieving project results.
- The HE monitoring system is seen as insufficient for its intended task. There is a lack of a comprehensive monitoring system for Partnerships to analyse their implementation efficiency and assess progress of the Green Transition. Furthermore, while R&I activity may often not deliver what was expected, it can provide significant learning opportunities. A systematic process to identify and utilise learning from projects that have not progressed or delivered as expected (i.e. poor problem definition, poor execution, or problems inherent in the issue addressed) should be established as this does not exist at present in a structured way.
- Partnerships show evidence of being able to effectively progress towards their objectives. Market implementation challenges for Partnerships should be further addressed.

#### 5.4. Efficiency

**A high level of satisfaction with the application process is exhibited for HE, as well as with the administrative and management processes** (including for the Partnerships). The various changes in processes compared to H2020 are well received. The Framework Programme has also shown **flexibility in relation to project changes**, as well as in adapting project objectives due to changing circumstances or subsequent developments. A broader need for anticipation and foresight of events is observed for Cluster 6. Additionally, certain inefficiencies occurred during the co-design process, due to the administrative burden.

Furthermore, **the complexity of the programme, the size of calls and the difficulty in joining consortia act as barriers to new applicants**, including SMEs. For Partnerships, the lack of alignment with the rest of the programme in Partnerships' application and implementation processes can also create barriers for new applicants, including SMEs.

Overall, **monitoring and evaluation systems are generally improved in comparison to H2020**. Nonetheless, participant data and participations for EIT-KICs, Co-funded Partnerships and third-party funding have yet to be integrated into CORDA.

Finally, **the delegation of programme implementation to the executive agencies has resulted in distancing from policy formation**. Additionally, there is a need to further promote shared activities and learning between projects. Usage rate of Horizon Results Booster and Horizon Results Platforms could be improved.

#### 5.5. EU added value

Concerning EU added value, the study has shown that **added value is identified as one of the programme's key strengths**. Concerning the Green Transition, Horizon Europe offers opportunities for researcher mobility, access to relevant research expertise across Europe, funding opportunities, tackling of insufficiently covered topics at the national level and capacities to address grand societal challenges. Existing regulations and, to some extent, language barriers are negatively impacting EU added value.



The Partnerships and Missions were found to be positioned in areas with high EU added value. They foster collaboration by mobilising relevant stakeholders to implement long-term strategic R&I objectives.

## 5.6. Contribution of the framework programme to the Green Transition

Horizon Europe represents one of the European Commission's key mechanisms for attaining a Green Transition, and climate and biodiversity mainstreaming is respectively required (35% of expenditure) and sought (7.5% and 10%).

Using keyword-based queries, **a strong alignment of Cluster 5 and 6 with the Green Transition was found**, with close to 90% of projects. For Horizon Europe overall, **28% of projects outside Clusters 5 and 6 were thematically aligned with the Green Transition topics. It suggests indirect contributions from the Horizon Europe programme to the Green Transition that go beyond the projects assigned to Clusters 5 and 6.**

Overall, the parts of HE covered by this evaluation, including Partnerships and Missions, highly contribute to the Green Transition. **Horizon Europe addresses emerging themes in each area.** Nevertheless, perceived challenges include policy priority evolutions and the lack of understanding by most stakeholders of what a Green Transition entails and the role of R&I in supporting it. While all Partnerships contribute to the Green Transition by addressing long-term needs, in some cases it was justly found that the Partnership objectives contributing to Green Transition objectives were secondary.

The multi-level perspective approach indicates that projects under Clusters 5 and 6 will contribute to the Green Transition to a similar extent for both Clusters. Anticipated results slightly exceed the results from Horizon 2020. Most projects will contribute to the macro process of 'building and nurturing niches'. **Most Horizon Europe projects are anticipated to contribute to a large or very large extent to the macro-process 'expanding and mainstreaming niches'**, in a similar or better way than in Horizon 2020. Findings are lower for the third macro-process 'opening and unlocking regimes', however, with the contribution of between a third and a half of the projects. While this result is to be expected for an R&I programme focussing on developing and testing new solutions, **it can also be concluded that more research into transitioning processes and abandoning existing rules and practices to achieve the Green Transition is needed.**

## 6. Recommendations

While the Green Transition could be defined as the pathway towards climate neutrality set in the European Green Deal, **there is no official definition of what R&I for a Green Transition entails.** For this study, the study team reconstructed principles that were used during both phases (Horizon 2020 and Horizon Europe). Based on the findings of this study, it is suggested to slightly update these principles:

- **The scope should be expanded**, for instance to cover biodiversity protection, conservation and restoration, resources depletion or zero pollution, **and not limited to a climate focus:** R&I should contribute to the development of technologies and innovations which facilitate all (technological) solutions and respective innovation systems becoming net zero, not generating pollution, and supporting biodiversity and ecosystems protection, conservation, restoration and management.

- **The realisation of a Green Transition depends on all types of innovation**, including those related to social and governance innovation, social sciences, and the humanities. Sustainable alternatives need to be made available now, not only as topics for technological development. While there is a need for more efficient use and effective uptake of existing technologies, there is also a need for other types of innovation, including innovative governance structures and new, more sustainable business models.
- **An inclusive approach towards stakeholders**, and not only producers and consumers **should be sought**: all types of stakeholders (including producers and consumers along the value chains, or public authorities) need to support more sustainable choices. For this, there is a need to provide the required networks and capacities for rethinking and redesigning the incentives to deliver the required behavioural change.
- **Negative externalities to the environment and to society need to be reduced at the same time** to prevent, minimise, or repair damages and ensure higher resource efficiency.

The following sections present the recommendations per evaluation criteria. The recommendations are presented without order of importance.

## 6.1. Recommendations regarding relevance

Against the background of **Horizon Europe exhibiting a high relevance for the Green Transition, the programme must address more complex societal aspects and structural barriers to achieving the Green Transition**. To increase relevance, the study has the following recommendations:

- For broad societal, economic and governance transformations, **mechanisms that better integrate diverse objectives and stakeholder needs are required**. There is a need to give more consideration to vested and competing interests, diverse values and types of knowledge, power asymmetries and unequal capacities among different groups, and fairness regarding the distribution of the Green Transition benefits and burdens. Bottom-up and needs-driven approaches should be further encouraged and supported.
- To engage more diverse groups and better assess inclusivity, **a more granular monitoring of participation from different types of stakeholders (such as private companies, financial institutions, civil society, business associations, local and national authorities) should be considered**. Consistent, programme-wide mapping of target groups and vulnerable groups should be established. There is a need to better recognise unique agendas of different actors, as well as their distinct capacities and potential to play a transformative role in delivering on the Green Transition priorities.
- It is necessary to **enhance policy relevance and improve responsivity between the R&I domain and sectoral policymaking**, including a focus on new regulations, standards, and norms. More iterative and dynamic policy feedback mechanisms are needed to address gaps in framework conditions and consider societal readiness and market readiness.
- To ensure the programme is **more responsive to rapid developments and changes**, there is a need for mechanisms to dynamically monitor and match changes in specific areas to programme topics (tagging technological areas undergoing rapid development,

deciding on types of external changes that should trigger response, systematising response strategies and tactics, using iterative inputs based on strategic intelligence), and to accommodate such changes within projects in a timely manner. This is particularly important when this might enhance project relevance and potential to generate meaningful impacts without creating excessive burden on the consortia.

- Horizon Europe should more explicitly focus on robust, adaptive, and place-based solutions, provisioning systems, shifts in global value chains, new ways of living and collective action. More systematic programme-wide efforts are needed to tackle wicked challenges, deep uncertainty, governance fragmentation, policy failures, geopolitical tensions and conflicts, rapid change, and future resource scarcities and constraints. **More consideration should be given to the proper mix of phasing-out activities, upscaling of necessary industries and down-scaling of the types of activities that are not compatible with the desired futures.**
- There is a need for more explicit and strategic measures that detail how the different programme components, including the European Partnerships and Missions, should develop international collaboration in the Green Transition area, given broader transition challenges and needs. Considering the increasing impact of climate change in Africa and the Americas it is important to promote projects led by participants from these regions. **International cooperation with third countries in Horizon Europe should be strongly and further encouraged to foster EU leadership in relevant areas.**

## 6.2. Recommendations regarding coherence

The **internal coherence of the Framework Programme is high**. However, the study identified several action points that deserve further attention:

- To increase the internal coherence of activities in Cluster 5 and 6 with other parts of the Framework Programme, mechanisms need to be put in place that **support joint cross-Cluster activities and increase knowledge valorisation between the different pillars of HE**. Synergies between the Clusters' activities and the MSCA, the ERC, and the EIC still need to be leveraged.
- The Framework Programme should establish mechanisms for **enhancing Horizon Europe's thematic project portfolio management** as a pre-requisite for creating better synergies among the different parts of the programme. With an emphasis on Cluster 6, the work of the JRC has demonstrated how such an approach could be intensified in the future. Within such thematic portfolio management, a systematic alignment of technological and scientific advances with social processes should be considered, to increase the coherence of R&I advancements with a systems perspective.
- To allow for better monitoring and portfolio management, the main project funding database, CORDA, needs to integrate project data from all implementation modes (including Co-Funded Partnerships and EIT KICs).

The **external coherence in the area related to the Green Transition and other funding programmes has scope for improvement**:

- There is a **need to increase active coordination between Horizon Europe and other EU funding programmes and strategically link Horizon Europe activities with other**

**funding mechanisms.** Opportunities for deployment, upscaling and replication of solutions should be anticipated and monitored. This is especially true for the Missions.

- The Horizon Europe Missions articulate objectives that are highly complementary to the activities at the Cluster level. In their conceptualisation, the Horizon Europe Missions provide stronger linkages to the national and regional levels, focusing on leveraging behavioural change and reaching the mission targets. This is not reflected in the type of activities funded by the Horizon Europe Mission Calls. On the one hand, there is a need to more strongly differentiate activities funded by the Missions from the rest of the work programme, while on the other hand there is also a need to create synergies between Horizon Europe Missions (and other Horizon Europe activities) and other EU funding programmes and Partnerships. More thought and weight in this regard should also be given to the challenges and opportunities influenced by differences in the economic structures of the EU Member States. This includes their diverse capacities to incorporate new technologies into existing infrastructure.
- The rationalisation of the Partnership landscape, including the creation of the Co-Funded Partnerships, contributed to multiannual commitments of the participating EU Member States and increased the coherence of effectively engaging and collaborating across EU-Member States. To enhance the co-creation between the **Co-Funded Partnerships** (as an instrument owned by the Member States) and the European Commission, a **platform for enhancing strategic dialogue** should be set up.

### 6.3. Recommendations regarding effectiveness

The following recommendations are identified for a more effective contribution to the FP objectives, EU priorities and SDGs from the results and anticipated outcomes of HE:

- Although the FP has advanced in relation to the requirements of the Green Transition over time, the achievement of the most effective results and outcomes for the Green Transition will require HE and its R&I to have a broader influence. The **governance of HE could further align itself across broader policy areas and organisational boundaries (while appreciating the internal co-creation process that has been introduced in HE).**
- In addition, as the current approach is not universally seen as being able to achieve the long-term targets, and where a sufficient degree of emissions reductions through decarbonising the supply side may not be seen within the necessary time horizons, more attention should be given to demand-side measures **of the energy transition.**

Recommendations for addressing or enhancing the following specific internal and external factors that are seen as being able to influence progress are also identified, as well as improvements for the dissemination and exploitation activities within HE:

- As the broad extent of the calls and topics within both Cluster 5 and Cluster 6 encompass multiple different instruments, and where this may dilute or reduce the results and overall outcome focus, **assessment and specialisation of the instruments could help to reduce complexity and the risks of overlaps and duplications.** Furthermore, as stakeholder engagement is widely acknowledged to be a significant enabling factor in the achievement of project results, there is a broader need to further incorporate the complexity and differences in perspectives among different stakeholder groups when it comes to the Framework Programme objectives so these can be more comprehensively included.

- **Increasing the absorption capacity for project results by relevant stakeholders is identified as a particular challenge.** There is a need to process the results more comprehensively, better inform future and wider activities, and enhance overall impact. The organisation of targeted online events and workshops could offer a potential way to foster enhanced knowledge exchange, networking, and collaboration among stakeholders and to help enhance absorption capacity.
- The **Horizon monitoring system could be strengthened** as this is seen by some stakeholders as insufficient for its intended task: it is not able to spot the TRL levels and indicate how far the development of critical technologies is in line with the requirements of a 55% reduction scenario, and it is unable to indicate the extent to which a technology will reduce costs for industry, etc. But it should be noted that this degree of monitoring may not be realistic. Reliable cost assessments would require access to (and disclosure of) confidential business data and furthermore a highly sophisticated level of modelling would be necessary. Furthermore, while R&I activity may often not deliver what was expected, it can provide significant learning opportunities. A systematic process to identify and utilise learning from projects that have not progressed or delivered as expected (i.e. poor problem definition, poor execution, or problems inherent in the issue addressed) should be established, as this does not exist at present in a structured way.
- While in overall terms the Partnerships are seen to have been managing to address relevant stakeholders and put forward joint R&I agendas and roadmaps (e.g. particularly in developing areas such as hydrogen and the circular economy), there is still a margin for **improving the knowledge management and presentation and capitalisation of project results.** Although it should be noted that the Partnerships have established various mechanisms for participation to increase the involvement of new members, engage a broad landscape of stakeholders, and to allow for feedback loops.

#### 6.4. Recommendations regarding efficiency

Against the background of an overall positive evaluation for efficiency, the study identifies the following points where improvements and enhancements can be made:

- The **co-design process should be streamlined** by building efficient coordination mechanisms and shared ways of working, as well as assessing when increased dialogue is necessary and how many actors to involve (without undermining the benefits of this coordination process). Additionally, particularly for Cluster 6, it should be ensured that the programme is flexible in response to current events, without undermining the initial Green Transition objectives of the FP (for instance, energy security versus energy transition).
- While the administrative and management processes are broadly rated as favourable for Horizon Europe and the Partnerships, **the application and reporting procedures for the Partnerships are seen as burdensome**, particularly for co-funded Partnerships. They should be **simplified and aligned, to the extent possible, with the rest of the Framework Programme.** An improved coordination between the EC and the Partnerships should be established in work programme preparation.
- **The participation rates of new applicants, in particular SMEs, should be enhanced.** Their participation could be facilitated through improving the understanding of the FP by new applicants and simplifying the FP, reducing the size of calls or focusing on specific

topics where the relative size of SMEs is not a disadvantage, and further measures to facilitate new applicants joining established networks (for consortia building).

- Although the monitoring and evaluation systems have improved in comparison to H2020, participant data and participations for EIT-KICs, Co-funded Partnerships and third-party funding have yet to be **integrated into CORDA**. Furthermore, steps should be taken to improve the usage rate of the Horizon Results Booster and the Horizon Results Platforms.
- There is a need to **improve linkages of project results between different parts of the Framework Programme and with policy formation**, as the projects are no longer managed by the EC (which formulates policy). To do so, coordination and support actions could be developed for the different Destinations with the objective of sharing results across projects and with policy makers. Capacity building and engagement with young researchers and PhDs could also be considered more systematically within the Framework Programme and its projects.

## 6.5. Recommendations regarding EU added value

Against the overall positive findings concerning EU added value, the following points deserve further attention:

- While the Green Transition is a global challenge, solutions must also be provided at a national, regional, and local level. The wide realisation of benefits across the EU requires learning and adaptation across EU Member States. However, the distribution of countries' participation is often skewed, with rather limited participation from Member States in Central and Eastern Europe.
- **The capabilities and needs of different countries and regions should be better considered.** This applies especially to Cluster 6, as many activities and outputs are location-specific, e.g. specific resources from land, coast, and industrial residues are used in local value chains, partly underlying specific national regulations. Replicating solutions to other contexts and regions is an important task often missing.
- To increase EU added value in European Partnerships, the inclusion and participation of countries in Central and Eastern Europe is still a challenge, and remedies for all types of Partnerships should be developed. Also, in the Horizon Europe Missions, solution replication and upscaling should occur at the Member State level. Mechanisms that increase the adoption of solutions in different regions should be fostered in the Horizon Europe Missions and Partnerships.
- According to the Commission Expert Group to support the monitoring of EU Missions<sup>93</sup>, beyond traditional engagement practices as part of policy making and implementation of Horizon Europe-funded and similar projects, **citizen and stakeholder engagement in the implementation of EU Missions is rather limited** and requires further elaboration and conceptualisation.

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93 Karo, E., Barajas, A., Sarvaranta, L. et al., Commission Expert Group to support the monitoring of EU missions – Final report of the Expert Group, Publications Office of the European Union, 2024, p. 9, <https://data.europa.eu/doi/10.2777/076494>

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This report presents the findings and conclusions of the second phase, on Horizon Europe, of the evaluation study on the European Framework Programmes for Research and Innovation for addressing Global Challenges and Industrial Competitiveness – Focus on activities related to the Green Transition.

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