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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

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

EU Missions two years on: assessment of progress and way forward

{COM(2023) 457 final}

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This Staff Working Document is organised as follows:

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  This part presents key insights to the assessment of the five EU Missions (from paragraph 1 to paragraph 6 of each Mission-specific chapter). In addition, each Mission secretariat has developed additional evidence which is presented under paragraph 7 'self-assessment'.

- **Part II: Review of the five Mission Areas**
  The five Mission Areas are those identified in Annex VI of the Horizon Europe Regulation. The analysis presented in this part is underpinned by an externally produced study

- **Part III: Review of the areas for institutionalised partnerships based on Articles 185 and 187 TFEU**
  The eight areas for possible institutionalised European partnerships established pursuant to Article 185 or 187 TFEU. The analysis presented has been elaborated by the European Commission on the basis of the methodology developed by the expert group on support of the coordinating strategic process for European partnerships (2023).

- **Annex A**: Methodology for the assessment of EU Missions

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I. Assessment of EU Missions

The EU introduced Missions as a new initiative in Horizon Europe. Subsequently, Mission boards, consisting of top independent experts, were appointed to elaborate visions for the future and concrete goals in five areas:

- Mission Area 1: adaptation to climate change including societal transformation;
- Mission Area 2: cancer;
- Mission Area 3: healthy oceans, seas, coastal and inland waters;
- Mission Area 4: climate-neutral and smart cities;
- Mission Area 5: soil health and food;

Starting in autumn 2019, five foresight on demand projects supported the work of the Mission boards with foresight expertise and methodology [(1)]. Based on proposals that the Mission boards handed over to the Commission in September 2020 [(2)], five Missions were identified in the Horizon Europe Strategic Plan:

- Adaptation to Climate Change;
- Cancer;
- Ocean, Seas and Waters;
- Climate Neutral and Smart Cities;
- Soil Health and Food [(3)].

On 29 September 2021, the European Commission adopted a Communication on EU Missions [(4)], which are a new and innovative way to tackle big challenges in health, climate and the natural environment, and achieve ambitious and inspiring goals in these areas.

Since then, Missions went through a preparatory phase during which detailed implementation plans, including objectives, budgets and indicators, were developed. EU Missions succeeded in preparing three Horizon Europe Missions' work programmes to ensure fast roll-out of their actions. They engaged with policy actors, citizens and stakeholders, ensuring that their efforts can tap into existing initiatives and networks at EU, national and regional level. At the same time, new governance structures were put in place to steer the implementation of the Missions.

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(1) The foresight reports for Missions in Horizon Europe are available here.

(2) The reports delivered on 22 September 2020 can be found here.

(3) Some official titles have, since, changed. The consolidated titles of each Mission are as follows Adaptation to climate change: support at least 150 European regions and communities to become climate resilient by 2030; Cancer; Restore our oceans and waters; 100 climate-neutral and smart cities by 2030; A soil deal for Europe: 100 living labs and lighthouses to lead the transition towards healthy soils by 2030.

(4) COM(2021) 609 final.

1 OVERALL AIM OF THE ASSESSMENT

As formulated in the Horizon Europe Regulation (Article 8.5): "An assessment of the first Missions established under the Programme shall take place no later than 2023 (…). The results of that assessment shall be made public and shall include, but not be limited to, an analysis of their selection process and of their governance, budget, focus and progress to date".

The evidence underpinning the assessment of EU Missions presented in this chapter has been gathered in the context of an externally procured study. The overall approach and methodology used in the study are presented in Annex A of this Staff Working Document.

The structure of each Mission-specific chapter is organised around the following dimensions:

1. The Mission's goal and objectives;
2. The selection process of each EU Mission;
3. The Mission's governance structures and functioning arrangements;
4. The progress towards the fulfilment of the Mission's objectives;
5. The Mission' s budget and funding arrangements.

In addition to the analysis and evidence carried out in the context of the external study, **each Mission secretariat has developed additional evidence which is presented under the paragraph 'self-assessment**'. Each Mission-specific paragraph therefore complements the assessment analysis developed through the external study and is organised around the initial 'Mission selection criteria' [(5)] used for selecting the initial 5 EU Missions.

The self-assessment section is organised as follows:

1. An ambitious yet realistic Mission goal;
2. The Mission's added value;
3. The Mission's R&I content;
4. Ensuring implementation is feasible, measurable and time-bound;
5. Securing buy-in;
6. Citizens and stakeholder engagement (this criterion was added at a later stage);
7. Progress, achievements and milestones ((this criterion was added at a later stage);
8. Budget.

(5) https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/assessment-criteria_en

The data related to the Missions' calls presented in this Staff Working Document can also be accessed via the Horizon R&I projects Dashboard [6]. By the end of 2023, this framework will be completed with some additional monitoring indicators and will integrate the data stemming from the R&I projects that have been identified as relevant for the Missions.

The external study underpinning the assessment of EU Missions

An external contractor carried out a study (EFIS; RTD/2022/SC/022)[7] to provide evidence to help the Commission assess the selection process, the governance structure, the functioning arrangements, the policy focus, progress and funding arrangements of the 5 EU Missions. In particular, **the study collected and analysed views and feedback from different stakeholder groups, governance levels, individual Missions, and actors who contributed to the design and implementation of Missions**. Consultations included targeted interviews, an online survey and Mission-specific policy workshops. The publication of this study is foreseen for the summer 2023.

A detailed description of the methodology used for assessing the EU Missions is provided in Annex A.

[6] Qlik Sense (europa.eu)

[7] Study supporting the assessment of EU Missions, the review of Mission Areas and the analysis of EU Missions' portfolio of instruments and actions – RTD/2022/SC/022. Specific Contract under the Multiple Framework Contract N° 2018/RTD/A2/OP/PP-07001-2018.

2 ADAPTATION TO CLIMATE CHANGE: SUPPORT AT LEAST 150 EUROPEAN REGIONS AND COMMUNITIES TO BECOME CLIMATE RESILIENT BY 2030

EU ADDED VALUE

- A **climate emergency** has been recognised by the European Parliament, by several Member States, and by over 300 cities.
- The **European Council** has concluded that climate change is "an existential threat".
- At individual level, **over 93% of Europeans** consider that climate change is a serious problem, and 70% agree that adapting to climate change is positive.
- The **European Climate Law** writes into law the goal set out in the European Green Deal and provides for stronger provisions on adaptation to climate change.
- Compared to the other measures under the **EU Adaptation strategy**, the Mission adds the **direct contact with the regions and municipalities** that need to take decisions on the ground leading to preparedness and resilience.
- The Mission is a key contributor to the objectives of **a climate resilient Europe** and the **EU strategy on Adaptation to Climate change.**

CITIZEN AND STAKEHOLDER ENGAGEMENT

- The Mission organised a **Sounding Board with regions, co-organised with the European Regions and Innovation Network, ERRIN**, to understand the needs and challenges regions are facing when planning adaptation actions.
- The annual Mission Forum is a governance element of the Mission, explicitly aiming at engaging the regions participating in the Mission and giving them a say in the steer of the Mission
- The Mission's **community of practice** with systematic and frequent gathering of regions and municipalities from throughout Europe leads to many fruitful exchanges, inspirations, and a voluntary experience of self-benchmarking.
- 308 regional and local authorities from 25 Member States have signed the Mission Charter and represent roughly **40% of the EU population**.
- The **Climate Resilience Dialogue is a means of engaging European Insurers** and bringing them in contact with regional and local administrations.

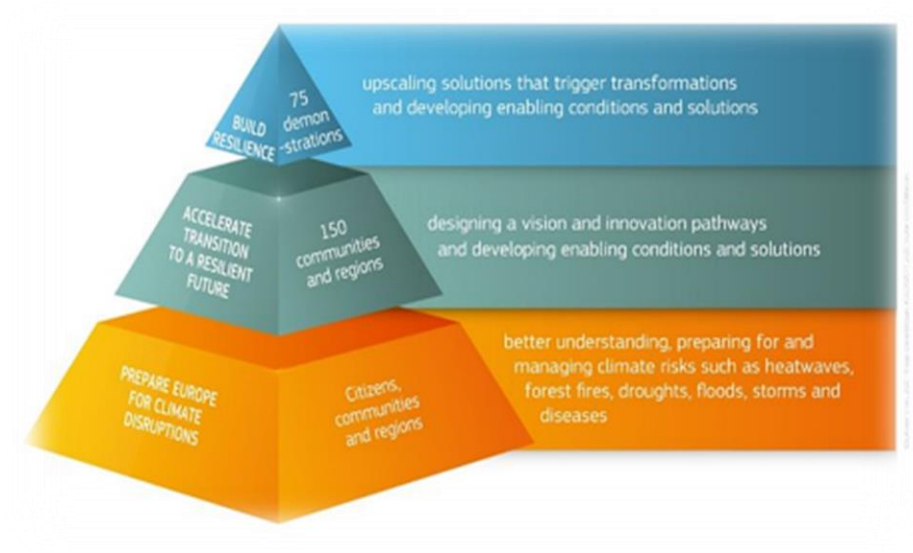
LEVERAGING FUNDING AND GENERATING IMPACT

- The total budget for the first three years in the **Horizon Europe** Adaptation Mission work programme is about **EUR 360 million**. There are other calls addressing the Mission, such as the Cluster 5/6 work programmes and the Research Infrastructures Programme. This adds another **EUR 92 Million EUR** in the period from 2021 to 2023.
- **The LIFE Programme** has a dedicated section for projects addressing adaptation. For the years 2021 to 2024, additional projects worth **EUR 167 million** are expected.
- Links are being established with the **European Urban initiative** and the **Digital Europe programme.**
- By 2025 the Mission will already have been supporting **more than 150 regions.**
- The **Mission Implementation Platform** will from 2023 to 2025 provide technical assistance to at least 200 regions (up to 14 days per region).
- Several projects aim at **demonstrating or testing adaptation solutions**. For example, improving resilience of the infrastructures in the Piraeus Port, reducing the vulnerability of the Canary Islands aquifer system.
- **The recently adopted new Spanish Adaptation Strategy refers to the Mission** and thereby invites Spanish authorities to consider the Mission when using Structural Funds.
- **Around 130 running projects with research & innovation content relevant for the Mission from Horizon 2020, Horizon Europe (other than the Mission work programme), LIFE and Interreg have been identified**. The Mission Implementation Platform will make available to the European regions the knowledge and solutions developed by these projects.
- The Mission on Adaptation to Climate Change develops **joint activities with the European Cohesion policy**. The Mission has already had a joint initiative with DG REGIO and the EIB on financing adaptation in regions.
- The new **EIB Climate Adaptation Plan** (October 2021) is based on the EU Strategy on Adaptation to Climate Change. It refers to the Mission to enable the first objective of the Strategy, namely Smarter Adaptation.

2.1 Mission goal and objectives

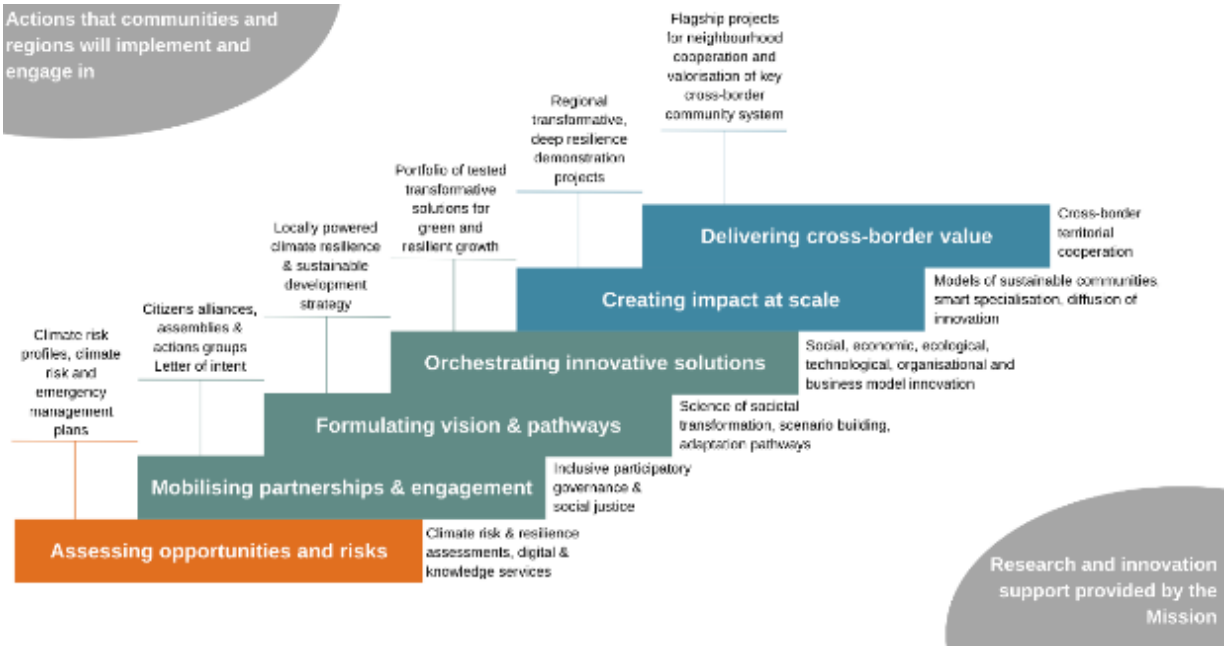
The Mission's overall goal is to **support at least 150 European regions and communities to become climate resilient by 2030**. The Mission is organised around three objectives and six steps.

Figure 1: Mission Climate Change Adaptation objectives



Source: (EC, 2021a)

Figure 2: Mission Climate Change Adaptation intervention steps



Source: (EC, 2021a)

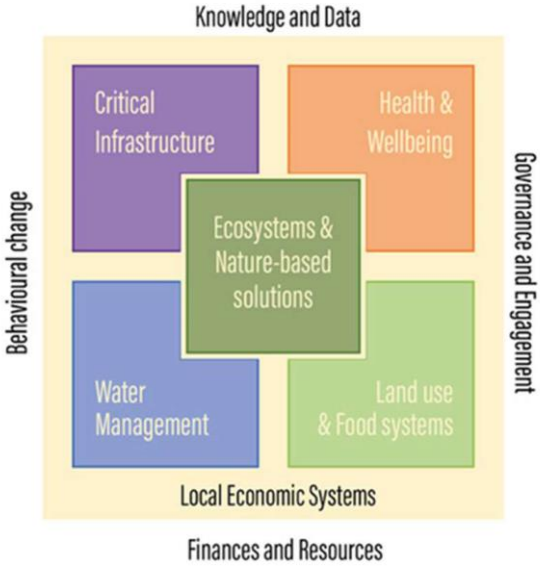
2.2 The Mission's selection process

The Mission implementation plan was prepared in 2020-2021 by the EC based on the Mission board report. Two main changes are visible in the move from Mission board report to Mission implementation plan:

1. The Mission title **did not feature any longer the term 'including societal transformation'**. While still retaining the ambition of deep transformation of key areas, the scope was somewhat narrowed down with references to cultural heritage or poverty alleviation skipped in the Mission definition. According to interviews, the drop of 'societal transformation' from the title was justified by its vagueness, the risk of dilution beyond an already broad concept of resilience and a perceived lack of suitability for communication purposes. Nevertheless, the ultimate ambition of the Mission still fits with a 'systemic transformation' frame, and the key features of the implementation plan reflect this ambition, in particular the focus on transformative pathways and the acknowledged contribution of social science and humanities.
2. The target number of 200 resilient communities and regions was changed to 150 and the number of expected deep demonstrators from 100 to 75. This was justified by an uncertainty regarding the number of regions and communities which would want to subscribe to the Mission goal, to ensure the setting of a realistic target and account for the evolution of the budget allocated to the respective Missions as the figures were revised downwards from the initial figure (EUR 1 billon per Mission).

The Mission's scope is defined around **five key areas of innovation and transformation** or key community systems and **four enabling conditions** (the elements outside of the blocks).

Figure 3: Scope of the Mission



Source: (EC, 2021a)

There are various ways to categorise the key community systems relevant for Adaptation to Climate Change. The Intergovernmental Panel on Climate Change (IPCC) organises its analysis around six key systems (IPCC, 2022):

- Terrestrial ecosystems;
- Oceans and coasts;
- Water;
- Food;

- Cities and settlements;
- Health;
- Poverty and livelihoods.

The categorisation used by IPPC and other bodies overlap significantly: the experts interviewed in the context of the external study that are experts in Adaptation to Climate Change converge in **assessing the Mission scope definition as relevant** [8].

The Mission definition pays important attention to the **diversity in situations and capacities** and to unequal preparedness levels with respect to Adaptation to Climate Change across EU territories: it has an explicit focus on territorial cohesion, in an effort to provide equal opportunities for regions and local communities across the European Union.

The various activities deployed by the Mission Board for the preparation of the Mission have ensured a **transparent and open process**, with wide consultations beyond expert circles. Governance structure and management arrangements

2.3 Management arrangements and governance structure

Horizontal governance across EU-level bodies

At EU level the Mission governance structure, under the responsibility of the European Commission (EC), follows the **standard set-up foreseen for all Missions**. It includes the following bodies:

- A Mission manager (DG CLIMA) and a deputy Mission manager (DG RTD);
- A Mission secretariat in DG CLIMA, as a joint team bringing together staff members from DG CLIMA and DG RTD;
- A second Mission board appointed in September 2022, continuing the work of the first Mission board appointed in 2019 with a renewed focus on implementation;
- A Mission implementation platform (MIP) contracted in January 2023 after public procurement procedures and reporting to the Mission manager;
- A Mission owners group composed of representatives from different DGs ensuring co-ordination within the Commission for the implementation of the Mission and its links with various other EU policies (see below);
- The European Climate, Infrastructure and Environment Executive Agency (CINEA) in charge of implementing programmes under the EU Green Deal;
- The Strategic Programming Committee (SPC) of Horizon Europe working group in charge of climate change adaptation;

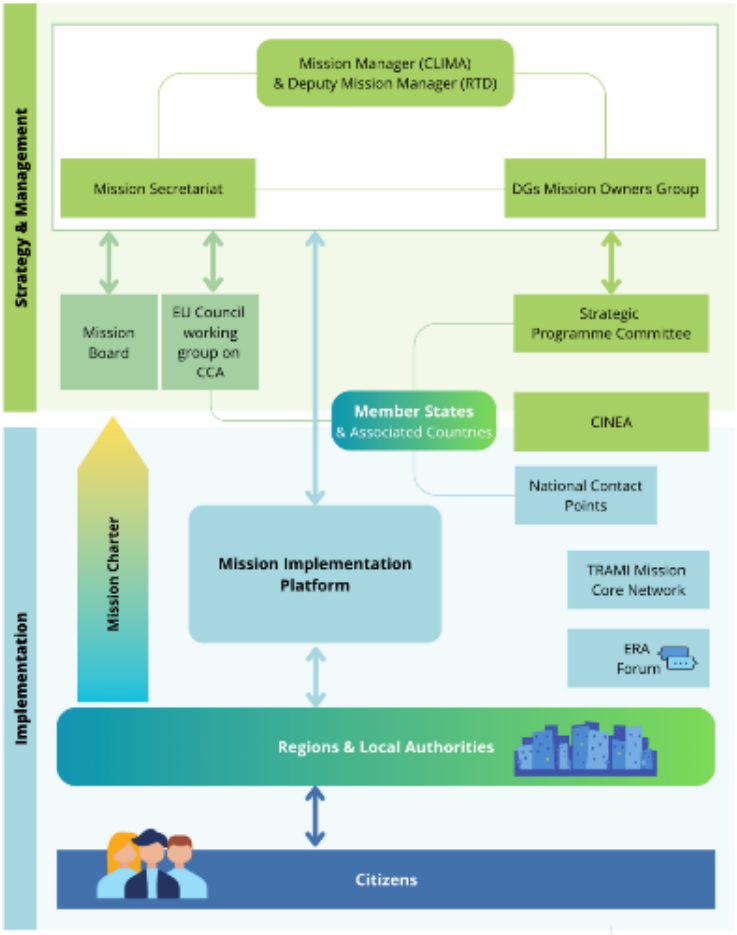
[8] See report on the review of Mission Area, which includes more details and a discussion on the ways the scope of climate change adaptation has been defined in various other organisations.

- The Council working group on climate change adaptation.

Concerning networks with Member States, the Mission Adaptation to Climate Change **does not have a specific network of national authorities** similar to e.g. the Cancer Mission hubs. However, at a meeting of the European Environment Information and Observation Network (EIONET) [9] in September 2022, the possibility was explored as to whether EIONET, as an already existing network of national authorities, could act a national relay for the Mission and inform the Mission governance about relevant national initiatives. This collaboration has not been formalised yet.

As for linkages with regional and local levels and broader communication, there is **no formal new body** established under the Mission. Rather, in addition to the MIP, the Mission organises annual fora, which are considered by the Mission secretariat as a governance instrument of the Mission.

Figure 4: Governance structures for the EU Mission Climate Change Adaptation



Source: EFIS study

Cooperation between DG RTD and DG CLIMA has been fostered since the start of the Mission with responsibility for the Mission allocated to those two DGs, with DG CLIMA

[9] https://www.eionet.europa.eu/

in lead. As foreseen in the EU Mission model, recognising the need for cross-domain cooperation for the success of Mission s, efforts are being made to further **stimulate inter-service coordination** through a newly established Mission owners group. An extensive work plan has been agreed recently (December 2022) with the different services in this group. It may though be hard to assess whether this is working in practice as the Mission has only been recently launched and that the implementation plan is rather wide. This being said, an opportunity exists to strengthen the co-ownership within the Commission and for the identification and creation of synergies across programmes. There is a need to maintain high level endorsement of this type of work in the DGs.

For example, the external study underpinning the assessment of the EU Missions pointed to the need to further strengthen the relationship and the collaboration with DG REGIO. The study did however recognise that the somewhat weaker link with the Directorate General for regional and urban policy is possibly due to its different mode of operation (cohesion policy being under shared management with Member States, unlike Horizon Europe and other relevant Commission programmes).

In addition to cooperation across Commission's DGs, cooperation with two other EU bodies is developed by the Mission:

- The Mission is tightly linked to the European Environmental Agency (EEA) running the Climate-ADAPT platform, the authoritative source of knowledge on climate change adaptation for the EU. Under a service level agreement between the Commission and the EEA, the MIP is hosted on this existing platform and the maintenance of the knowledge base remains the responsibility of the EEA. This linkage is a strong asset for the Mission as the platform is already well known by the climate change adaptation community and populated with a wide range of data, methodological tools, examples, country profiles, etc. Its extension to regional and local authorities is funded with new resources allocated to EEA. The MIP intends to work in close relationship with EEA experts, which is a commendable orientation.
- The European Investment Bank (EIB), currently working on developing its offer of adaptation finance: adaptation financing workshops are organised to facilitate financial support to demonstration in the field of adaptation to climate change. This cooperation is welcome as it addresses one of the identified enablers for the Mission the availability of adequate finance, which is suited for investments with long term perspective and a large degree of uncertainty.

Finally, there is an acknowledged **need for cross-Mission collaboration**, in particular between the Climate Neutral Cities and the Mission Adaptation to Climate Change. There is a good rationale for this: cities often develop strategies covering both mitigation and adaptation and there are synergies to be reaped by considering the two jointly, enhancing co-benefits. Facilitating these interactions is one of the tasks assigned to TRAMI, which has begun to operate recently. To foster such interactions, a joint call has been launched between two Missions (Climate Change Adaptation and Cities) in the second wave of calls in 2022, however no proposals were submitted for this call.

Vertical coordination

Vertical coordination mechanisms, between the EU-level Mission endeavour and national, regional and local levels of authorities, **should be reinforced to ensure an in-depth multiplication of the Mission's efforts at these levels**.

The external study analysis suggests deepening the work of the following two bodies, to ensure the needed vertical coordination with national authorities [(10)]:

- The Horizon Europe programme committee Mission Adaptation to Climate Change. This Committee consists of representatives of national research ministries;
- The Council working group on climate change adaptation. This working group consists of those national ministries responsible for adaptation to climate change.

However, **Managing Authorities do not have direct connecting points with the Mission**, although they have a potentially important role given the significant amounts of funding potentially available to support the Mission within cohesion policy funds.

The Mission generates three **new roles for regional and local authorities**, as the Mission's primary target group:

- Actors in R&I activities through "participatory action research";
- Users of research and innovation outcomes;
- Programmers and funders of R&I actions.

The process of charter signatories officialises this role and brings it well beyond Horizon Europe as support for adaptation to climate change is also expected to come from other sources. The orientation of Mission calls also highlights this role, making their participation mandatory. In line with the focus on territorial cohesion, participation is fostered both for advanced and lagging territories.

Stakeholders' involvement and participation

The Mission has a **strong focus on communication and awareness raising**. Notably, the first Mission board's work had a remarkably strong emphasis on communication activities through numerous events in Member States. This is notably due to the relative novelty of climate mitigation, a situation justifying intensified efforts. Many debates and interactions with stakeholders (networks) took place during the Mission preparation.

The analysis conducted in the context of the external study identified three possible degrees of participation of stakeholders that depends on their understanding of the Mission:

- A funding programme under Horizon Europe: it is likely that many stakeholders outside the inner circle of 'Mission insiders' understand the Mission only through the dedicated calls (and later the MIP when its activities start to roll out);

[(10)] The ERA Forum may also be mentioned, however it is not specifically oriented towards individual Missions' work.

- A funding programme under Horizon Europe, which uses a different, participatory research approach;
- The creation of a climate adaptation knowledge base driven by the specific needs of EU territories rather than by scientific questions;
- A participatory experimentation and learning platform fostering exchanges between regional and local authorities on the creation and use of knowledge as well as on experience and practice around climate change adaptation (a 'community of practice').

No evidence has been found on significant private sector participation in the Mission. **This is understandable,** as contrary to the mitigation area where large incentives and new markets exist for carbon-reducing technologies, products and services, **the 'adaptation economy' is much less visible**. A tradition of public sector-driven initiatives in the context of disaster risk management is not conducive to strong commitment by businesses, despite the fact that climate change adaptation aspects are increasingly taken into account in the building and infrastructure sectors (with climate-proofing requirements). Companies are likely to become interested in the Mission through the testing of pilot solutions and the deployment of demonstrators.

Citizens' involvement took place through events during the preparation of the Mission. Involving citizens further at strategic level for the Mission as a whole does not seem justified at this stage and the majority of the external study survey respondents are of the opinion that it is unclear how to involve them. Opportunities for new strategic involvement will emerge when more visibility will be given to projects reaching first results in various territories. In the meantime, some Mission projects focus specifically on methods to involve citizens in climate change adaptation planning and action (e.g., the CLIMAS project [(11)]).

2.4 Progress to date

Hard evidence on Mission implementation relates to the core Mission actions (Mission calls, MIP and charter signatories) which already cover the various objectives and steps foreseen in the Mission implementation plan. Notably, **the Mission calls under Horizon Europe already address the six steps.** The diversity in terms of level of advancement of regions and local communities across Europe is recognised. Hence, not all territories need to follow the six-step journey, and some can work right away on deep demonstrators foreseen in step 5.

The target of 150 regions and communities supported in their transformative journey towards resilience is within reach thanks not only to the large number of regions and communities already beneficiaries of projects, but also to the multiplying effects incorporated in the funded Mission projects through e.g., cascading grants [(12)] and the work

[(11)] https://cordis.europa.eu/project/id/101094021.

[(12)] Some projects, such as PEERS, committed to support 100 regions.

of the Mission Platform (MIP), which has resources to provide technical assistance to at least 200 regions (up to 14 days per region).

Table 1: Progress towards objectives and steps of the Mission Adaptation to Climate Change

Mission Objectives	Mission Step	Mission calls under Horizon Europe	Mission Charter and Implementation Platform
OBJECTIVE 1: Preparing and Planning for climate resilience	STEP 1: Better understanding of climate change related risks	Good progress: projects are currently addressing this step, including substantial financial, analytical and practical support to regions and communities to develop and improve their climate risk assessments; promotion of the use of asset level modelling to achieve a better understanding on climate related tangible direct and indirect impacts produced by complex, cascading and compound disasters.	Regions and local authorities are mobilised and resources will be made available and technical assistance provided. Material on the Climate-ADAPT platform will include regional/local usable information on risk assessments, adaptation planning, citizen engagement and systemic transformation. Relevant material will be translated in EU languages.
OBJECTIVE 2: Accelerating transformations to climate resilience	STEP 2: Mobilising support and engagement	Good progress: projects address the development of blueprints for effective decision making and collaborative processes building on the dialogue among stakeholders and on the integration of different types of knowledge, providing toolboxes and good practices for citizens' engagement in climate change action and build up citizens` supporting infrastructure for climate change adaptation measures. The extent to which the projects can contribute to the development of adequate governance structures at local and regional levels is not clear. Further research could be useful on what constitutes an optimal climate change adaptation governance structure, and how to articulate it with other levels of climate change adaptation governance (ex. National).	The Charter Signatories reach 301 entities, covering approximately 40% of the EU population. The MIP has a role to play in documenting and sharing information about existing governance structures, how they are being strengthened to address climate change adaptation and how they are articulated with other governance structures. The general communication work of the MIP and the Mission board will contribute to mobilisation.
	STEP 3: Formulating a vision and transformative pathways to climate resilience	Good progress: a number of projects are currently addressing this step, supporting actors to develop a Regional Resilience Journey framework, providing supporting services to equip regions and communities in developing climate resilience pathways and connected innovation agendas. Quality of resilience plans should be fostered trough this support. One project is developing an indicator set for measuring regional resilience.	Resources will be made available in the MIP to support capacity building in regions and local communities for building resilience plans, both generic and specific for these actors (limited number of days for tailor-made advice).
	STEP 4: Orchestrating	Good progress: a number of projects are currently addressing this, e.g. pilot	Resources will be made available in the MIP to support

Mission Objectives	Mission Step	Mission calls under Horizon Europe	Mission Charter and Implementation Platform
	innovations and testing transformative solutions	regions will constitute the co-production arena to co-design, co-develop and complement climate change adaptation solutions: they are experimenting pilot solutions in the various intervention areas of the Mission.	access to, and diffusion of climate change adaptation solutions, as well as promoting exchanges between regions involved in climate change adaptation projects, funded by the Mission and beyond. The MIP and the Mission board will also play a role in supporting the identification of funding sources for pilots.
OBJECTIVE 3: Demonstrating systemic transformations to climate resilience	STEP 5: Creating impact at scale	A number of projects are currently starting with establishing deep demonstrators in regions and communities, aiming at the transformation of key community systems, transferring lessons and practices to 'twinning' and 'following' regions. However, co-funding for large scale deployment needs to be secured.	Resources will be made available in the MIP to support access to, and diffusion of climate change adaptation solutions, as well as promoting exchanges between regions involved in climate change adaptation projects, funded by the Mission and beyond. The MIP will support accessing large funding sources for deployment of demonstrators. Work with EIB will help upgrade the offer of adaptation finance.
	STEP 6: Creating cross-border value	Not yet explicitly addressed by calls, but possibly incorporated in funded projects.	Resources will be made available in the MIP to support access to, and diffusion of climate change adaptation solutions, as well as promoting exchanges between regions involved in climate change adaptation projects, funded by the Mission and beyond.

Source: EFIS study based on desk research

The external study analysis suggests strengthening the message that adaptation **to climate change is a process**. In this perspective, actions implemented in the 'core' of the Mission (the specific calls, the MIP and the charter process) address the need for raising awareness of climate change adaptation; building a better understanding of climate risks and impacts at the local level; developing adequate governance and mobilising for climate change adaptation and, on this basis, developing strategic frameworks leading to implement pilot and bold transformative actions. However, the Mission's 'core' actions only cover the 'tip of the iceberg': **mainstreaming climate change adaptation in a large number of programmes, funding lines and other actions remains a major task going forward** for the Mission to reach its goal of at least 150 regions and communities *becoming resilient* to climate change.

> *"Given high levels of uncertainty and the nature and scale of current challenges, there will be no silver bullet. R&I policy generally, and enabling structures for Missions specifically, need to see innovation less as an activity of generating static solutions with discrete deliverables and more*

> *as a continuous learning and intelligence generating exercise to support decision-making and civic engagement through innovation options"* (ESIR, 2023).

> *"Policy coherence must systematically consider adaptation to avoid inadvertently undermining it. Whenever relevant, EU and Member State policymaking should apply the following policy coherence principles: ensure that regulation and funding take into account disaster risk to avoid creating new exposure; reduce existing risk by building up resilience, prevention, and preparedness; manage residual risk. These principles should be integrated, for example, in calls for tender and selection criteria for EU-funded projects as well as taken into due account when designing policies more generally"* (EC, 2021c).

2.5 Budget and funding leveraged

The text of the Mission implementation plan provides an estimation of a sum of €10 B needed for the Mission to deliver according to its ambitions. The external study underpinning the assessment of EU Missions reported funding gaps at local, regional and national levels more than at EU level and the need to align resources between EU, national, regional and local levels. The challenge of **leveraging funding beyond Horizon Europe's specific Mission calls is key to the Mission's success.**

There is no detailed information on budgets available to the Mission beyond the EU funds allocated to the Mission calls (and the MIP). The situation in terms of leverage effect of the Mission on other EU funding programmes, national, regional, and private funding, both for R&I and for complementary action (such as investments for demonstration projects) is yet unknown. As indicated by the EEA, because of climate change adaptation being often included in programmes with broader goals, **methodological issues prevent a good measurement of funding allocated to climate change adaptation** (or indeed climate action more widely) and national reporting on climate change adaptation budgets is not yet well established:

> *"With mainstreaming climate change adaptation into a broad range of sectors, the EU funds (27) are also used for adaptation. However, the precise amounts allocated remain unclear. The European Commission announced that the EU had met the 20% target for 2014-2020, reporting that it had spent EUR 216 billion on climate action (ECA, 2022). However, the auditors found that the spending reported was not always relevant to climate action, and that the amount reported as having been spent for that purpose had been overstated by at least EUR 72 billion (ECA, 2022). This can also be explained by the fact that there is no common methodology for monitoring, reporting and evaluating the implementation of adaptation strategies and plans"* (EEA, 2022).

One way to appraise the budgetary amounts devoted to climate change adaptation with EU funds is through the use of 'tagging' mechanisms to create project portfolios. Such a process is already put in place with the assimilation of four Green Deal projects to Mission projects and is further developed by the Mission secretariat's work in screening Horizon, LIFE and Interreg projects to constitute a project portfolio that will be at the disposal of the MIP.

A search in the Climate-ADAPT platform with the tag 'adaptation' generates a long list of projects from earlier FPs, other parts of Horizon Europe, LIFE, Interreg programmes and transnational programmes. This database however does not identify projects funded under mainstream Cohesion policy (see below) and does not provide budgetary amounts.

Table 2: EU-funded research and knowledge projects on climate change adaptation in Climate-ADAPT database.

Funding sources	Number of projects
FP7	30
Horizon 2020	134
Horizon Europe	11
LIFE	142
Interreg	90
Others: JPI, ERANETs, Baltic Sea region…	92
Total	**499**

Source: EFIS study based on search in Climate-ADAPT database with tag 'adaptation', accessed 2 March 2023.

The **two main EU programmes to be leveraged to support the Mission goal are LIFE and the cohesion policy** [(13)]. The LIFE Programme can benefit from and link to Mission projects to reinforce synergies and maximise impacts by extending the financing to innovative solutions, mobilizing resources at EU, national and local levels, and disseminating and promoting good practice. Large scale demonstrations can be implemented with cohesion policy support.

The EU decision of mainstreaming climate objectives into all its instruments, in line with the Green Deal, is influencing all programmes, however without distinguishing between mitigation and adaptation: in particular 61% of the LIFE financial envelope is expected to be climate related.

- Cohesion policy is naturally a large potential funding source for regions and local authorities engaged in implementing climate change adaptation strategies and actions. Data for the specific objective: "Promoting climate change adaptation and disaster risk prevention and resilience, taking into account ecosystem-based approaches" (RS 02.4) indicate that an amount of €12.6B is planned for the period 2021-2027 [(14)].

Several synergy mechanisms can be used to leverage budgets from other EU programmes to amplify the Mission support to climate change adaptation.

(13) EIB climate funding is another important funding source for deployment, in the form of loans or blended finance.

(14) To be noted however that this objective also includes investments related to non-climate risks.

Table 3: Synergy and amplification mechanisms at programme and project levels

Types of synergies	Mechanisms
Synergies between centralised EU programmes	**LIFE** Programme has a sub-programme on climate. It provides action grants for best practice, pilot and demonstration projects that contribute to mitigate the effects and increase resilience to climate change. The climate sub-programme also supports integrated projects that implement EU policy and strategy on climate change adaptation. The LIFE programme promotes and incentivises synergies with research and innovation, by granting additional "bonus" points during evaluation to those projects which make demonstrable use of research outcomes stemming from other EU-funded projects, including Horizon. At project level, the Mission secretariat is compiling a list of climate change adaptation-relevant projects under Horizon, LIFE and Interreg, which will be made available to the Mission implementation platform under its task of **creating synergies between projects through the ex-post creation of a Mission 'project portfolio'.** This can be extended to other programmes, e.g. EIT KICs and to sharing of data generated through projects under various programmes. The Mission owners group foresees the possibility of **co-creation of calls** between various programmes, or **cross-referencing programmes** in calls or **joint promotion** of the Mission/LIFE in relevant constituencies (as it is done in Mission calls).
Synergies between Mission projects and programmes EU shared management	**Horizon Mission calls:** some calls include **provisions for complementary funds** in project definition, as e.g. in this call text: "a *written commitment to apply for complementary funding is required from the participating regions in which the action proposed will be implemented in case the project will be selected for funding. This should be expressed by a letter of intent annexed to the proposal signed by the corresponding authority/ies from the participating regions. The letter should state the willingness of the regional authority to seek (when possible) complementary funding from other national and European programmes for investments aiming at increasing resilience and adaptation to climate change. This will include European Regional Development and Cohesion Fund and the Next generation EU.*" (15) Cumulative funding synergies are notoriously difficult to achieve (see box below), hence the more realistic option points towards **consecutive funding synergies.** "*Successive funding synergies, where projects/initiatives build on each other's results/resources, are the most frequent synergy mechanisms that are successfully implemented by beneficiaries. These are relatively more easily generated by single applicants, whereas partnership-based synergies seem more problematic because consortium beneficiaries may be supported by different funds from different countries/regions*" (EC, 2022a). **Horizon Mission calls:** an attempt has been set to allocate **a 'seal of excellence'** in the last Mission call to those projects that have passed the evaluation threshold but could not be funded. There is no clear perspective yet on whether this represents a realistic way forward: past practice shows that the seal of excellence are *de facto* limited to mono-beneficiaries and are too difficult to implement for multi-beneficiary projects from different countries (EC, 2018).
Mainstreaming climate change adaptation in national programmes	"*Legal requirements to enforce horizontal policy integration and binding vertical governance frameworks that require regional and/or local authorities to engage in adaptation planning are in place in only a minority of Member States*" (EEA, 2022). Introducing sustainability and resilience criteria in **public procurement** is one option (the Net Zero Industry Act, March 2023). Climate proofing guidance can be used to this aim.

Source: EFIS study

(15) e.g. HORIZON - MISS 2021 CLIMA 02 04 (IA-49.5M€): Large scale demonstrators of climate resilience creating cross border value.

The Mission is also expected to rely on private funding for its implementation. However, **companies have so far not engaged in the Mission** since the Mission is structured according to community systems and adaptation strategies are mainly seen from the perspective of public authorities. Private sector participation is expected to be attracted at stage of development of pilots and foremost large-scale demonstrators, and much less in the early phases of awareness-raising and knowledge base creation steps.

2.6 Key conclusions from the external assessment

The EU Mission on adaptation to climate change shows a strong ambition to act as a game changer for EU territories in their journey towards climate resilience: the orientation of the Mission aims to support a **paradigm shift away from fragmented and incremental climate change adaptation efforts towards transformational adaptation strategies, aiming at reaching higher impacts**. This is well in line with the overall Mission concept and with frontier thinking around transformative innovation, featuring: clear directionality and identification of intended impacts, wide and deep stakeholder participation, high ambition to create synergies between several levels of authorities as well as between policy domains, opening space for experimentation and pilots, combining the latter with determined efforts towards upscaling and last but not least bringing in more strategic intelligence and building up capacity.

The Mission has **ignited enthusiasm from regional and local authorities and lifted climate change adaptation up on their policy agendas.** The Mission comes at a right time and has an important awareness-raising effect on a societal challenge that is still relatively new, yet urgent to address. A higher-than-expected number of responses to the invitation to sign the Mission charter (301 instead of 150), now covering 40% of the EU population and 25 Member States, reflects the political will of regional and local authorities to engage in transformative journeys to adapt their territories to the impacts of climate change. Welcoming the recognition of their heightened role in Horizon Europe, more than 250 regions and local communities participate in Mission projects; many express their willingness to be part of an EU community of practice launched in April 2023 and to get support from the new-born Mission implementation platform. The wide reach of this initial batch of activities under the EU Mission is a positive factor for diffusion across the EU territory.

The Mission is now reaching a turning point: a momentum has been created with the charter signatory process, the launch of first Mission projects and of the Mission implementation platform. **This momentum needs to be sustained through quick and visible actions on the ground**. What the Mission really is and what it can bring in practice is still not easily understood by the main target group, confronted with the difficulty to find time and resources and to build its own capacity to contribute to and benefit from the Mission's opportunity, amidst many competing offers from other initiatives and networks.

The large spread of signatories and Mission projects' activities across Europe, involving both frontrunners and lagging territories, reflects the cohesion approach of the Mission. This approach, combined with a somewhat elusive concept of 'resilience' as a process rather than as a state to be reached, creates a **challenge to combine territorial inclusiveness with a demonstration and mobilising effect** of the Mission concept around 'flagships', crystallising around a few bold and convincing projects.

Overall, at this initial stage of implementation, the Mission appears as a **timely, positive and promising initiative**. The next steps will have to be deployed quickly and visibly, addressing several challenges so that the Mission delivers well beyond its value as an "inspirational tool". A **central challenge is that of leveraging a broader portfolio of instruments much beyond its core under Horizon Europe**, mobilising Member States and sub-national authorities' portfolio of instruments at large scale, with the Mission calls as 'seeds and glue' rather than main instruments.

2.7 Self-assessment of the Mission Adaptation to Climate Change

The last decade (2011-2020) was the hottest decade on record during which the title for the hottest year was beaten eight times. People, planet and prosperity are vulnerable to climate change, so we need to prevent the un-adaptable and adapt to the un-preventable [(16)]. Halting all greenhouse gas emissions would still not prevent the climate impacts that are already occurring.

The frequency and severity of climate and weather extremes is increasing [(17)]. This has caused a surge in the number of, and damages from, disasters over the last two decades [(18)]. Water shortages in the EU have affected economic activities as diverse as agriculture, aquaculture, tourism, power plant cooling, and cargo shipping on rivers. It affects not only the economy, but also the health and well-being of Europeans, who increasingly suffer from heat waves (globally, the deadliest disaster of 2019 was the European heatwave with 2500 deaths). It also poses risks to food security, worsens existing social inequalities and threatens cultural heritage.

Economic losses from more frequent climate-related extreme events are increasing**.** In the EU, these losses already average over EUR 12 billion per year. Conservative, lower bound estimates show that exposing today's EU economy to global warming of 3°C above pre-industrial levels would result in an annual loss of at least EUR 170 billion (1.36% of EU GDP [(19)]).

A climate emergency has been recognised by the European Parliament, by several Member States, and by over 300 cities. The European Council has concluded that climate change is "an existential threat". At individual level, over 93% of Europeans consider that climate change is a serious problem, and 70% agree that adapting to climate change is positive.

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(16) Adaptation is the process of adjustment to actual or expected climate and its effects (IPCC AR5). It is not a one-time emergency response, but a series of proactive measures to deal with the nexus of hazard (e.g. drought, sea level rise), exposure (e.g. less water in the South), and vulnerability (e.g. poverty or lack of education). Complications (and danger) arise from tipping points (i.e. thresholds in the rate of climate change) like permafrost melting, sea-ice loss, or massive forest dieback.

(17) https://www.eea.europa.eu/highlights/soer2020-europes-environment-state-and-outlook-report

(18) https://www.undrr.org/news/drrday-un-report-charts-huge-rise-climate-disasters

(19) https://ec.europa.eu/jrc/en/peseta-iv/economic-impacts

The European Climate Law [20] writes into law the goal set out in the European Green Deal [21] and provides for stronger provisions on adaptation to climate change. The relevant Union institutions and the Member States shall ensure continuous progress in enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change. The second horizontal initiative under the European strategy for data, the proposal for the '**Data Act**'**,** establishes a robust framework for public sector bodies to access privately held data in order to efficiently and quickly respond to public emergencies such as major natural or human-induced disasters.

The Mission is a key contributor to the objectives of a climate resilient Europe and the EU Strategy on Adaptation to Climate Change. Adopted by the College of Commissioners two years ago, it anchors the Mission from the outset in EU policy.

2.7.1 An ambitious yet realistic Mission goal

The overall objective of the Mission is to support at least 150 European regional and local authorities to become climate resilient by 2030.

The Adaptation Mission is designed to help accelerating adaptation to climate change in Europe and to contribute to more systemic policy design based on the latest knowledge. Its aim is to help regions and local authorities by providing direct support, and/or by facilitating access to the best knowledge in three areas: 1) to better understand climate risks they are and will be subject to, 2) to define pathways to climate resilience for at least 150 regions by experimenting with different futures, and 3) to build resilience with at least 75 large scale demonstration projects.

By 2025 the Mission will already have been supporting more than 150 regions.

Indeed, in 2022, twenty-nine regions were supported through the 4 first Mission projects. In the beginning of 2023, two cascading grants, CLIMAAX and PEERS have been signed. These will provide support to regions until 2025. The first will support 50 regions, with up to EUR 300 000 per region, to carry out risk and vulnerability assessments. The second will assist 100 regions with up to EUR 300 000 to develop detailed adaptation pathways.

In addition, the Mission Implementation Platform will from 2023 to 2025 provide technical assistance to at least 200 regions (up to 14 days per region).

2.7.2 The Mission's added value

Compared to the other measures under the EU Adaptation strategy, the Mission adds the direct contact with the regions and municipalities that need to take decisions on the ground leading to preparedness and resilience. **This exposure to local and regional decisions and the constraints under which these are taken, helps shaping the portfolio of**

[20] Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law').

[21] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

adaptation actions foreseen in the strategy. It also allows to develop new policy initiatives based on the practical experiences gained through the Mission.

In addition, the Mission is contributing to raising awareness among policy makers and citizens about the need to build climate (and economic) resilience.

Linking up research & innovation with policy implementation ensures that the most recent knowledge is used, and that **implementation is sound and accelerated**.

Compared to "classical" research programmes, the Mission work programme clearly identifies non-scientific users, the regional and local authorities, and their requirements vis à vis IT tools or processes to carry out risk assessments, which is necessary to build climate resilience. Researchers are in direct contact with those non researchers using the knowledge, know-how and tools produced, which gives researchers a purpose to their work going far beyond the scientific circles. Especially by younger researchers, this is perceived as deeply satisfying and gives a more prominent role to RDI policy.

The Mission's community of practice with systematic and frequent gathering of regions and municipalities from throughout Europe leads to many fruitful exchanges, inspirations, and a voluntary experience of self-benchmarking. This in turn ensures a **much more rapid and resource efficient spread of solutions throughout Europe**.

2.7.3 The Mission's R&I content

R&I projects funded under the Horizon Europe Missions Work Programme deal with a variety of topics.

Several projects aim at **demonstrating or testing adaptation solutions**. For example, improving resilience of the infrastructures in the Piraeus Port, reducing the vulnerability of the Canary Islands aquifer system or using nature-based solutions in systemic transformations to improve urban resilience, the latter in co-funding with the Cities Mission.

Two consortia will assist regions with **risk and vulnerability assessments** as well as with the **development of adaptation roadmaps**. The two consortia will in 2023 issue calls for proposals following which 50 regions shall be supported on risk assessments and a further 100 regions in the development of their adaptation roadmaps. The regional risk assessments will be carried out using a common methodology, defined through the project.

Citizen engagement is another topic addressed by several projects. Stakeholder communities will be built, toolboxes be developed and used to facilitate involvement of locals through participatory approaches. Data analysis and assessment methods will be developed to support decision and policy making.

Asset modelling is needed for the development of IT support tools on adaptation. The information from climate models needs to be combined with information on assets. **User driven tools to use climate and climate impact models by lay people and public administration** is another angle looked at in modelling.

Further topics were inviting to develop approaches **unlocking financial resources** for climate resilience, best practices and piloting **innovative insurance solutions**, transformation of regional economic systems for climate resilience and boosting the sponge function of landscapes to improve water management.

Around 130 running projects with research & innovation content relevant for the Mission from Horizon 2020, Horizon Europe (other than the Mission work programme), LIFE and Interreg have been identified. The Mission Implementation Platform will make available to the European regions the knowledge and solutions developed by these projects.

2.7.4 Ensuring implementation is feasible, measurable, and time-bound

The build-up phase of the Mission, which according to the Implementation Plan was scheduled until the end of 2023, has been realised in the first quarter of 2023: The community of practice is established, the Mission Implementation Platform has started, the cascading grants for risk assessments and adaptation pathways have started and the LIFE projects in the field of adaptation have been identified and added to the Mission portfolio.

The Mission has opened its IT portal on the well-proven **Climate ADAPT platform** and will use the portal also as central knowledge hub and as entry door to the Mission's community of practice.

The Climate Adapt platform is the best-known Europe wide reference platform on adaptation, with which all Member States and European regions work. It is a huge asset for the Adaptation Mission that the European Environment Agency agreed to host the Mission Portal on that website.

Objective 1: Better understanding of climate change related risks

Through a large single grant, acting in two steps, the Mission will first develop **a climate risk and vulnerability assessment framework**/template available to be used widely. In the second step that same grant will support regions in conducting multi-hazard/risk assessments or upgrading/refining existing ones.

Other projects will provide IT tools to visualise and understand asset risks and how to protect them.

Objective 2: Accelerating transformations to achieve climate resilience

The Mission supports participating regions in formulating their vision of a climate resilient future and the pathways to reach it. A cascading grant was set up and signed in Jan 2023, which will **support 100 regions for their pathway development**. The **Mission Implementation Platform will also provide** up to 14 days **technical support services** to regions for developing pathways. In 2023, twenty regions will benefit from this service.

In addition, the regions will be supported in their efforts to engage citizens and to test solutions addressing challenges and policy objectives identified. In Work Programme 2022, **Demonstration Projects were launched for more than 100 million EUR**. This will provide for solutions testing, for example smart water management systems and raingardens or living walls to better manage water resources; **use of 2D and 3D computational modelling to better predict flooding, drought, urban hea**t; **solutions to better manage water scarcity and mitigate the impacts of droughts**; greening of infrastructures by tree planting, increasing of permeable green surfaces, or river

deculverting [22] in cities; peatland, wetland and floodplain restoration; culture rotation and silvo-pasture as solutions for a more climate resilient agriculture.

Objective 3: Demonstrating systemic transformations

The Mission stimulates the **larger scale deployment of tested solutions for climate resilience and the transformation of key community systems.**

Several demonstration projects are carried out by regions having signed the Mission Charter and have indeed already defined pathways. These projects are all having partners from several countries, therefore transnational aspects are well covered. The call texts were defined to create a portfolio of projects covering a multitude of climate risks, approaches, and biogeographical regions.

2.7.5 Securing buy-in

The Mission is one of the key actions of the EU Strategy on Adaptation to Climate Change. The Mission is a key contributor to the implementation of the European Green Deal and the objective of a climate resilient Europe enshrined in the EU Climate law.

The Council Conclusions of 10 June 2022 [23] welcomed the proposed role of the Mission on Adaptation to Climate Change in the roll-out of solutions which aim to improve Europe's climate preparedness, accelerate adaptation actions, and deepen societal transformation towards climate-resilience. **In the Council Working Group on Adaptation Member State representatives have discussed their role of 'brokers' of the Mission towards their regional and national actors**. Their engagement certainly helped the strong buy-in by regions in Europe. **308 regional and local authorities from 25 Member States have signed the Mission Charter and represent roughly 40% of the EU population.**

The Mission on Adaptation to Climate Change develops **joint activities with the European Cohesion policy**. While addressing policy objectives of the European Cohesion policy (smart specialisation, fight against climate change, a more social Europe, Europe closer to citizens) Member States and regions, by developing the appropriate projects, can at the same time improve their resilience to the impacts of climate change. The Mission has already had a joint initiative with DG REGIO and the EIB on financing adaptation in regions. This will be repeated 3 to 4 times in the coming months.

The Committee of Regions [24] emphasised that the Mission Adaptation to Climate Change should have an essential overall role, especially on foresight and motivating all

[22] 'Deculverting' refers to uncovering rivers mainly in cities that are not visible anymore and have been made underground rivers.

[23] Council of the European Union (10124/22): Conclusions on "European Missions", adopted by the Council at its 3877th meeting held on 10 June 2022

[24] https://cor.europa.eu/en/our-work/Pages/OpinionTimeline.aspx?opId=CDR-5656-2021

the actors of Europe to actively contribute to the EU Missions. The Adaptation Mission should achieve a general commitment to create large-scale systematic solutions.

Also, the European Economic and Social Committee gave strong support [25] in their Opinion on the Commission Communication on EU Missions: "The EESC strongly supports the idea of empowering 150 climate benchmark regions throughout Europe".

The new EIB Climate Adaptation Plan (October 2021) [26] is based on the EU Strategy on Adaptation to Climate Change. It refers to the Mission to enable the first objective of the Strategy, namely Smarter Adaptation. The EIB Plan links to the Mission and the EIB has committed itself to boost its climate change adaptation work. The EIB has set up an Adapt Platform, increasing its advisory and technical assistance and has set forward explicit and ambitious new financing targets of EUR 6 billion for climate change adaptation.

The **European Environment Agency** is one of the major and most robust actors supporting the Mission implementation as its **strategy for 2022-2024 refers to the Mission and clearly describes how the EEA will use Climate-ADAPT to showcase the results of the Mission Adaptation to Climate Change and to host the Mission web pages**. Through that collaboration Climate- ADAPT will be enriched with regional level information. The collaboration is a clear win-win situation and an excellent example of synergy between policy tools.

The LIFE Programme combines efforts with Horizon Europe, in particular its Mission in support of the European Green Deal (Climate Change Adaptation, Climate Neutral cities, Oceans and Soils). **Projects supported from LIFE calls in the sub-programme "Climate Change Mitigation and Adaptation" will become part of the Mission portfolio, as agreed between DG ENV, CLIMA and RTD**.

2.7.6 Citizens and stakeholder engagement

In its beginnings, the Mission organised a **Sounding Board with regions, co-organised with the European Regions and Innovation Network, ERRIN**, to understand the needs and challenges regions are facing when planning adaptation actions. This has subsequently led to a call for regions to sign the Mission Charter. As a result, 308 regional and local authorities have signed the charter and 63 organisations adhered to the charter as Friends of the Mission.

The **annual Mission Forum is a governance element of the Mission, explicitly aiming at engaging the regions participating in the Mission and giving them a say in the steer of the Mission**. The first Forum was co-organised with the Committee of Regions and the second with the Swedish Presidency and the region Blekinge. The Mission engaged with regions also through an outreach and information event on Adaptation Financing in Coimbra and through a launch event of the Mission's Community of Practice. The

[25] Opinion of the European Economic and Social Committee on European Missions (INT/967) on Commission Communication COM(2021) 609 final.

[26] https://www.eib.org/en/publications/the-eib-climate-adaptation-plan

Community of Practice itself, which has started in the beginning of 2023 is a further means of engaging regional and local authorities.

The **Climate Resilience Dialogue is a means of engaging European Insurers** and bringing them in contact with regional and local administrations. The Dialogue will have events on a yearly basis. At the first of these events, in October 2022, insurers met with several signatory regions of the Mission to discuss their insurance and financing needs.

Regions and municipalities will be assisted in their efforts to engage with citizens through Mission projects: Project TransformAr, for example, is developing toolboxes for citizens engagement and providing those tools to regions and local authorities [(27)].

Project AGORA supports communities and regions participating in the Mission to exploit a broad range of approaches, mechanisms and initiatives to meaningfully and effectively engage citizens, civil society organisations, academics, experts, policymakers, entrepreneurs and other relevant actors in all phases of climate change adaptation and in all steps of transformation towards a climate resilient Europe.

Project CLIMAS will identify and describe underlying mechanisms to empower citizens. And will organize climate assemblies.

2.7.7 Progress, achievements, and milestones

Without exception, **all building blocks foreseen in the build-up phase of the Mission have been realised in the first quarter of 2023**, although according to the Implementation Plan several of those were only due by the end of 2023:

The Mission secretariat staffed by DG CLIMA and RTD and the second Mission Board are established.

The Mission Implementation Platform 'MIP4ADAPT' and the cascading grants for risk assessments and adaptation pathways have started. The LIFE projects in the field of adaptation have been identified and added to the Mission portfolio. An administrative arrangement with the JRC has been signed as well as a service level agreement with the European Environment Agency.

Several milestones have been reached in terms of ensuring buy-in and participation in the Mission.

By the end of 2022 **the Mission Owner's Group has agreed a joint work plan** and its activities have been integrated into the Inter-Service Steering Group on the EU Strategy on Adaptation to Climate Change.

A particular focus has been given to synergies with Cohesion policy and the EIB adaptation strategy. For this purpose, a first adaptation finance event, in Coimbra, **was organised**

[(27)] https://transformar.eu/news-and-events/

jointly by DG REGIO, the EIB and the Mission. Four more of such events are planned for the last quarter of 2023.

Several bodies composed by Member States representatives have been addressed to integrate national efforts. In addition to the Horizon Europe Programme Committee, also the **Council Working Group on Adaptation is regularly informed about the Mission, as well as the EIONET** group [28] on climate change impacts, vulnerability and adaptation.

A major milestone was the strong support to the Mission shown by European regions. **308 regional and local authorities from 25 Member States have signed the Mission Charter and represent roughly 40% of the EU population.**

All these groups also are part of the Mission's **Community of Practice** that has been established in the beginning of 2023. The Community of Practice, animated and organised by the Mission Implementation Platform, serves as the major exchange platform for the signatories of the Mission, and in addition integrates other members such as the above-mentioned Member States representatives.

The signatories of the Mission, the Member States representatives, as well as the Committee of Regions are **given a major role in the governance of the Mission. For this purpose, an annual Mission Forum is organised**. It took place for the first time in June 2022 in Brussels and will take place again in June 2023 in Blekinge under the Swedish Presidency.

2.7.8 Current estimation of the budget

The total budget for the first three years in the **Horizon Europe** Adaptation Mission work programme is about EUR 360 million. In addition, there are also calls in other parts of Horizon Europe addressing explicitly the Mission, such as the Cluster 5 or Cluster 6 work programmes as well as the Research Infrastructures Programme. This adds another 92 Million EUR in the period from 2021 to 2023.

As regards access to other sources of EU funding, work is progressing in relation to a number of funding programmes:

- **The LIFE Programme** has a dedicated section for projects addressing adaptation. Applicants use this for example to propose Strategic Integrated Projects implementing national or regional adaptation strategies. It is clearly mentioned that these LIFE projects will be considered part of the Mission on Adaptation to Climate Change and will be invited to join the Mission's Community of practice. At information events on LIFE calls, applicants are informed about the Mission and the collaboration between the Mission and LIFE. As a result of the 2021 work programme, projects funded with 29 million EUR were added to the Mission. For the years 2022 to 2024, additional projects worth 138 million EUR are expected.

- **DG REGIO's European Urban Initiative** – Greening cities call (May 2023): The call text specifies that project proposals should not be elaborated in isolation. They

[28] https://www.eea.europa.eu/en/about/who-we-are/our-knowledge-network-eionet

should, for example, include sustainable urban development strategies of Cohesion Policy or Climate City Contracts prepared by the cities involved in or adhered to the EU Mission on Climate-Neutral and Smart Cities, **or activities of the cities which have signed or endorsed the Mission Charter of the EU Mission on Adaptation to Climate Change** (overall budget EUR 120 million).

- **Digital Europe Programme**: References to the objectives of the Adaptation Mission are included in relevant calls of the Work Programme (and in the same way, the Digital Europe Programme is referenced in the Adaptation Mission's calls in Horizon Europe). For example: The Commission is currently evaluating a call for an action supporting, through cascading grants, pilots combining data in the area of sustainable mobility, **extreme weather events**, energy and zero pollution. The action should establish **links to the Adaptation and the Cities Missions** (EUR 18 million). In addition, the European Centre for Medium Range Weather Forecasting (ECMWF), the contractor in charge of establishing the digital twin on adaptation of **Destination Earth**, is in contact with the Adaptation Mission, to use signatory regions in the use cases developed under the **Digital Twin**.

The biggest potential for funding adaptation can be found in Recovery and Resilience Funds and in Structural Funds. Both funds are or will be used by Member States to fund projects that are entirely or partly aiming at adapting to and preparing for future impacts of climate change. The underlying Recovery and Resilience Plans or operational programmes were drafted when the Mission did not yet exist or only started its activities.

However, there is good reason to believe that at least some of these funds will be used in connection to initiatives developed under the Mission. **For example, the recently adopted new Spanish Adaptation Strategy refers to the Mission** and thereby invites Spanish authorities to consider the Mission when using Structural Funds.

Also, the **Technical Support Instrument of DG REFORM** is inviting for Flagship Initiatives on adaptation. In these projects, the Member States authorities are made aware of the Mission on Adaptation and on the collaboration possibilities.

3 CANCER: IMPROVE THE LIVES OF MORE THAN 3 MILLION PEOPLE BY 2030 THROUGH BETTER PREVENTION, CURE AND QUALITY OF LIFE

EU ADDED VALUE

- Implementing **Europe's Beating Cancer Plan**
- Connecting Health and R&I ministries leads to more **evidence-based policy making:**
  - new **Council Recommendation on cancer screening**
  - Proposal for a Regulation on a **European Health Data Space**
  - **Uncan.eu:** federated Europe-wide cancer research data hub
  - **Cancer Medicines Forum** under the European Medicines Agency to advance academic research into cancer treatments
- Integrated policy making spills over to the Member States: creation of **Cancer Mission Hubs**

CITIZEN AND STAKEHOLDER ENGAGEMENT

- Dialogue with young cancer survivors and conference **'Addressing the needs of young cancer survivors'** (February 2023) with more than 200 participants
- **Focus groups in six Member States** to understand views and perceptions of common citizens
- Dedicated **Cancer Group** on the EU Health Policy Platform

LEVERAGING FUNDING AND GENERATING IMPACT

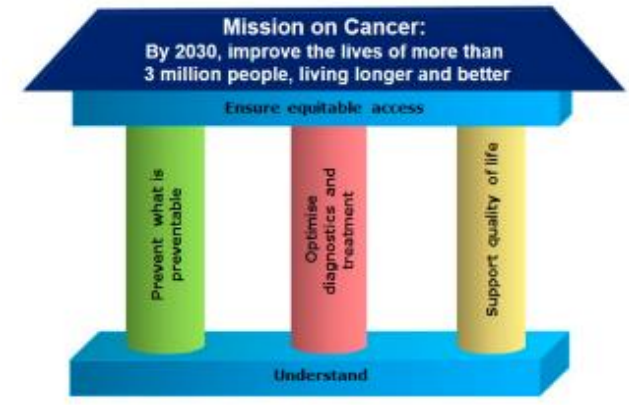
- Between 2021 and 2023, a total of **EUR 365 million** has been made available through the **Horizon Europe Mission work programmes** resulting in about 50 projects.
- The **Horizon Europe Work Programme 2021 "Infrastructures"** included two topics, resulting in two funded projects supporting the Cancer Mission by providing technical solutions for the roll-out of its digital flagship initiatives: EOSC4Cancer and canSERV (budget: EUR 23 million).
- The Horizon Europe Partnership **Innovative Health Initiative** included calls for cancer funding in 2021 and a further call in 2023.
- Between 2021 and 2023, **at least EUR 400 million has been invested by other programmes** to support specific objectives of the Cancer Mission:
  - The **Digital Europe Programme** [1] supports the Federated European Infrastructure for Cancer Images Data [1] (budget EUR 18 million), which will be the cornerstone of the Cancer Imaging Initiative.
  - The **EU4Health Work Programme 2021-2022** contains twelve action grants and three tenders with a total budget of EUR 226.93 million in support of the mission.
  - The **EU4Health Work Programme 2023** provides further investments with a budget of EUR 187,3 million.
- Under the **Recovery and Resilience Facility**, the **Czech Republic** plans to strengthen oncological prevention and care through acquisition of technologies for comprehensive cancer centres (**estimated EUR 350 million**). **Croatia** intends to purchase equipment for the prevention, diagnosis, and treatment of cancer (EUR 85 million). **Greece** wants to establish a new radiotherapy centre (EUR 30 million).

3.1 Mission goal and objectives

The overall goal of the EU Cancer Mission is "to improve the lives of more than 3 million people by 2030, through prevention, cure and for those affected by cancer including their families, to live longer and better, by accelerating cancer prevention and control programmes and creating more equitable access to these programmes" (EC, DG RTD 2021c). The goal is to be jointly achieved with the Europe's Beating Cancer Plan (EBCP) (EC, DG SANTE 2021a) through understanding better the causes of cancer, detecting earlier and preventing, treating more effectively and ensuring quality of life (QoL) for cancer patients, cancer survivors and their families [(29)]. The target of 3 million people was set on the advice of the Mission board based on the analysis of avoidable deaths by the International Agency for Research on Cancer (IARC)[(30)].

The Mission addresses all types of cancers (including rare and poorly understood types) in men and women, cancers in children, teenagers/young adults and the elderly, cancers in socio-economically vulnerable people, living in either cities, rural or remote areas, across all Member States and associated countries. On the horizontal level, the Mission strongly advocates for equitable access along the cancer control pathways: from prevention and early diagnostics to treatment and survivor support, palliative and end-of-life care. It applies this principle systemically, across four specific objectives.

Figure 8: The 'House' of the Cancer Mission



Source : Mission Implementation Plan (EC, DG RTD 2021c)

[(29)] The EBCP is a renewed EU commitment to cancer prevention, treatment and care. It "calls for 'a whole-of-government approach' that focuses on the patient, maximises the potential of new technologies, aims to eradicate inequalities in access to cancer, and delivers improved health outcomes to patients" (EC, DG RTD 2021c, p.9). It includes 10 flagship initiatives and 32 actions covering such areas as employment, education, social policy and equality, marketing, agriculture, energy, environment and climate, transport, cohesion policy, and taxation.

[(30)] The figure is based on Mission Board's advice, see detailed explanation under Mission objective and in section 8 "Monitoring Framework" and Report of the Mission Board: https://op.europa.eu/en/publication-detail/-/publication/b389aad3-fd56-11ea-b44f-01aa75ed71a1 and https://www.iarc.who.int

Four specific objectives (SO) are defined, namely to:

1. Improve the understanding of cancer (understanding);
2. Prevent what is preventable through screening and early detection (prevention);
3. Optimise diagnostics and treatment (treatment); and
4. Support quality of life (QoL).

'Understanding' covers understanding the development of cancers, everything around prevention and screening, development of diagnostic devices, tests, treatment and care. 'Prevention' focuses on exploring how to prevent 40% of cancers, which are known to be preventable [(31)]. 'Diagnostics' and 'treatment' are grounded in the principle of equitable access, creating conditions for more patients accessing needed treatments and with minimal secondary effects. The 'quality of life' aims to make the lives of all affected by cancer longer and better. The four operational objectives are transversal to the SO and outline the Mission's achievement through individual activities (building blocks) supporting the delivery of the specific objectives. These are:

1. Foster innovation through generation of knowledge and evidence (R&I programme)
2. Promote innovation, test, validate, demonstrate and upscale solutions (Living labs)
3. Track progress and monitor inequities in access to knowledge, research and care (Monitoring, support & indicators)
4. Engage with the cancer community, citizens/patients and society at large (Health literacy, communication, citizen engagement)

3.2 The Mission's selection process

One of the key pre-requisites in ensuring a Mission reaches its objectives (and ensures societal ownership) is that a wide range of stakeholders and citizens are involved in the co-design of Missions. **A year-long Mission development process (from the time the Mission board was set up until its report was published) offered opportunities for various leading experts and stakeholders to participate in the selection process**.

On the expert side, the Mission Board brought together expertise from different domains relevant to cancer as well as representation from organisations in different countries. In addition, the national expertise was further strengthened through the Cancer Mission assembly, Members States representatives and Members of the European Parliament. Moreover, the commissioning of a foresight study running in parallel to the development process made sure the Mission board could rely on independent expert support and feedback throughout the whole process. Overall, most stakeholders (57%) participating in the external study survey stated that the Mission was selected in a transparent manner.

With respect to the involvement of citizens, **consultations with EU citizens have been and continue to be critical for the Mission development**. Citizens play a prominent role

[(31)]EC, DG RTD (2021c).

in prevention and early detection and to some extent in treatment and care. The Mission board together with the Mission secretariat held a series of citizens engagement activities, with a specific focus on cancer patients and survivors. Despite the logistical difficulties imposed on these activities by the COVID-19 pandemic, it was possible not only to bring the participants to focused discussions but also to engage them in a 2-week long dialogue via a secure online platform. The Mission secretariat and board members organised various focus group discussions between May 2020 and February 2021 bringing together citizens from 26 European countries. Discussions also took place in a number of national events in local languages, thus making it an even more inclusive process. In addition, as Mission 'ambassadors' in their own country (plus 1-2 additional countries for some members) (EC, DG RTD 2023), board members met with the ministries of health and/or research/science, members of the national parliament, clinical and research stakeholders, patient organisations.

Nevertheless, it seems that these citizen engagement activities did not have a visible effect on the Mission formulation. In fact, the overall goal of the Missions and the four identified areas – understand, prevent, treat and support quality of life – were already defined prior to these citizens engagement activities. The feedback obtained from citizens, however, offered the Mission board the confirmation that **the proposed Mission will be societally accepted and that the identified areas for action are logical and important**. In the current implementation phase, involvement of stakeholders and citizens continues to be important. Most of the respondents (64%) in the external study's online survey agreed that the Mission encourages broad engagement and active participation of stakeholders and citizens.

In summary, the formulation of the Mission was based largely on the opinion of experts involved in the process as well as political considerations linked to the Mission Area defined by the European Parliament and the European Council. Although citizens and stakeholders beyond the high-level experts and stakeholders involved were only partially instrumental to the process, **the Mission is inspirational to citizens and shows strong societal value**.

What continues to be a challenge in the current implementation stage is the link between the Mission Cancer and the EBCP. In some places, the EBCP is called an EU strategy for beating cancer whereas the Mission is the R&I element of it. A call for a clearer synergy between the EBCP and the Mission was echoed by several stakeholders consulted in the context of the external study. On the one hand, it is clear that the EBCP is an overarching policy whilst the Mission could be viewed as its R&I 'arm'. On the other hand, the fact that the Cancer Mission is 'a Mission' should by definition place it much higher in the hierarchy of the policies, thus making the EBCP a part of the Mission. This requires a detailed discussion as confusions currently exist among the stakeholders as which of the two should take priority in implementation nationally. In this respect, DG RTD and DG SANTE have a role to play in deciding how to strategically (and politically) position the two initiatives and how to communicate this to different stakeholders. To achieve this, the EC Knowledge Centre on Cancer in fulfilling its mandate to foster S&T alignment of EU-related activities on cancer may help.

3.3 Management arrangements and governance structure

Horizontal governance across EU-level bodies

At the European level several governance elements are present. A joint leadership of the Mission is assured via a co-management model within the EC, with **a Mission manager** coming from DG RTD and **a deputy Mission manager** from DG SANTE. **A Mission secretariat** at DG RTD manages the daily Mission operations and ensures the interactions with other services, Member States and stakeholders. The work is done in close cooperation with the DG SANTE cancer team.

The **Mission board** was set up as an advisory body to the Mission Cancer. As the Mission is an integral part of the EBCP, the Mission board's advice is also being used to support the EBCP. The 1st Mission board worked from September 2019 until December 2021. The 2nd Mission board started in September 2022 on a 3-year rotation. Both boards consist of 15 people with the chair, vice-chair and one board member in charge of internal cooperation, continuing from the 1st to the 2nd board. They bring together cancer and public health scientists, and innovators, national and regional healthcare representatives with experience in implementing specific measures. The 1st Mission board was tasked to define the Mission and provide ideas for the implementation. The 2nd Mission board has implementation as their main objective, building coalitions and more trust nationally, regionally and locally. This is done through the Mission board members being 'ambassadors' of the Mission to their country, as well as one or more (not always neighbouring) countries. By joining the board, these experts as well as the institutions they work for cannot participate in the Mission linked HE calls due to strict rules on conflict of interest. The board has created five working groups related to the Mission's objectives.

In addition, there are five more EU-level governance elements:

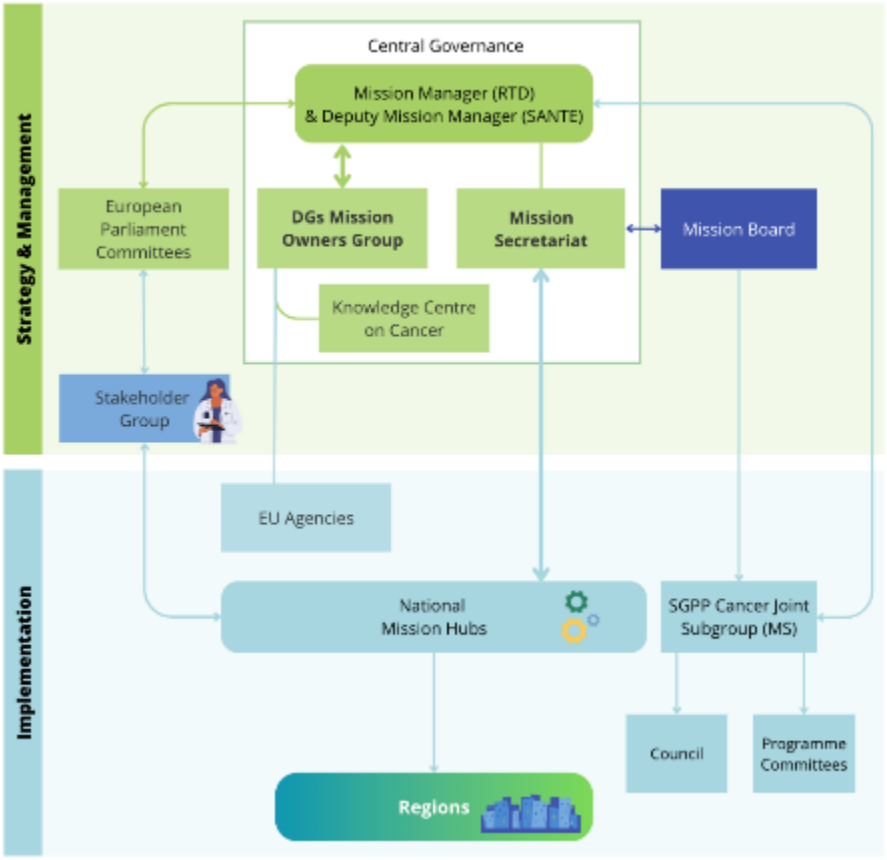
- The temporary Special Committee on Beating Cancer (BECA) from June 2020 until December 2021 (when its mandate ended) was the main cancer thematic link to the **European Parliament** (EP). It was set up by the EP decision on 18 June 2020 (EP, 2020) with 16 responsibilities ranging from looking at actions to strengthen the approach at every key stage of cancer, evaluating the best possible way of supporting research to strengthen prevention diagnosis, treatment and innovation, to assessing the various framework conditions (e.g. pharmaceutical legislation, development of common standards, implementation of the Cross-Border Healthcare Directive) and making recommendations necessary with regard to the Union policy on combatting cancer. [(32)] The EC services and the Mission board members participated in hearings and committee meetings. In February 2022, the EP adopted its final report for a comprehensive and coordinated EU strategy to fight cancer focusing on prevention, equal access to cancer care across borders, and a European approach addressing medicine shortages (EP, 2022a). These were prepared over 15 months through several public hearings and interactions between MEPs, national parliaments,

[(32)] For more detail on the description of responsibilities, see p.p. 56-57 of EP (2020).

international organisations and experts. The MIP mentions that interactions through the Committee on Industry, Research and Energy (ITRE) and the Committee on the Environment, Public Health and Food Safety (ENVI) took place.

- In February 2023 Members of the European Parliament agreed to set up a new Public Health subcommittee (SANT) under the umbrella of the Committee on the Environment, Public Health and Food Safety (ENVI). This subcommittee (comprising of 30 members) will deal with programmes and specific actions in the field of public health, pharmaceutical and cosmetic products, health aspects of bioterrorism, the European Medicines Agency, and the European Centre for Disease Prevention and Control. It is also expected to follow the work on cancer.

Figure 5: Governance structure for the Cancer Mission



Source: EFIS study based on Mission Implementation Plan (EC, DG RTD 2021c, p.35)

Note: SGPP Cancer Joint Subgroup is now called a joint sub-group on cancer under the Public Health Expert Group

- The **Mission owners' group** is composed of key Commission services [33]. The same group is called the EU Cancer Plan Implementation Group in the EBCP. The group works closely with the EP, the Member States, stakeholders, and the Mission Cancer board to 1) help shape the orientation and content of the EBCP; 2) create a governance structure for the implementation of both cancer initiatives within the Commission (joint inter-service group) and in the MS (joint sub-group on cancer) and stakeholders (Health Policy Platform [34]).
- The **Knowledge Centre on Cancer** (KCC) assists the coordination of the EU's scientific and technical actions on cancer. It provides scientific and technical information for prevention, detection and treatment policies, manages the EU Cancer Information System (ECIS) which tracks and anticipates cancer trends, develops and provides guidelines and quality assurance schemes for screening, diagnosis and care, operates the European Cancer Inequalities Registry and acts as a 'data broker" connecting with the European Health Data Space. Launched by the JRC in 2021, it is jointly governed by DG JRC, SANTE and RTD.
- The **EC Group of Chief Scientific Advisors** is brought on a needs basis to give scientific advice on specific topics. For example, on 2 March 2022 the group offered their advice on cancer screening (EC, DG RTD 2022), which was taken by the EC to update the 2003 Council Recommendation on cancer screening.
- The **EU agencies**, both decentralised agencies ECHA, EFSA and EMA and the executive agencies HADEA, CINEA, REA are part of the implementation process.

On the horizontal coordination at the EU level, **bringing together two DGs to steer the joint implementation of the Mission** is a **novel approach**, a new way of working.

With regards to the Mission board, the composition of the 2nd board has a higher representation from EU13, thus possibly also indicating the Commission's attempt to embed the Mission more in the Eastern and Central Europe, although no clear public communication was given around the composition of the boards.

Vertical coordination

On the vertical coordination at the EU-national-regional levels, **MS are deemed key to the delivery of the Mission's activities and to the achievement of the planned results by 2030**. There are strong synergies with the national cancer plans which many (but not all) MS have adapted or will adapt in alignment with the EBCP and/or the Cancer Mission. There is significant variation between MS when it comes to the organisation of national and regional research programmes, health systems, setting of national cancer priorities and availability of necessary resources. Hence, the Mission aims to support MS with strategic

[33] SG, LS, BUDG, ENV, CNECT, JRC, MOVE, JUST, EAC, MARE, AGRI, REGIO, REFORM, AGRI, CLIMA, COMP, DEFIS, ECHO, ECFIN, ENER, DIGIT, ECFIN, EMPL, FISMA, HOME, GROW, INTPA, NEAR, TAXUD, TRADE.

[34] https://webgate.ec.europa.eu/hpf/

tools and governance to work closer together, generating new evidence, allowing efficiency gains as well as leveraging considerable EU funding to support implementation. Aligning national and EU strategies is essential to build synergies, enhance collaboration and increase impact yet ensuring implementation at the national level.

However, the issue of capacity has also been raised on the national level. According to the stakeholders interviewed in the context of the external study, the Mission activities can sometimes be perceived as additional to what is currently being implemented. More so, the still visible negative impact (fatigue, etc.) of the COVID-19 pandemic on health-related personnel and the health care system in general, brings additional implementation issues. The situation could change favourably in the future through the Mission implementation mirror groups. Although not (yet) officially in the governance structure as presented in the implementation plan, these groups play an important role for the future set up of the Mission implementation nationally and regionally. Austria, Belgium, Portugal and Spain [(35)] have already set up such mirror groups (although with different structures).

With regards to the national and regional levels, coordination of national R&I priorities and agendas is essential for the sustainability of the Mission goal and objectives and to see tangible impact and achievements on the ground in the medium- and long-term. Regions have established **health innovation ecosystems that in many cases act as living labs** [(36)], which are important requirements for testing and deploying new solutions through different funding schemes and partnerships. Here, the existing smart specialisation platforms are to be noted as key for implementation i.e. to support regional prioritisation in cancer innovation and support the cross-sectoral mobilisation of funds. The Horizon 2020 projects SAPHIRe [(37)] and Regions4PerMed [(38)] have investigated at the regional level how to translate personalised medicine in complex health system settings that involves variables such as policy, regulation, industry, technologies, and patient associations.

When it comes to citizen and stakeholder engagement level in the Mission governance, citizens are clearly mentioned as the centre of attention for the Mission design and delivery (Arabadjiev, 2023). This will be further refined when the NCMH are in place in different countries and complement all the past and ongoing efforts.

Overall, in assessing the Mission's governance, the survey respondents were generally positive (to neutral) about the suitability of the governance setup for steering and implementing the Mission. Yet, there are certain barriers. Among the top-3 most reported

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[(35)] These countries were mentioned in several interviews, but not all together.

[(36)] Living Labs are defined as user-centred, open innovation ecosystems based on a systematic user co-creation approach integrating research and innovation processes in real life communities and settings. In practice, Living Labs place the citizen at the centre of innovation, and have thus shown the ability to better mould the opportunities offered by new ICT concepts and solutions to the specific needs and aspirations of local contexts, cultures, and creativity potentials.

[(37)] Securing the Adoption of Personalised Health in Regions (SAPHIRe) aims to structure the application of personalised health at regional level which will drive the transition towards sustainable healthcare and personalised health, https://www.saphire-eu.eu

[(38)] https://www.regions4permed.eu

barriers to effective Mission governance, the survey respondents picked 'Challenges in aligning resources across different governance levels (EU, national, regional, etc.)', 'Lack of clarity of the cooperation structures between the Mission governance bodies', and 'Lack of clarity of responsibilities among the Mission governance bodies. This was echoed by the interviewees who considered that the overall governance structure is too large, difficult to follow with so many players and often not understood in its fullness.

Clear cooperation structures between the Mission governance bodies, involvement of non-governmental stakeholders and clear and well-functioning communication channels are viewed as some of the factors enabling successful Mission management.

3.4 Progress to date

The progress made since the adoption of the Mission Areas in 2019 includes the formulation of the specific Mission by the Mission board, the development of an implementation plan (with the specific activities assigned to the individual objectives of the Mission, and targets), and the first steps for putting the implementation plan to action.

When discussing implementation of the Mission Cancer it is important to keep in mind that the development of the Mission took place during the COVID-19 pandemic. The Mission board published the Mission report in September 2020 in the middle of the lockdowns and heavy restrictions when the attention of all healthcare sectors and citizens was on one disease (and that was not cancer). The MIP was published in September 2021 at the time when the healthcare systems (including the policymakers dealing with health questions) were struggling with the overwork, backlog of activities while at the same time continuing the race of vaccination.

The overall conclusion of the external study, based on the reviewed documentation, targeted interviews and the survey is that it may be too early to evaluate the results of the Mission implementation. In particular, it is difficult to say what the Horizon Europe projects will lead to in terms of exploitable outcomes. There are also questions about pulling the results of the funded projects into a coherent story and who can perform this function.

Nevertheless, **most respondents to the survey (59%) agree or strongly agree that the Mission is progressing in line with its implementation plan**. Yet, some interviewees commented that the first call for projects came a bit late [(39)], that the second call was too close to the first call with organisations rushing to submit the proposals without fully appreciating the ambition of the Mission. Moreover, they felt that some of the national players are not yet fully following the development of the Mission.

Despite some of the implementation bottlenecks summarised above, there is a strong belief (47%) that **the main objective of the Mission is achievable by 2030 and that the Mission is likely to create added value compared to existing initiatives or instruments** (81%).

[(39)] it is important to note that there was an overall delay launching the Horizon Europe Work Programme resulting in the Mission WP delays as well as the decision by the Project Group to have a one-year preparatory phase for the creation of the implementation plans for all five EU Missions.

Survey respondents gave examples of the actions on the national level: the Czech National Cancer Control Plan 2030 (NOPL CR 2030) specifically mentions a number of Mission Cancer actions; in Austria a 'Mission action group' was set up, the Spanish Mission mirror group links the Mission with national research funding and capacities and includes important national stakeholders, in another country (not specified by the online survey respondent) the National Plan for Recovery and Resilience has a special measure dedicated to Missions under which a form of mirror group was created, called centres of competence.

The external study pointed to the following key enabling factors to reach Mission's goals: effective coordination between EU, national, regional and local levels, strong commitment and involvement of different stakeholders, the coherence between available funding and Mission objectives and commitment by different stakeholders with citizen involvement

The table below summarises the key steps taken towards achievement of specific Mission objectives, the corresponding implementation steps undertaken as part of the Mission or in other interconnected EU initiatives and the challenges identified during the desk research, interviews as well as the survey.

Table 4: Summary of progress towards Mission objectives

Specific objectives / Operational objectives / Cross-cutting	Implementation steps taken	Challenges ahead (identified in interviews, survey and desk research)
SO1. Improve the understanding of cancer	• Ongoing work to build project portfolio • Started project to establish the 'UNCAN.eu' platform with a blueprint being currently developed	• Make the blueprint from UNCAN.eu into a full-fledged and functioning platform managed by MS, AC and stakeholders • Further budget needed to build on future actions
SO2. Prevent what is preventable through screening and early detection	• Acquired guided terms of reference for consultation of EC proposal for update of Council recommendations on cancer screening	• Understanding and eliminating barriers for previous prevention steps (e.g. why screening programmes did not happen in all countries) • Bringing synergies with other Missions into a reality, e.g. better soil, cleaner cities and better climate can reduce some causes of cancer • Involvement of primary care considered by some interviewees as a potential challenge in some countries
SO3. Optimise diagnostics and treatment	• Ongoing projects around the CCI (e.g. CRaNE) • The CCC network to be created by 2025 to integrate care, research, training and awareness • Developed a clinical trials programme on treatment	• Not allow 'oncopolitics' to deliver an innovative and comprehensive approach to diagnostics and treatment • Ensure sustainability of CCC by bringing synergies of EU-national funding (i.e. some opinions exist

Specific objectives / Operational objectives / Cross-cutting	Implementation steps taken	Challenges ahead (identified in interviews, survey and desk research)
		that once CCCs are established there will be an ongoing funding stream from the EC).
SO4. Support quality of life	• Launched development of the blueprint for the European Cancer Patient Digital Centre (ECPDC)	• Further budget needed to build on future actions • Incorporate the needs of some patients' groups which are currently not visible (i.e. terminally ill patients) • ECPDC (was supposed to have been done during 2021-2023) – no proposals submitted – how does it affect the other activities
OO1. Foster Innovation (R&I programme)	• Ongoing work to build project portfolios	
OO2. Living labs	• Current examples are found in Finland ([40]), France ([41]), Spain ([42]) and at a European level ([43])	• No indication found on the development of additional ones or their funding sources
OO3. Monitoring, support and indicators	• Initial Mission-specific targets and indicators developed per objective as described in the Mission implementation plan.	• Ensuring consistency of Mission-specific monitoring efforts and design with the overall Horizon Europe monitoring system.
OO4. Health literacy, communication, citizen engagement	• Focus groups • Main event and follow-up with young survivors ("Young Cancer Survivors workshops and Conference", 6-7 February 2023)	• Ensuring systematic data collection & feedback from citizen engagement campaigns

Source: EFIS study

[40] Living lab services Kuopio University Hospital (FI): https://www.psshp.fi/web/en/organisation/living-lab

[41] Living Labs at INCa (FR): https://gnius.esante.gouv.fr/en/players/player-profiles/living-lab-institut-national-du-cancer

[42] Living Lab at IrsiCaixa AIDS Research Institute (ES): https://www.scishops.eu/case-study-living-lab-for-health-spain/

[43] European Network of Living Labs (ENoLL): https://enoll.org/

3.5 Budget and funding leveraged

To turn Mission objective into the reality and reach all the targets of the Mission Cancer, at the Mission design phase the Mission board called for *"funding be made available as was planned before the COVID-19 pandemic"* (EC, DG RTD 2020).

The Mission implementation plan outlines that resources need to come from multiple sources for the different stages of the Mission. These are to be used for the "*development and deployment of solutions for end-users, from basic, translation and clinical research through the uptake by health systems, to broad deployment at national and local level"* (EC, DG RTD 2021c). The Horizon Europe Mission-dedicated budget should, thus, be viewed as "seed" investment *"aimed at catalysing, unlocking and coordinating additional financing from other sources"*.

The table below lists the EU and national level funding sources for the Mission along with the corresponding earmarked budgets as outlined in a) the Mission implementation plan, b) the EC's funding and grants webpage and c) from materials provided by the Mission secretariat.

Table 5: Portfolio of instruments mapped by the assessment

	Policy Instrument	Budget (in millions EUR)	Status
1. Horizon Europe – c.€365 million* (2021-2024) from Mission-related WP + €178 million from other WPs			
	Work programme 2021	€126 m	Projects launched
	Work programme 2021 – Research infrastructures (had two topics supporting EU Cancer Mission resulting in two funded projects: • canSERV • EOSC4Cancer	€23 m	Projects launched
	Work programme 2021 Cluster 1 Health (HORIZON-HLTH-2021-DISEASE-04-1 on care of cancer patients and HORIZON-HLTH-2021-CARE-05-02 on data-driven decision-tools)	€90 m	Projects launched
	Work programme 2022	€130 m	Projects launched
	Work Programme 2023	€110.68 m	Calls open
	Work Programme 2023 – EIC Accelerator WP 2023 includes a call on novel biomarker-based assays	€65 m	Calls open
2. EU4Health - €1.25 billion (2021-2027)			
	EU4Health (WP 2021 + 2022): 12 action grants, 3 tenders on e.g., safety of radiation technology, prevention diagnosis and treatment, cancer survivors. • EHDS2 Pilot – Pilot for a European Health Data Space on secondary use of health data • CraNE Joint Action (EU Network linking recognised National Comprehensive Cancer	€149 m €54 m	Confirmed

	Policy Instrument	Budget (in millions EUR)	Status
	Centres (CCCs)) (started on 1 November 2022) • Project grant BEACON, 'EU Cancer Treatment Capacity and Capability Mapping' project – Network of Comprehensive Cancer Centres (started in late 2022)	€3 m €1 m	
	EU4Health (WP 2023): new Joint Action to support MS to create CCIs/CCCs • New networks of expertise on cancer and cancer conditions • Action grant on Mental health challenges for cancer patients and survivors • Service level agreement: development of EU guidelines and quality assurance scheme for lung, prostrate and gastric cancer screening • Service: Evaluation study: Use of sunbeds and cancer risk • Service: Study on the quality of life of cancer survivors	€94 m 40.5 m 8 m 7.5 m 1 m 1.5 m	Calls launched
	EU4Health (WP 2024): co-developing a study on the provision of care for Adolescent and Young Adult (AYA) cancer patients in the EU with DG SANTE	10 m	Planned
3. Digital Europe – up to €250 million (2021-2027)			
	Digital Europe (WP 2021-2022): e.g., deployment of a federated infrastructure for cancer images data	18 m	Project launched
	Digital Europe (WP 2023): Topics with potential relevance for cancer	N/A	Planned
1. **Erasmus+ programme, Marie Skłodowska-Curie actions & European Institute of Innovation and Technology (EIT) – up to €500 million**			
5. National / regional sources			
	Horizon Europe Partnership for personalised medicine	50 m	Planned
	Horizon Europe Transforming Health Systems Partnership	50 m	Planned
	Several Joint Actions under EU4Health program: e.g., Comprehensive Cancer Infrastructure, 60% co-funded by Member States	240 m	Confirmed
	Recovery and Resilience Facility	450 m	
6. Funding sources involved private sector contributions			
	Innovative Health Initiative (IHI), a public-private partnership with co-financing from industry (2 out of 4 calls in the area of cancer)	135 m 20 m	Published

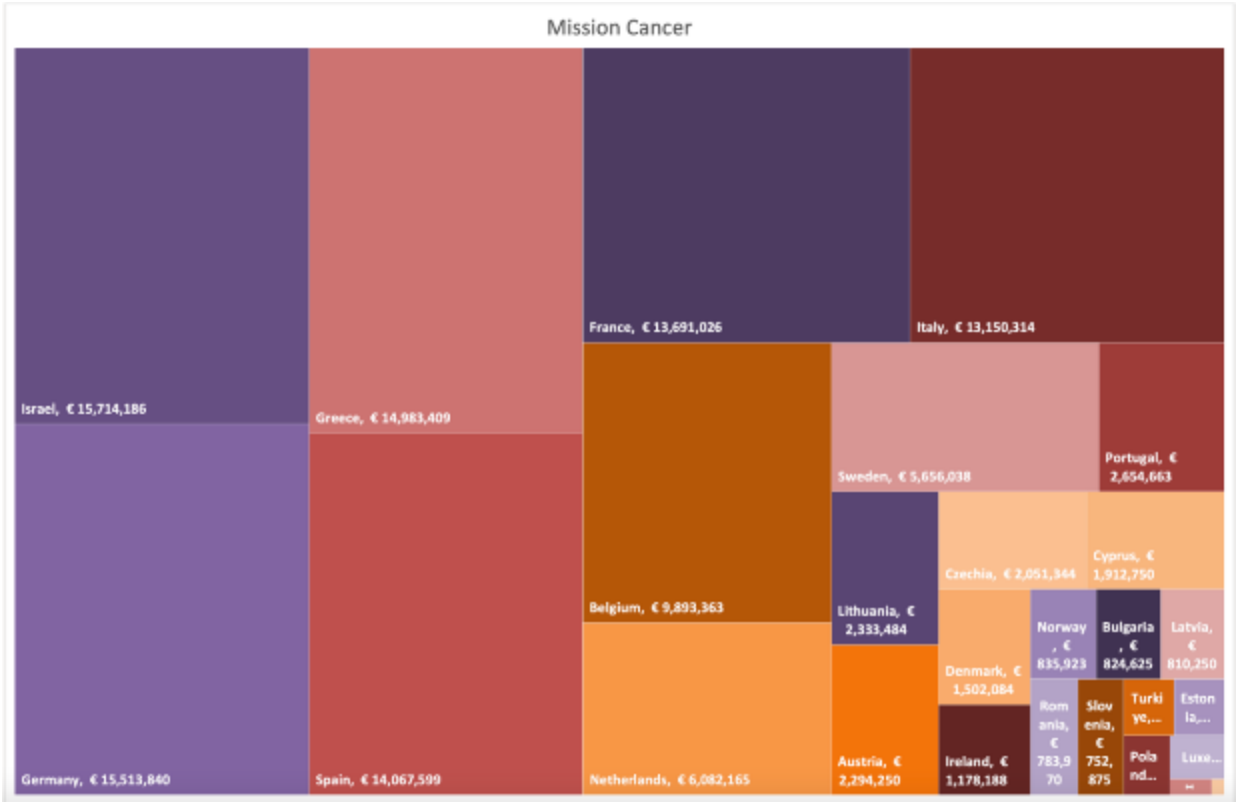
	Policy Instrument	Budget (in millions EUR)	Status
	IHI 2023 call 3 – biomarkers for prediction & prevention of disease – potential relevance for cancer		

Source : EFIS study based on available documentation

Note: * MIP mentioned EUR 378 million.

Horizon Europe supports the Mission directly with a budget of EUR 365 million (EC, DG RTD 2023c) [44] in 2021-2023 (i.e. 10% of the budget for the health cluster under pillar 2 of Horizon Europe). For the initial period 2021-2023 €300 million were secured in additional funding to support Cancer Mission objectives. [45] A number of projects was launched by end 2022. The most notable beneficiaries of the calls are from Israel, then followed by Germany, Greece, Spain, France and Belgium.

Figure 6: Horizon Europe Mission Cancer project funding per country



Source: Horizon Europe Dashboard. Data extracted 21 March 2023. Analysis and visualisation: authors

In total over the 2021-2027 period, the Mission funding pool incorporates a further €1.25 billion coming from the EU4Health programme to fund many of the initiatives detailed in the EBCP, including major actions proposed by the Cancer Mission such as the European

[44] The amount €365 million is slightly below €378 million mentioned in the Implementation Plan.

[45] Information provided by the Cancer Mission Secretariat.

Cancer Patient Digital Centre and the development and roll-out of the network of Comprehensive Cancer Infrastructures.

Regarding the support of different Mission implementation stages two main differences are to be made depending on the type of investment:

- For the **research component** (including the facilitation and coordination of research activities) in addition to Horizon Europe funding, the Horizon Europe partnerships will be the main source. Contributions are also expected from other Horizon Europe parts (i.e., ERC and EIC), philanthropic and charitable organisations as well as industry.
- For **physical and/or digital infrastructure investments**, funding is due to come from the EU4Health programme 2021-2027, the Digital Europe programme 2021-2027, Cohesion Policy Funds, and (to some extent) from the JRC's Knowledge Centre on Cancer and the InvestEU programme. The Digital Europe Programme pledged up to €250 million for 2021-2027 for cancer related actions.
- For Mission Area-related activities in **education, training, as well as research in the field of cancer and the promotion of healthy lifestyles** EUR 500 million are expected from the Erasmus+ programme (e.g., the sport chapter), Marie Sklodowska-Curie actions and EIT.
- For **institutional, administrative, and growth-enhancing reforms**, the Technical Support Instrument (TSI) provides tailor-made needed technical expertise to EU Member States to design and implement reforms. At least one TSI project supported EU Cancer Mission and EBCP: 'Improving Cancer Care Coordination and Screening in Latvia and Slovakia (ICCCS)' project was launched in March 2022. [(46)]
- Loans from **EIB** can strengthen the MS investments from the Cohesion Funds as well as the **Recovery and Resilience Facility** and cover infrastructure investments, medical R&D, cancer control programmes, education.

Stakeholder discussions held in the context of the external study highlight the need to maximise funding and ensure synergies. The survey responses showed that **67% of the respondents are of the opinion that European level funding sources are sufficient or even more than sufficient to realise the Mission**. On the contrary, **51% consider that national resources are insufficient** (for the implementation of the Mission ambition). The study analysis suggested that MS need to be incentivised to commit with their own funding for the Mission implementation. Regional and local resources also appear mostly insufficient but remain key for the Mission's success on the ground.

The following table presents the external study analysis on the brokered agreements of the Mission.

Table 6: Agreements brokered as part of established synergies established

[(46)] https://www.amcham.lv/en/communications/news/4518

Synergistic agreements brokered			
	Agreement	**Budget/commitment (in millions of €)**	**Status**
1.	Stakeholder Group on Health Policy Platform (HPP) – regular webinars on cancer initiatives to engage with stakeholders	N/A	Set up
2.	Synergy with Cities Mission	30	Under discussion
3.	Synergy with Soils Mission	30	Topic on prevention published
4.	Common topic with Cluster 6	30	Under discussion
5.	Photonics21 Partnership	36.98	Work programme (2023-2024) published with Photonics partnership cited
6.	Working groups on Comprehensive Cancer Infrastructures and Inequalities Registry under the Public Health Expert subgroup on cancer	N/A	Under discussion
7.	Austrian, Belgian, Spanish, Portuguese, German, Swedish, Romanian and Lithuanian Mirror groups	N/A	Set up
8.	Bilateral cooperation with US on cancer research	N/A	Launched

Overall, **the external study suggests that the amount of funding for the Cancer Mission is deemed to be appropriate, at least in its first phase 2021-2023**. It allowed a broad range of actions across different strategic objectives of the Missions, a set of the governance, and bringing the importance of the Mission into the national level. However, the Mission will only succeed if sufficient funding is secured over the next years (2024-2027), if it continues to bring different funding sources together on the EU level and mobilise needed funding on the national level.

3.6 Key conclusions from the external assessment

The EU Cancer Mission was designed 'to improve the lives of more than 3 million people by 2030, through prevention, cure and for those affected by cancer including their families, to live longer and better, by accelerating cancer prevention and control programmes and creating more equitable access to these programmes'. **The Mission is perceived to be ambitious, inspirational, yet realistic.** It addresses a critical societal challenge and has all the preconditions to make a difference to patients, their carers, families, and citizens at large. Strong linkages and the joint management model of the Mission together with EBCP are welcomed and having the same key activities in both the EBCP and the Mission delivers a message of synergies and coherence. There are questions, however, if the two should become one taking the unified messages and actions even further.

It is promising that the design of **the Mission covers more than just R&I**. Research is undoubtedly needed to better understand the disease itself or the behaviour of individuals when it comes to prevention, and innovation can bring solutions for treatment, diagnostics as well as quality of life. In parallel, work with the stakeholders spans beyond R&I bringing education, sports, community involvement into the picture. Various stakeholders understand and support the Mission. What perhaps is new for them is that the Mission concept implies a new way of working, i.e., putting stakeholders which have never worked before together, bringing even more multidisciplinarity into R&I, developing actions and activities from the ultimate impact in mind.

The Mission's goal is viewed as realistic, measurable and time bound. **Although the goal is measurable overall, it is not yet clear how the current (or future) portfolio of activities contributes directly to the fulfilment of the overall goal** [47].

The Mission encourages broad engagement and active participation of stakeholders and citizens. Their involvement is still critical for the Mission development as **the Mission needs to be embraced by all stakeholders to generate an even greater bottom-up movement**. **Communication here is key** and needs to be adjusted to different stakeholders, as further explained in the recommendations part of this report.

The setup of the Mission's governance brings together **a relevant and balanced mix of stakeholders at the EU level and national level,** in advisory functions and stakeholder groups to steer and implement the Mission, **breaking organisational silos and bringing organisations together which have never worked before**. A Mission approach requires this multi-governance model; but it also puts this same model to the test. Bringing multiple stakeholders in new constellations, be effective in decision-making processes to deliver on the ambitious goal adds complexity to the process, requires time, flexibility, and experimentation in how the governance is set up. The cooperation between DG RTD and DG SANTE via the joint Mission secretariat is viewed as a success. Yet, the structure looks stretched in terms of the capacity of resources and time and calls for clearer links.

As far as the **governance structure is concerned, it does at times come across as difficult to understand, and stakeholder feedback mechanisms should be clarified.** This complexity partially explains why national structures to support the Mission are not in place in many countries. Nevertheless, several MS have been inspired to create "mirror groups", replicating the same integrated approach to health and research established at the EU level. The HE-funded project ECHoS drives forward the ambition of setting up National Cancer Mission Hubs which will further support this integration process to support cross-policy dialogues with national stakeholders on cancer prevention and control. Political leadership and buy-in within EU MS are equally important for these national structures to embed themselves and deliver.

With regards to the financial resources underpinning the Mission, one should emphasise that **Horizon Europe funding is only the 'seed' funding** to support the Mission's

[47] Hence, questions remain as to how one will be able to measure e.g., how many of the 3 million people will be improved through prevention or through treatment? How many of these lives will be impacted by an individual project funded through the Mission?

implementation in 2021-2024 and that financing from other sources should be unlocked. For the research component in addition to Horizon Europe funding, the Horizon Europe partnerships will be the main source and contributions are also expected from the ERC and EIC, philanthropic and charitable organisations as well as industry (although private sector investment is not yet too visible). For physical and/or digital infrastructure investments, funding is due to come from the EU4Health programme, the Digital Europe programme, Cohesion Policy Funds. The Erasmus+ programme), Marie Sklodowska-Curie actions and EIT will support activities education, training, as well as research in the field of cancer and the promotion of healthy lifestyles; and the Technical Support Instrument could be used for institutional, administrative, and growth-enhancing reforms. For national funding programmes it is not at all clear, whether the Cancer Mission helped catalyse public funding at national and/or regional levels. Some activities have been observed in connection to the Recovery and Resilience Facility, but further efforts are needed to maximise funding and bring synergies.

3.7 Self-assessment of the Mission Cancer

Cancer is a major and growing societal challenge: **each year, 2.7 million people in the EU-27 are diagnosed with cancer, while 1.3 million die from the disease**. This number will increase rapidly due to ageing populations, unhealthy lifestyles, unfavorable health determinants, and environmental and working conditions. The Commission President Ursula von der Leyen announced a "European Plan to fight cancer to support Member States in improving cancer control and care", as a key component of her political guidelines 2019-2024.

3.7.1 An ambitious yet realistic Mission goal

The Cancer Mission has set the ambitious overall goal, to be jointly achieved with the Europe's Beating Cancer Plan, of **improving the lives of more than 3 million people by 2030**, through prevention, cure and for those affected by cancer including their families, to live longer and better [(48)]. The goal can realistically be achieved by **accelerating cancer prevention and control programmes and by creating more equitable access to these programmes**.

Four specific objectives are the basis for the successful accomplishment of the Cancer Mission: 1) **understanding**, 2) **prevention, including screening and early detection**, 3) **diagnosis and treatment**, and 4) **quality of life.** Together, these objectives also address the Mission's transversal priorities of equity, innovation, childhood cancer and personalised medicine. The actions foreseen address the whole cancer control 'continuum', i.e. from prevention, early diagnosis and treatment, to survivor support, palliative and end-of-life care, for all ages and all cancers, including rare and poorly-understood cancers.

[(48)] This goal was based on an analysis of avoidable deaths by the International Agency for Research on Cancer (IARC).

The COVID-19 pandemic created a backlog on cancer diagnostics and treatment, requiring all countries to commit extra efforts to resume diagnostics and treatment as well as to manage the backlog. Furthermore, for some countries, achieving this level of reduction in mortality requires considerable investments into new infrastructures, with the Mission helping to mobilise EU funds in this regard. Other countries can improve cancer control through the rapid implementation of new knowledge and evidence into their health systems.

A series of actions are being channelled towards **citizens' mobilisation, engagement and literacy** in favour of the Mission. Examples include the Plastic Pirates campaign, the EU4Ocean Coalition, student and school initiatives through the Blue School Network, campaigns to support sustainable consumption such as "Choose your fish", community-driven business models and citizen science initiatives.

3.7.2 The Mission's added value

The Cancer Mission is **breaking silos and is fostering cross-sectoral solutions** to cancer control both at EU and national level. Through the Mission, a new dialogue with and between Member States on cancer has been established, bringing health and research ministries to work together for the first time in the joint sub-group on cancer under the Public Health Expert Group [(49)], thus ensuring that research evidence informs policy development and knowledge gaps are identified. This new approach is bearing fruits. For example, the early involvement of this subgroup was instrumental in shaping the **new Council recommendation on cancer screening** [(50)], which was revised 20 years after its adoption to reflect the latest scientific developments, with substantial input from the Commission's Scientific Advice Mechanism. In December 2022, the Council approved a text that will extend screening to prostate, lung, and gastric cancer, in addition to breast, colorectal and cervical cancer, ultimately aiming to save millions of lives across the EU.

Inspired by the Cancer Mission, several Member States have created "**mirror groups**" at the national level, replicating the same integrated approach to health and research established at EU level. Thanks to this new approach, R&I priorities and investments start to be more prominent in national plans for cancer control.[(51)] For example, under the Recovery and Resilience Facility, the Czech Republic plans to strengthen oncological prevention and care through acquisition of technologies for comprehensive cancer centres (estimated €350M). The future "**National Cancer Mission Hubs**" will further support this integration process at national and regional levels.

The Cancer Mission is maximizing citizens' engagement to shape future policy actions and priorities, for example through a **new dialogue with young cancer survivors**, to help address their specific needs.

[(49)] Joint expert group consisting of delegates from health and research ministries; see also: Expert Group on Public Health (europa.eu)

[(50)] Council updates its recommendation to screen for cancer - Consilium (europa.eu)

[(51)] For example, same Member States use investments under the Recovery and Resilience Facility to strengthen oncological prevention and care.

The Mission is mobilising resources in EU programmes, by creating a **portfolio of R&I actions and exploiting existing R&I project results**. Between 2021 and 2023, a total of more than €1 billion has been made available through Horizon Europe and other EU programmes.

3.7.3 The Mission's R&I content

Between 2021 and 2023, the Cancer Mission has made available EUR 365 million through its Work Programmes, to support R&I projects and the development of digital flagships, in line with its **Implementation Plan** [52]. Each Work Programme aims to underpin the four Mission objectives. The HE calls continue to work on developing new R&I activities and solutions while fostering synergies a with Horizon Europe Partnerships, other EU Missions, and the EU4Health Programme, with a view to foster the integration of new evidence into concrete solutions.

The full roll-out of the flagship initiatives will require support of other **EU programmes**. Therefore, considerable effort is going into building synergies, between Horizon Europe programmes (e.g., other Missions, Health Cluster, research infrastructures, partnerships tackling health, technology, and digital priorities, the EIC and EIT-Health) and other EU programmes such as EU4Health, Digital Europe, Euratom.

Similarly, the Cancer Mission is contributing to enabling **other EU initiatives** to enhance research capabilities. For example, the UNCAN.eu platform and the European Cancer Patients Digital Centre aim to translate the future European Health Data Space [53] into tangible changes and benefits for researchers and citizens.

To increase synergies among **Mission portfolios**, three Mission project clusters have been created under each Mission objective.

3.7.4 Ensuring implementation is feasible, measurable, and time-bound

The **Cancer Mission Implementation Plan** [54] provides a clear operational and feasible course of action across the four objectives. It specifies the main actions to be undertaken over the lifetime of the Mission, with an emphasis on the first three years (2021-2023), which are being complemented with new actions following an iterative consultation and review process. The following actions have started to implement the four objectives:

[52] https://ec.europa.eu/info/sites/default/files/research_and_innovation/funding/documents/cancer_implementation_plan_for_publication_final_v2.pdf

[53] European Health Data Space (europa.eu)

[54] Implementation Plans for the EU Missions (europa.eu)

1) For the "**understanding of cancer**", a project [55] has started in September 2022 to establish the 'UNCAN.eu' platform, with a duration of 15 months. This unique digital platform will enable researchers to access to high quality and diverse research data (from environment to genomics to imagining to clinical data) whereby the understanding of cancer will be enhanced. Five projects have recently started to enhance the understanding of cancer and will be contributing data to this platform once set up [56].

2) With "**Prevention**" being the most cost-efficient long-term cancer control strategy, the Mission aims to enhance the understanding of effective prevention measures and improve existing prevention programmes. Six projects have started in January 2023 to improve and upscale primary prevention of cancer [57]. Six other projects will soon start to develop new methods and technologies for screening and early detection[58].

3) Under the objective "**diagnosis and treatment**", actions aim to shorten the time to diagnosis, develop new diagnostic tests, and to improve the implementation of existing treatment guidelines and standards of care across Europe. Twelve projects involving pragmatic clinical trials on a range of difficult-to-treat cancers will start soon.

4) Under the objective "q**uality of life**"- the project EUonQoL [59] has started to conduct systematic surveys issues as well as to collect new and update existing quality of life data and registries information. Results from these surveys will help to better understand the unmet needs of cancer patients.

A study has been launched to develop a concept for the (virtual) **European Cancer Patient Digital Centre** [60]. This platform will enable cancer patients and survivors to access their own clinical data, to deposit clinical and patient reported health data in a standardised manner and share their data with healthcare professionals and researchers in a secure way. It will also allow them to access information on e.g., treatments, care options, and psychological support.

3.7.5 Securing buy-in

Tackling cancer is one of President von der Leyen's main priorities, included in her Political Guidelines with the promise to "*put forward a European plan to tackle cancer, to support Member States in improving cancer control and care*". As a result, in February

[55] A Coordination and Support Action to prepare UNCAN.eu platform | 4.UNCAN.eu Project | Fact Sheet | HORIZON | CORDIS | European Commission (europa.eu)

[56] The five projects are GENIAL, MELCAYA, DISCERN, ELMUMY and LUCIA, from call MISS-2021-CANCER-02-03.

[57] Mission Work Programme topic HORIZON-MISS-2022-CANCER-01-01.

[58] Mission Work Programme topic HORIZON-MISS-2021-CANCER-02-01.

[59] Quality of Life in Oncology

[60] https://etendering.ted.europa.eu/cft/cft-display.html?cftId=11984

2021, the Commission adopted the **Europe's Beating Cancer Plan** [61]. The research and innovation dimension has become central to the Cancer Plan, with a focus on new technologies and on how the better understanding of cancer initiation, prevention and diagnosis, and follow-up care can improve health outcomes for individual patients.

The Cancer Mission and the Europe's Beating Cancer Plan were co-developed from start, their objectives aligned, and a joint governance put in place, **ensuring full integration and complementarity**. The Cancer Plan outlines actions across the same objectives as the Mission, including the UNCAN.eu), European Cancer Patient Digital Centre, and Comprehensive Cancer Infrastructures.

The **European Parliament** adopted its resolution of 16 February 2022 on "*Strengthening Europe in the fight against cancer – towards a comprehensive and coordinated strategy*" [62]. This covers actions in the area cancer prevention, screening, and treatment, calls for funding on cancer research and for lessening the inequalities in cancer care between Member States.

In parallel, the **Council** endorsed this priority by including cancer in its 18-month programme prepared by the French, Czech and Swedish Presidencies for the period from 1 January 2022 to 30 June 2023. As a result, the Mission is now systematically part of high-level discussions on health, organised by the Council Presidencies 2022-2023 (FR, CZ and SE). Member States are also being engaged via regular country visits; ten have taken place to date [63] as well as through a series of national cancer events.

Several **other EU initiatives** support the implementation of the Mission. For example, the EC proposal for a Regulation on '**European Health Data Space**' will provide a legal framework for the use of health data for research, public health, and policymaking. As another example, the first building block of the Commission's data strategy, the '**Data Governance Act**', creates a coherent legal framework for making more protected data held by public sector bodies available for access, use and reuse. This will support the creation of the UNCAN.eu platform and the European Cancer Patient Digital Centre.

The **European Medicines Agency**, in collaboration with the European Organisation for Research and Treatment of Cancer, established the 'Cancer Medicines Forum' with academia to support the Cancer Mission. By advancing research into optimising cancer treatments, the Forum contributes to foster high standards in cancer care in the EU.

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[61] Europe's Beating Cancer Plan

[62] Report on strengthening Europe in the fight against cancer – towards a comprehensive and coordinated strategy, A9-0001/2022, European Parliament

[63] Country visits: Spain (5 April 2022); Austria (26 April 2022); Croatia (31 May 2022); Lithuania (14 June 2022); Greece (11 July 2022); Moldova (14 September 2022); Germany (27 September 2022); Portugal (16 November 2022); Estonia (24 November 2022), Cyprus (May 2023).

As part of its activities, the **European Partnership on Metrology** [64] will deliver metrology solutions for industry and supports the development of regulations and standards, which will contribute to optimising cancer treatment in clinical practice. The **Photonics21 Partnership** [65] will address instant diagnosis of major diseases (highly targeted, minimally invasive, and increasingly effective treatment) and new sensors for faster analysis of cancer cells in the blood.

The new **Knowledge Centre on Cancer** [66] helps implement the Mission through fostering scientific alignment, coordination and support to EU cancer-related policies and activities, acting as evidence-clearing house for policymaking on cancer prevention, early detection, treatment, and survivorship. In addition, it manages the European Cancer Information System [67], and the European Cancer Inequalities Registry [68], supporting the Mission's specific monitoring, and will run the future **European Cancer Prevention Centre**.

3.7.6 Citizens and stakeholder engagement

The Cancer Mission is maximizing citizens' engagement to shape future policy actions and priorities. For example, under the Quality-of-Life objective, it has launched a **new dialogue with young cancer survivors**, to better understand their specific need and co-create initiatives that will help address them. Beginning of 2023, about 70 young cancer patients and survivors from all over Europe as well as a few caregivers attended workshops organised by the Commission. Participants shared their personal experiences, struggles, and needs. Among the issues reported, focus was on mental health and ensuring psychosocial support, both during and after treatment, when late effects such as fatigue, chronic pain, infertility, impact survivors' lives. Transition from childhood to adult care, and more generally follow-up care, together with continuity in education and access to quality information were listed as areas where inequities and inequalities hit the most, both from the perspective of young cancer survivors and caregivers.

Building on the results of these workshops, a conference on "Addressing the needs of young cancer survivors" took place on 7 February 2023 [69], gathering more than 200 participants, which brought the buy-in of the DGs CNECT, EAC, EMPL, JRC, SANTE and the WHO. A follow-up event with the same group of young survivors took place on 26 May 2023 to further discuss specific needs and options for co-creation of future initiatives to be supported by the Mission, including the objectives of a new R&I topic.

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[64] Measurement research - European Partnership on metrology (Horizon Europe programme)

[65] Photonics: Industrial innovation and cooperation | Shaping Europe's digital future

[66] Cancer

[67] The European Cancer Information System (ECIS) - | Knowledge for policy

[68] https://cancer-inequalities.jrc.ec.europa.eu/

[69] Events | The research and innovation community platform (europa.eu)

In 2022, **focus groups** have been organised in six EU Member States [70] to understand the views, perceptions, and experiences of common citizens on aspects related to cancer awareness, prevention, cancer risk factors, early detection, and screening. The main conclusions related to 1) improve availability and accessibility of information on cancer; 2) address barriers on screening participation; 3) support access to prevention.

As part of the joint governance with the Europe's Beating Cancer Plan, a dedicated Cancer Group was created on the **EU Health Policy Platform** [71], which provides a framework for the dialogue among health stakeholders and with the Commission on EU cancer initiatives. Several thematic webinars took place in 2021-2023.

A series of conferences and events have been organised by European and national cancer organisations to raise awareness of the Cancer Mission and discuss its implementation. For example, Commissioner Gabriel intervened at the yearly Cancer Summit [72] organised by the European Cancer Organisation (ECO) in 2022.

3.7.7 Progress, achievements, and milestones

Since September 2021, great progress has been made to implement the Cancer Mission, which is creating a portfolio of R&I actions and systematically exploiting existing R&I project results.

Between 2021 and 2023, a total of EUR 365 million has been made available through the **Horizon Europe Mission work programmes**, to support a series of R&I projects. This includes preparatory work for the development of the digital flagship initiatives underpinning the four Mission objectives. As a result, about 50 projects have been and will be awarded funding [73].

To build **Mission portfolios**, two project clusters, "Understanding" and "Prevention and early detection", have been set up in 2022 to engage coordinators in building synergies among projects, and conducting joint activities. A third cluster "diagnosis and treatment" has been set up in January 2023. These activities will contribute to mobilising the cancer research community as well as other cancer stakeholders and engaging them to start implementing the Mission's objectives. The intention is to organise annual meetings of clusters.

The new **Knowledge Centre on Cancer**, which was co-developed with the help of the Cancer Mission Board, launched in June 2021, has now started to develop its '**European Cancer Prevention Centre'** dimension. With the support of the Commission's Scientific

[70] Bulgaria, Czech Republic, Finland, France, Lithuania, and Malta.

[71] EU Health Policy Platform - EU Health Policy Platform (europa.eu)

[72] Summit (europeancancer.org)

[73] 33 Projects from the Work Programme 2021-2022, and we expect to support 16-18 more projects from the Work Programme 2023.

Advice Mechanism, it will become a clearing house for evidence on cancer prevention measures to support Member States in implementing effective prevention strategies, by collecting and reviewing data, including from research projects and best practices.

At national level, several Member States have created "mirror groups", which replicate the same integrated approach to health and research established at EU level. To further integrate of the Cancer Mission at national and regional levels, the ECHoS project [(74)] has started its work to help Member State create "**National Cancer Mission Hubs**"; the kick-off event took in Lisbon on 3-4 May 2023. These hubs will foster cross-policy dialogues with national stakeholders on cancer prevention and control.

The Mission is building strong links and **synergies with other EU programmes and initiatives**. Between 2021 and 2023, at least EUR 300 million has been invested by other programmes to support specific objectives of the Cancer Mission. The Horizon Europe Partnership Innovative Health Initiative included calls for cancer funding in 2021 and a further call in 2023. The **Digital Europe Programme** [(75)] supports the Federated European Infrastructure for Cancer Images Data [(76)], launched on 23 January 2023, and will be the cornerstone of the Cancer Imaging Initiative; a new topic with potential relevance for cancer will be launched under the Work Programme 2023-2024. A Cancer call is also included in the **EIC Accelerator** Work Programme 2023 on novel biomarker-based assays. Collaboration with the **European Investment Bank** focusses on an investment agenda to support the development of Comprehensive Cancer Infrastructures and cancer control services (e.g. screening, vaccination, training) in Member States.

3.7.8 Current estimation of the budget

In addition to the Cancer Mission Work Programmes 2021-2023, the **Horizon Europe Work Programme 2021 'Infrastructures**' included two topics, resulting in two funded projects supporting the Cancer Mission by providing technical solutions for the roll-out of its digital flagship initiatives: EOSC4Cancer and canSERV (budget: EUR 23 million). Overall, Horizon Europe has supported R&I on cancer for a total of EUR 1 billion.

The **EU4Health Work Programmes 2021-2022** contain twelve action grants and three tenders (budget: EUR 226,93 million). This includes inter alia the following major actions: EHDS2 Pilot - Pilot for a European Health Data Space on secondary use of health data (budget: EUR 54 million); CraNE Joint Action - EU Network linking recognised National Comprehensive Cancer Centres (budget: EUR 3 million); project grant BEACON: 'EU Cancer Treatment Capacity and Capability Mapping' project - Network of Comprehensive Cancer Centres (budget: EUR 1 million).

The **EU4Health Work Programme 2023** provides further investments (budget: EUR 187,3 million), e.g.: Joint Action to create CCIs/CCCs (budget: EUR 94 million); new

(74) CSA led by the Portuguese Agency for Clinical Research and Biomedical Innovation (AICIB) includes 58 partners from 28 EU countries.

(75) The Digital Europe Programme | Shaping Europe's digital future (europa.eu)

(76) Digital Europe Programme call for proposals: Health data space — federated European infrastructure for cancer images data | Shaping Europe's digital future (europa.eu)

Networks of expertise on cancer and cancer conditions (budget: EUR 40.5 million); action grant on mental health challenges for cancer patients and survivors (budget: EUR 8 million); development of EU guidelines for lung, prostrate and gastric cancer screening (budget: EUR 7.5 million); study on use of sunbeds and cancer risk (budget: EUR 1 million); study on quality of life of cancer survivors (budget: EUR 1 million).

The **Digital Europe Work Programmes 2021-2023** includes the deployment of a federated infrastructure for cancer images data (budget: EUR 18 million) and several other topics with relevance for cancer data.

Under the **Recovery and Resilience Facility,** the Czech Republic plans to strengthen oncological prevention and care through acquisition of technologies for comprehensive cancer centres (EUR 350 million). Croatia intends to purchase equipment for the prevention, diagnosis, and treatment of cancer (EUR 85 million). Greece wants to establish a new radiotherapy centre (EUR 30 million).

4 RESTORE OUR OCEAN AND WATERS BY 2030

EU ADDED VALUE

- Reconciling protection with the sustainable use of aquatic resources, the Mission treats the ocean, seas, rivers and waters as one interconnected system.
- Key contributor to the **European Green Deal and the fulfilment of its 2030 targets:**
  - Protection and restoration of **biodiversity**: EU Biodiversity Strategy, Nature Restoration Law
  - Prevention and elimination of **pollution**: EU Zero Pollution Action for Air, Water and Soil
  - Making blue economy **carbon-neutral** and **circular**: EU Climate Law, Strategy for the Sustainable Blue Economy
- Through its lighthouses, the Mission is bundling efforts and allowing effective coordination and cooperation at EU and regional level
- To make ocean knowledge readily available to citizens, entrepreneurs, scientists and policymakers, the Mission is developing a **European Digital Twin Ocean**

CITIZEN AND STAKEHOLDER ENGAGEMENT

- Strong political support by **Member States, associated countries and regions** during the **four high-level lighthouse launch conferences** in in 2022-23.
- **Mission Charter** engaged **hundreds of stakeholders** in the Mission implementation
- **Communities of actors are being established:** ports, islands, waterfront cities, coastal regions, shipping, fishing, conservation communities
- At **international level**, several declarations adopted in the last few months show **mutual support around the Mission's objectives**: Union for the Mediterranean, All Atlantic Research and Innovation Alliance, G7 Science Ministers, Kunming-Montreal Global Biodiversity Framework, BBNJ Treaty
- **regions** in the basin

LEVERAGING FUNDING AND GENERATING IMPACT

- **Mission lighthouses** established in four major EU sea and river basins
- The Mission is acting as a catalyst for synergies and complementarities across different EU, national and regional programmes, already pooling funds beyond R&I. **Mission Charter** mobilised more than **EUR 3.72 billion** in the form of 480 concrete actions submitted.
- The Mission is accelerating the scaling-up of research and innovation solutions, by testing and replicating them in more than 100 associated regions across Europe. In **Horizon Europe,** approximately EUR 345 million are being invested in 2021-23. In addition, a portfolio analysis across 16 EU programmes showed that more than 800 projects with a budget of around EUR 4 billion contribute to the Mission objectives and enablers.
- Alignment with **EMFAF national plans in 26 Member States. EMFAF** direct management calls launched in 2022 on blue career and regional flagships in EU sea basins, designed to complement activities implemented by the Mission. **BlueInvest**: EUR 1.5 billion in risk finance supporting the uptake and deployment of solutions.
- **'Blue Champions'** scheme with EIB piloting advisory support for 15 companies contributing to the Mission objectives.
- Complementary activities carried out by several European partnerships and Joint Undertakings, incl. the Sustainable Blue Economy partnership, Zero-Emission waterborne partnership, Biodiversa+, PRIMA, Water4All and the Joint Undertaking on Circular Bio-based Economy.
- Under the **Recovery and Resilience Funds**, several reforms and investments planned in MSs plans in the blue economy and marine domains, including marine data and monitoring, mobilising a budget of the order of EUR 10.7 billion.
- Digital Europe: Piloting the interoperability between Destination Earth and the Digital Twin Ocean (DTO).
- **Mission Oceans and Waters implementation platform** launched as a one-stop-shop providing tailored services
  - calls addressing Mission objectives (EUR 450 million)
  - **Sustainable Blue Economy Partnership** (SBEP): topics complementary to the Mission (EUR 150 million)
  - **Water4ALL Partnership**: EUR 420 million contribution

4.1 Mission goal and objectives

The aim of the EU Mission 'Restore our Ocean and Waters by 2030' is to provide a **systemic approach for the restoration of the ocean, seas and waters by 2030**. The Mission implementation plan outlines **three specific objectives**:

- Protect and restore marine and freshwater ecosystems and biodiversity;
- Prevent and eliminate pollution of our ocean, seas and waters; and
- Make the sustainable blue economy carbon-neutral and circular.

Overall, **nine quantitative targets** across the three specific objectives were set (European Commission, 2021b). **Two enabling aspects**, **digital ocean and water knowledge system and public mobilisation and engagement**, are underlined as closely interrelated and mutually supportive lines of action. The Mission is building on the existing structures and capacities of a fit-for-purpose marine observation, monitoring and forecasting system (including climate predictions). The goal is to develop an interactive replica of the ocean – the Digital Twin Ocean (DTO) – as a digital space with vast amounts of data, models, artificial intelligence, and other tools that will enable digital modelling of the properties and behaviours of marine systems for more informed decision making (European Commission, 2022d). New deliberative decision-making and engagement mechanisms support citizen co-design of sustainable management of aquatic resources and co-implement transformative solutions supporting the restoration of EU waters (European Commission, 2021b).

Figure 7: Mission's objectives and targets

Source: EFIS study on the basis of the Mission implementation plan (MIP)

4.2 The Mission's selection process

The selection of the Mission in the area healthy ocean, seas, coastal and inland waters was motivated by the recognition that restoring the health of our hydrosphere requires a large-scale systemic change, which, given the environmental tipping points, is urgent and there

is a risk of irreversible consequences if no action is taken (2020a). The scale of the challenge requires an effective mobilisation of society, economy and knowledge for impact in new and innovative ways. This entails a new *modus operandi* that allows to mobilise actions in a bottom-up manner while ensuring alignment and direction through top-down guidance.

Through the online survey launched in the context of the external study underpinning the assessment of EU Missions, a large majority (84%) confirmed that **the Mission is bold, inspirational and has the necessary scope**. It was widely recognised by the consulted stakeholders that **addressing the hydrosphere as a connected system of ocean, seas, coastal and inland waters is necessary** given the existential challenges that the degradation of water ecosystems are posing.

Recognition that the health of the hydrosphere face existential tipping points provides the right context for setting up bold initiatives with ambitious targets. Moreover, the Mission not only aims to halt the degradation of the water and marine ecosystems, but seeks to regenerate their health, which underlines its ambitious character (Deidun, 2020). The recent international attention focused on this challenge suggests that the **Mission is a daring attempt to address a global problem**. For example, in March 2023 the High Ambition Coalition [(77)] under the auspices of the United Nations Intergovernmental Conference (European Commission, 2022a), was adopted. This ground-breaking new treaty is a promising step to protecting nature across remote waters and demonstrates the type of international cooperation necessary to avert the biodiversity crisis. **The Ocean and Waters Mission is an opportunity to demonstrate European leadership in designing systemic approaches for tackling some of the greatest societal challenge** such as marine degradation, litter pollution, and support the sustainable use of ocean and water resources.

While there is a wide recognition among the stakeholders consulted via the external study (through an online survey, targeted interviews and a dedicated workshop) that conceptually a systemic focus on the entire water system is necessary for tackling the challenges associated with biodiversity loss, pollution and carbon-neutral blue economy, **from the operational perspective the scope of the Mission remains somewhat a challenging topic**. A third of the interviewees highlighted that the focus on the three broad sub-objectives and coverage of all water systems present an intricate framework that is complex, and it requires to balance different growing challenges simultaneously. Remarks that both ocean and freshwater coverage is 'watering down' the focus for the Mission has been expressed also by survey respondents.

With regards to the transparency and inclusiveness of the Mission selection, the first Mission board process has been open to external expertise and included the uptake of viewpoints from large network NGOs such as Seas-at-Risk, WWF, Greenpeace, Friends of Earth, OceanUnite, Pew, etc. Stakeholders have been consulted also through interactive sessions and workshops at conferences, such as R&I Days, European Maritime Day, etc.

[(77)] https://oneplanetsummit.fr/en/events-16/one-ocean-summit-221

Regular liaison activities were ensured also with youth organisations, lobbies, Mission Assembly [78], individual Member State representatives and industry stakeholders (Deidun, 2020). The external study analysis confirms that these external consultations were productive and influential leading to many external inputs being successfully integrated into the Mission board's thinking and the deliberation of the final Mission proposal. It also highlights that the **predominant view among stakeholders is that the Mission has been selected in a transparent manner** (with 41% agreeing and 14% strongly agreeing to this statement). Also targeted citizen deliberation sessions have been successfully carried out in countries like Ireland, France, Italy, Portugal. Overall, the external study concludes that the Mission board thinking was strongly endorsed by a broader public.

4.3 Management arrangements and governance structure

The established EU level governance mechanism for the Mission Ocean comprises **new cross-sectoral steering and coordination bodies**. The high-level political steer is ensured by the Commissioners of the respective Commission's Directorates-General (DGs). In the case of the EU Mission 'Restore our Ocean and Waters by 2030' the political steering is shared among the Directorate General for Maritime Affairs and Fisheries (DG MARE) and Directorate-General for Research and Innovation (DG RTD). The day-to-day steering and coordination of the Mission is undertaken by the Mission manager (DG MARE) and the deputy Mission manager (DG RTD). The interservice coordination of the Mission programming is ensured by the Mission owners' group (MOG) that includes representatives from 13 DGs [79].

The policy coordination work for implementation is undertaken by the Mission secretariat that includes staff members from DG RTD and DG MARE. The Mission board consisting of 15 independent experts provides an advisory role. The strategic configuration of the Horizon Europe Programme Committee (SPC) serves as a representative forum for the exchange of information and views among Member State (MS) representatives and the Commission related to Missions in Horizon Europe. The governance structure at the implementation level comprises the establishment of the four basin-level lighthouses, the Mission implementation platform launched in early 2023 and the European Climate Infrastructure and Environment Executive Agency (CINEA) that

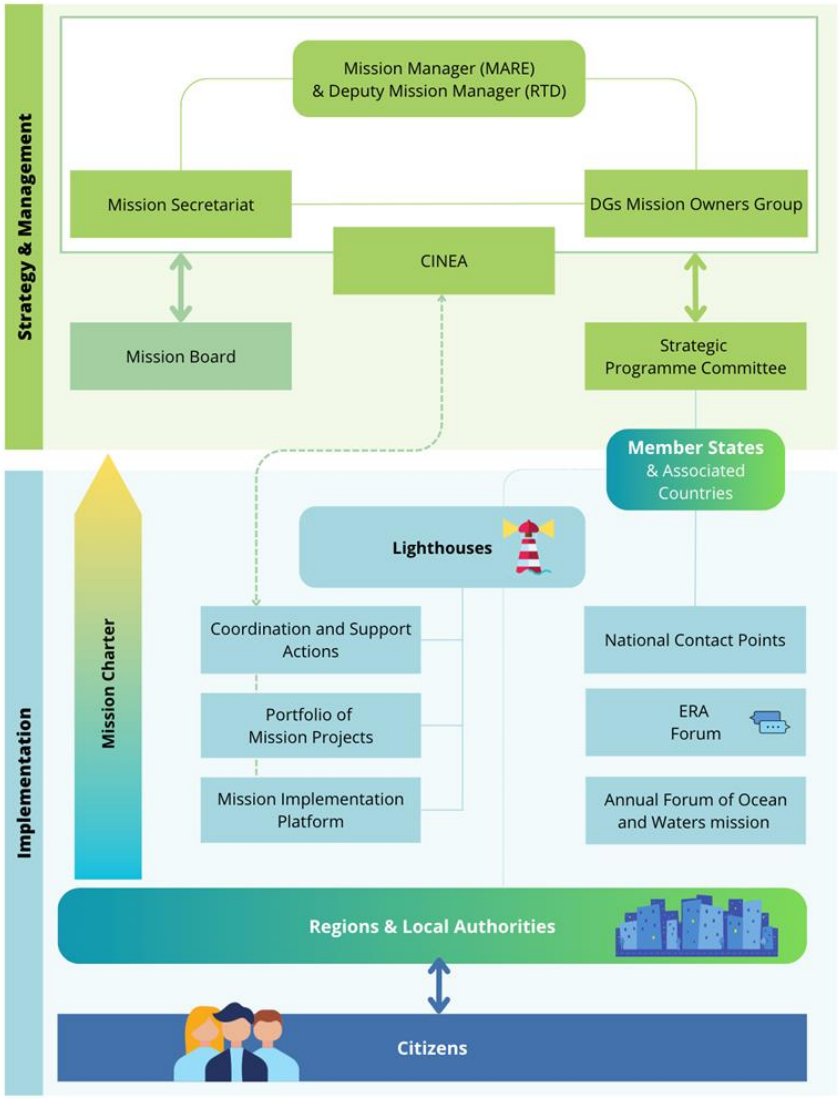
([78]) Mission Assembly consists of up to 30 high-level experts, selected among the applicants for the Mission boards and aimed at providing an additional pool of ideas, knowledge and expertise.

([79]) Beyond DG MARE and DG RTD these are DG for Agriculture and Rural Development (DG AGRI), DG for Climate Action (DG CLIMA), DG for Communications Networks, Content and Technology (DG CNECT), DG for Defence Industry and Space (DG DEFIS), DG for Education and Culture (DG EAC), DG for Environment (DG ENV), DG for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW), EC Joint Research Centre (JRC), DG for Mobility and Transport (DG MOVE), DG for Neighbourhood and Enlargement Negotiations (DG NEAR), DG for Regional and Urban Policy (DG REGIO).

oversees the execution of the Mission-specific Horizon Europe projects and the contract of the Mission implementation platform.

The main governance structure for national, regional and local level are the dedicated basin-level lighthouses covering the Atlantic-Arctic basin, Mediterranean Sea basin, Danube River and Black Sea basin and Baltic and North Sea basin. The lighthouse mechanisms also include the Horizon Europe Associated Countries and the outermost regions as an integral part of the Mission initiatives. Four Mission-specific Horizon Europe coordination and support actions (CSA) [80] started in January 2023 to support the development and roll-out of the four Mission lighthouses, including governance at basin level.

Figure 8: Governance structures for the EU Mission Ocean and Waters



Source: EFIS study

([80]) Danube River and Black Sea lighthouse – EcoDaLLI; Atlantic and Arctic basin – BlueMissionAA; Mediterranean Sea basin – BlueMissionMed; Baltic and North Sea basin – BlueMissionBAN.

A fundamental principle of the lighthouse design is to take into account the existing governance platforms and structures at macroregional and regional level. While not designing any new rigid structures the four CSAs are expected to serve as entry points and support mechanisms for a well-functioning basin scale innovation ecosystem. To gain momentum, different lighthouses are piloting and leading on one of the Mission's objectives capitalising on already established activities and programmes and delivery models (European Commission, 2021b).

The established Mission governance model has been an important step forward in carrying out the cross-cutting Mission steering work. The EU Missions' assessment by the external consultants suggests that the systemic nature of the Ocean and Waters Mission, its close links to a plethora of policy and legislative actions and interlinks with other Missions (most notably, Mission Soil, Adaptation to Climate Change and 100 Climate-Neutral and Smart Cities by 2030) presents a **significant coordination challenge**. Recognising this complexity, a dedicated agency for the implementation of the Mission was suggested by the Mission board in its Mission proposal (European Commission, 2020a). This governance model was not taken up in the Mission implementation plan as considered not appropriate at this point in time.

Regarding the suitability of the existing governance model for steering and implementing the Mission, survey responses collected via the external study indicate that 38% of respondents agree or strongly agree that the existing governance arrangements are fit for purpose and 15% disagree or strongly disagree to this statement, whilst most respondents either do not have a strong opinion (27%) or cannot answer (19%). The analysis of the online survey suggests that **external stakeholders were not yet aware enough about the existing governance mechanisms** was echoed in the open answers of the survey. The lack of clarity of cooperation structures and the lack of clarity of responsibilities among Mission governance bodies was singled out as main barriers to effective Mission governance by respectively 44% and 43% of survey respondents.

While high level commitments such as the speech of the EC President Von der Leyen at the One Ocean Summit in Brest, France in 2022 ([81]), commitments made at the Mission's annual forum ([82]) in Brussels in 2023 as well as other ongoing events ([83]) demonstrate the highest level of connectedness to the Mission at the EC level, the study analysis points out that up to now the **political attention to the Mission objectives has been uneven among the involved Commission's DGs and other EU institutions**. The external study analysis suggests that **the thematic area of ocean and waters will gather more political support**

([81]) European Commission (2022) Speech by President von der Leyen at the One Ocean Summit https://ec.europa.eu/commission/presscorner/detail/en/speech_22_962

([82]) EU Missions "Restore our Ocean and Waters by 2023" Annual Forum https://icfnext.swoogo.com/missionforum2023/2943360

([83]) European Commission (2022) How to engage with the Mission "Restore our Ocean and Waters by 2030" https://research-and-innovation.ec.europa.eu/events/upcoming-events/how-engage-Mission-restore-our-ocean-and-waters-2030-2022-06-14_en

considering the ongoing pivotal international agreements and initiatives, such as All-Atlantic Ocean Research and Innovation Alliance Declaration ([84]), G7 Ocean Deal Science Ministers Communiqué [85], Global biodiversity framework of COP 15 UN Biodiversity conference (United Nations, 2021), The **existing and ongoing declarative and legislative frameworks provide favourable conditions for the necessary political mobilisation and show progressive buy-in at political level.**

With regards to the horizontal coordination, the analysis carried out by the external consultants indicates that **there is scope for further development of cross-departmental governance structures in the Commission**. Given the number of DGs involved it is expected that horizontal coordination will remain very challenging. There are, however, examples of good coordination, e.g. with DG CNECT piloting the interoperability between Destination Earth and the Digital Twin Ocean (DTO) in the Digital Europe 2023-2024 work programme as well as DG DEFIS and JRC, or with DG EAC bringing together excellent projects and researchers funded under Marie Skłodowska-Curie Actions (MSCA) and the European Institute of Innovation and Technology (EIT) [86]. The study reports the views of consulted stakeholders that suggest that the coordination with e.g. DG ENV, DG CLIMA, DG GROW, DG MOVE has not been optimal due to diverging policy attention on the health of the water systems or conflicting policy priorities. The greatest challenge in coordination might be potential conflicts between various EU policies (e.g. protection of biodiversity and offshore wind energy targets). In conclusion, the external study suggests that **higher level political steering, e.g. from the European Council, would help to underline the political priorities of the Mission and support the alignment of action plans at cross-departmental level**.

Effective coordination between EU, national, regional, and local levels is, according to consulted stakeholders, the most important element for the Mission to create added value (74% of survey respondents mark it as a key feature). This reflection is supported by workshop discussions, as participants highlighted that the Mission objectives are shared by local and regional stakeholders, but it is not always clear to what extent the Mission contributes to their work. The main mechanism for the vertical coordination with national, regional and local level are the four basin-level lighthouses. The governance of lighthouses was initially foreseen through establishments of political implementation charters concluded among the Members States, regions, the EC and other stakeholders (European Commission, 2021b). The Mission charter, open and publicly accessible, covering all

([84]) European Commission, Directorate-General for Research and Innovation (2022), The EU signs landmark All-Atlantic Ocean Research and Innovation Declaration with 7 partner countries https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/eu-signs-landmark-all-atlantic-ocean-research-and-innovation-declaration-7-partner-countries-2022-07-14_en

([85]) Future of the seas and oceans initiative (2022) G7 Science Ministers' Communiqué https://www.g7fsoi.org/g7-science-ministers-communique/

([86]) https://rea.ec.europa.eu/events/msca-cluster-event-Mission-ocean-and-waters-2022-06-07_en

lighthouses was launched in 2022. In the first half of 2023 important efforts are being made to mobilise the national and regional level actors through lighthouse launch events

With respect to the **coordination with the MS and AC**, the analysis and consultations carried out in the context of the external study point to a sub-optimal integration of the national level during the first two years of Mission implementation. Stakeholder impressions are that at this early stage the Mission is mostly being only discussed by national public authorities (42%), some countries have started to identify funding sources (18%), but implementation through specific public policy instruments is not yet prevailing (only 7% survey respondents mark this being the case). The range of recent Mission events and individual meetings between the EC and MS have been diverse and numerous. Concrete activities with regards to Mission uptake are reported by 13 MS [(87)], which indicates that more initiatives may be ongoing than is known to the wider stakeholder groups. While the **formation of mirror interdepartmental groups for the EU Ocean and Waters Mission is not yet widespread across the EU, good examples at national level**, e.g. Austria, Denmark, Germany, Ireland Norway, Portugal, **are gradually emerging**. An active stance towards the Mission is also taken by public administrations in Spain, Italy, the Netherlands, as well as more recently in Bulgaria and Romania. Continuous political engagement work by the Commissioners, Mission manager and deputy Mission manager is ongoing to ensure the MS connectedness to the Mission, especially those countries that have not shown sufficient interest and commitment. Some interviewees expressed the conviction that the ongoing political mobilisation events can improve this lag in connectedness very quickly citing, for instance, the changes in Irish political attention to the Mission after the Atlantic-Arctic Lighthouse event in Cork, Ireland [(88)] convened in November 2022.

Citizen engagement is a fundamental feature of the Mission approach. To ensure the emotional connection with citizens, the Mission board proposed a starfish metaphor to communicate the central objective of restoring our ocean and waters and the five related sub-objectives to achieve that. While the starfish image has not been taken up in further Commission documents, three interviewees underline that it has been a very beneficial way to explain the Mission objectives to citizens. Overall, **the Mission activities appear to have a strong emphasis on promoting citizen engagement, encourage ocean literacy and education**, especially for children. For example, PREP4BLUE project is running a webinar series to enable stakeholders to design projects with citizen participation [(89)]. The European Ocean Coalition (EU4Ocean), a bottom-up initiative supported by the Commission, connects diverse organisations, projects and people that contribute to ocean

([87]) Non-public presentation delivered at the Horizon Europe SPC meeting on 30 March 2023.

([88]) https://research-and-innovation.ec.europa.eu/events/upcoming-events/Mission-restore-our-ocean-and-waters-2030-atlantic-arctic-lighthouse-2022-11-24_en

([89]) https://prep4blue.eu/events/prep4blue-webinar-series-planning-for-citizen-participation-in-Mission-ocean-waters/

literacy and the sustainable management of the ocean [90]. Citizen science activities to prevent plastic pollution through the initiative Plastic Pirates have been supported [91]. Involvement of citizens and communities is an integral part of the Mission-specific Horizon Europe funded coordination and support actions (CSAs) and Mission-specific research and innovation projects [92]. Moreover, survey results confirm the stakeholder opinion that the Mission encourages broad engagement and active citizen participation with 62% agreeing or strongly agreeing. Several stakeholders confirm that the implemented **citizen engagement initiatives have had high support and good rates of participation indicating that there is a great source of energy and goodwill at the level of society** and that bottom-up initiatives are implemented even without much support. This presents a real opportunity for the Mission.

4.4 Progress to date

The Mission is in its early stages of implementation, and it is too early to fully assess results. Major efforts have been dedicated to launch Horizon Europe Mission calls that introduce a new paradigm for implementing R&I, development, and piloting projects. The portfolio of other EU supported actions is gradually identified and linkages to Missions' objectives are established. The Mission implementation platform was launched at the end of 2022, and it will provide a single information portal for Mission partners, host Mission-specific monitoring and progress tracking system and implement various community support and communication tasks. Four Horizon Europe Coordination and Support Actions for the preparation of the lighthouse set-up have also been launched at the start of 2023. The pledges to the Mission charter have grown rapidly with currently more than 480 signatories joining the initiative and putting forward initiatives with a budget of around EUR 3.72 billion.

The charter was launched by the European Commission as a non-binding and open mechanism to engage stakeholders, create mutual awareness and visibility of the involved actors and promote the stakeholder 'ownership' of the Mission. The charter distinguishes among pledges related to 1) research and innovation actions, 2) evidence-based knowledge and data, 3) upscaling, deployment and replication of solutions, 4) citizen engagement, outreach, awareness raising and 5) education and training.

The interviews carried out in the context of the external study suggest, however, that **the logic and added value of the charter initiative is not well understood by all target audiences**. Regional representatives specify that local actors do not see a clear process for and clear benefit of joining the charter, hence not all regional actors have made a pledge. The charter interactive dashboard indicates that regional authorities have made less pledges, yet cities and local authorities have been slightly more active. This view is

([90]) https://webgate.ec.europa.eu/maritimeforum/en/frontpage/1482

([91]) https://www.plastic-pirates.eu/en

([92]) List of projects – EU Mission "restore our Ocean and Waters by 2030" – Call for proposals 2021 https://oceans-and-fisheries.ec.europa.eu/system/files/2023-02/list-of-projects_en_0.pdf

supported also by survey results that outline that 69% of respondents are **unclear on how to become involved in the Mission** and 57% consider there are insufficient instruments/actions to support the involvement. Opportunities to involve key regional innovation ecosystems, which already have engaged companies and universities in a transnational manner and can scale up research and innovation significantly (e.g., WaterCampus Leeuwarden) have been highlighted as important. More targeted communication on the charter process through the foreseen EC support initiatives could possibly improve the rates of engagement.

At this early stage, among the most significant achievement of the Mission, the external study analysis outlines the dedicated and **targeted efforts to surpass the institutional fragmentation** by developing connections between initiatives. The Mission provides a more holistic approach to very fragmented R&I activities bringing them under one umbrella with more coherent governance structures. The objective to bring a systemic view to the ocean and waters topic is acknowledged as a very important contribution of the Mission. Most survey respondents (54%) agree or strongly agree that the Mission is progressing in line with its implementation plan. Despite the concerns for the suboptimal visibility of the initiative in all relevant stakeholder networks (e.g., research infrastructures, regional and local levels), survey responses suggest that stakeholders are supportive of the achieved progress to date. In a similar vein, a very large portion of the respondents to the survey (78%,) agree that the **Mission is likely to create added value compared to existing initiatives or instruments at EU level**. This shows quite important stakeholder trust in the Mission as an instrument and the efforts put in place for its implementation. This reflection is in line with the interview results, where a large part of participants underlined the significant added value of the Mission in term of coherence, complementarity, and synergies with other initiatives on the topic of ocean and waters at EU level and beyond.

The table below provides a summary overview of the assessment findings concerning the progress made against each of the Mission objectives.

Table 7: Summary of progress toward Mission objectives

Specific Mission objectives	Implementation steps taken	Challenges ahead (identified in interviews, survey and desk research conducted up to date)
1.Protect and restore marine and freshwater ecosystems and biodiversity	• Mission Charter and implementation platform launched • Atlantic-Arctic lighthouse, Danube River basin lighthouse initiated (CSAs + high level lighthouse events) • Two Innovation Actions providing scientific evidence to support the establishment of EU-wide Blue Parks • Horizon Europe Mission projects launched • Portfolio of funded and ongoing projects from other EU level instruments identified	Maintaining/broadening political commitment and stakeholder buy-in

Specific Mission objectives	Implementation steps taken	Challenges ahead (identified in interviews, survey and desk research conducted up to date)
	• Synergies and complementarities with EU level funding schemes identified and ongoing	
2.Prevent and eliminate pollution	• Mission Charter and implementation platform launched • Mediterranean lighthouse initiated (CSA + two Innovation Actions + high level lighthouse events) • Horizon Europe Mission projects launched • Portfolio of funded and ongoing projects from other EU level instruments identified • Synergies and complementarities with EU level funding schemes identified and ongoing	Maintaining/broadening political commitment and stakeholder buy-in Addressing the scope and measurability of the goal (e.g. which pollutants and value chains will be targeted)
3.Make the sustainable blue economy carbon-neutral and circular	• Mission Charter and implementation platform launched • Baltic North Sea lighthouse initiated (CSAs + 2 Innovation Actions + high level lighthouse events) • Horizon Europe Mission projects launched • Portfolio of funded and ongoing projects from other EU level instruments identified Synergies and complementarities with EU level funding schemes identified and ongoing (incl. the launched Sustainable Blue Economy partnership)	Maintaining/broadening political commitment and stakeholder buy-in
Enabler 1. Develop ocean and waters knowledge system	• Mission Charter and implementation platform launched • Horizon Europe Mission projects launched • Synergies and complementarities with EU level funding schemes identified and ongoing • Steps for Copernicus, EMODnet and ERIC infrastructure resource integration	
Enabler 2. Support public mobilisation and engagement	• Mission Charter and implementation platform launched • Horizon Europe Mission projects launched • Citizen engagement methodologies reviewed and mainstreamed in Mission projects	Developing tested deliberative democracy mechanisms

Specific Mission objectives	Implementation steps taken	Challenges ahead (identified in interviews, survey and desk research conducted up to date)
	• EU4Ocean activities implemented • Other targeted citizen engagement activities rolled out	

Source: EFIS study

4.5 Budget and funding leveraged

To support the development, scaling up and deployment of solutions, the Ocean and Waters Mission is expected to mobilise a dynamic investment ecosystem. The underlying concept is that **the Mission investment agenda should bring together a wide range of financial and non-financial tools and mechanisms from public and private sources, from grants to financial instruments, including options of blended finance**. The Mission implementation plan outlines that different funding sources will be mobilised for the different phases of the Mission (European Commission, 2021b). The table below lists the EU level funding sources and earmarked budgets as outlined in the Mission implementation plan and from updated materials provided by the Mission secretariat.

Table 8: Portfolio of EU level instruments

Instrument	Type of instrument	Funding allocated and period
Horizon Europe Mission calls	Support action	€344.1 million for 2021-2023
Horizon Europe Cluster calls		€447 million for 2021-2024
Horizon Europe Partnerships		Waterborne transport 2021-2024: Together with industry, around €150 million for 2021- 2024 Blue economy 2021-2027: €450 million of which €150 million EU funding + €300 million MS and AC contributions has been launched Water4All 2021-2027: €420 million of which, €126 million EU funding + €294 million MS/AC
Horizon Europe Research Infrastructure programme		Around €46 million in 2021- 2024
EMFAF	Support action	€217 million for 2021-2027
EMFAF direct management: calls 2022 on blue career and regional flagships in EU sea basins		€15.1 million
COPERNICUS (in kind)	Support action	€24.3 billion
LIFE	Support action	
CEF	Support action	

Instrument	Type of instrument	Funding allocated and period
Digital Europe Programme on Data Spaces	Support action	
Recovery and Resilience Plans	Support action	€10.7 billion (commitments by end 2023)
ERDF/ESIF	Support action	
INTERREG	Support action	
Marie Skłodowska-Curie Actions (MSCA)	Support action	
Erasmus+	Support action	
Network of European Blue Schools	Support action	
BlueInvest	Financial and advisory services	€1.5 billion
The EIB Innovation Finance Advisory service	Advisory services	€2 million
EIB Clean and Sustainable Ocean Programme	Financial and advisory services	€4.5 billion
European Circular Bioeconomy Fund (ECBF)	Financial services	€65 million, exact focus on blue bioeconomy TBD

Source: EFIS study based on reviewed documentation

Other potential funding sources that have been identified (but their mobilisation is not yet confirmed), include the Just Transition Fund, the Innovation Fund, JPI Ocean calls, Interregional Innovation Investment instrument (I3), Natural Capital Financing Facility (NCFF), as well as wider venture capital and risk capital funding platforms (European Commission, 2021). At the macro-regional level, possible funding channels include sources like Nordic Investment Bank (NIB), NEFCO, Grant schemes of Nordic Council of Ministers, EEA and Norway Grants, Baltic Sea Action Plan Fund, Swedish Institute programme, etc. (European Commission, 2022b).

The types of funding instruments deployed for Mission implementation can be grouped in the following five categories:

Sources supporting research and innovation and deployment of solutions

The R&I core centred on the lighthouses and enablers is funded through dedicated Horizon Europe Mission calls. For the period 2021-23, Horizon Europe earmarked EUR 344.16 for

Mission implementation projects [93]. By January 2023, 20 of these projects were already launched for a total budget over EUR 117 million [94]. Seven of them with an overall EC contribution amounting to EUR 52.9 million tackles the specific objective of protecting and restoring our oceans and waters. Two projects target the fighting of pollution with €16 million and another two support the sustainable blue economy with EUR 17.8 million. To develop the European Digital Twin Ocean two projects are supported with EUR 10 million. Three projects to involve citizens, the key allies of the Mission, received a combined funding of EUR 3.8 million. The four coordination and support actions for the four lighthouses received a total funding of EUR 11.7 million. Another EUR 5 million has been awarded to the preparatory action of the Mission PREP4BLUE. These 20 projects have been complemented with18 additional funded projects from the 2022 calls. 20 more projects are expected to be funded from the 2023 calls (deadline 20/09/2023). Also, three joint calls with the Mission Soil and Mission Adaptation to Climate Change, for a total budget of EUR 51 million, were also adopted in the work programmes 2022 and 2023.

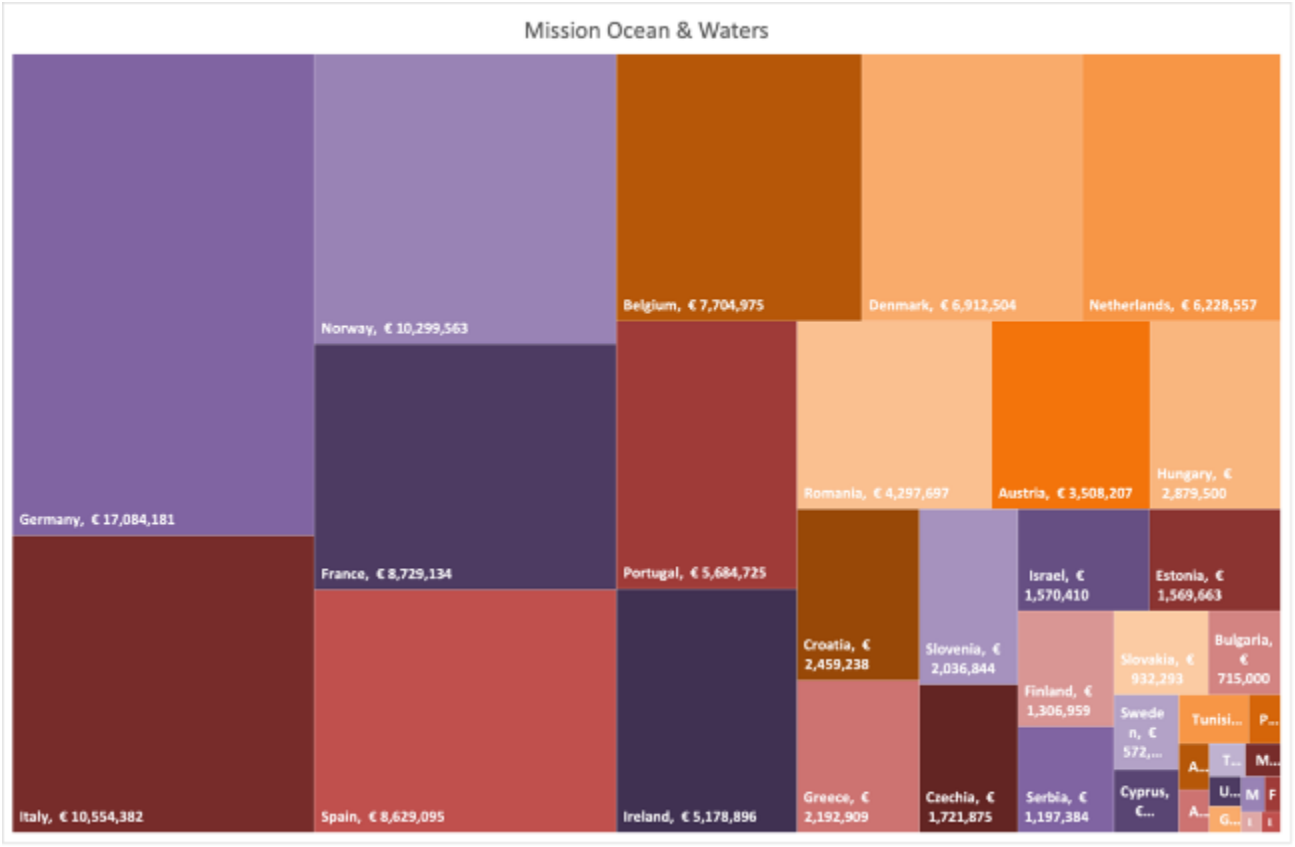
The 20 projects presented above and already launched, gather 297 partners from 39 countries. The most notable beneficiaries of these Mission calls are organisations from Germany, Italy, Norway, France and Spain. Also, smaller countries like Belgium, Denmark, the Netherlands, Portugal and Ireland are strongly represented in the projects.

Besides the targeted Mission calls, **R&I actions in the areas of relevance to ocean and waters Mission are also supported by Horizon Europe Cluster calls**. The European Partnerships (Waterborne transport, Blue economy and Water4All) are contributing to innovation development, demonstration, deployment and diffusion of innovative solutions.

[93] https://www.call-for-europe.org/blog/the-oceans-and-seas-Mission-under-horizon-europe-new-funding-calls-for-research-and-innovation

[94] https://oceans-and-fisheries.ec.europa.eu/news/eu-Mission-restore-our-ocean-and-waters-20-new-projects-restore-our-blue-planet-2030-2023-02-17_en,n

Figure 9: Horizon Europe Ocean and Waters Mission project funding per country-related to the 20 projects already launched



Source: Horizon Europe Dashboard. Data extracted by the external study team on 21 March 2023. Analysis and visualisation: external study team

Support to physical and digital infrastructure investments

The European Commission has been investing about €10 million annually since 2021 to develop a core European Digital Twin Ocean (DTO), conceived as a public service and a public good [(95)]. DTO benefits from in-kind contributions from Copernicus programme and Marine Observation and Data Network (EMODnet). The Digital Europe Programme supports the interoperability between DTO and the EC flagship initiative Destination Earth. The research infrastructure programme under Horizon Europe has allocated budget through topics for FAIR and open data sharing as well as for access to research infrastructures services in support of the Mission.

Support to education, training, and skills development

Multiple programmes from the DG Education and Culture are supporting Mission objectives, including Marie Skłodowska-Curie Actions (MSCA), Erasmus+, the European Solidarity Corps and the Creative Europe Programme. Concrete budget appropriations in

(95) https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters/european-digital-twin-ocean-european-dto_en

support to Ocean and Waters Mission are being clarified. Ocean literacy is supported by DG MARE funded Network of European Blue Schools, which is part of the EU4Ocean Coalition of Ocean Literacy. EMFAF direct management programme have calls on blue careers. The topic of water, marine and maritime affairs is also considered as a topic of a future knowledge and innovation community (KIC) of the European Institute of Innovation Technology (EIT, 2021).

Regional investments and capacity building

Mechanisms to interlink with the EU shared management programmes are currently put in place. For example, complementarities and synergies with the Mission were systematically encouraged and checked during the adoption process of ESIF partnership agreements and EMFAF national plans. 26 MS explicitly refer to the Mission in their ESIF operational programme. 26 out of 27 EMFAF national plans adopted by the beginning of 2023 include clear coordination and complementarities with the Mission. The analysis of the Recovery and Resilience Facility (RRF) plans submitted by MS also shows substantial investments into the sustainable blue economy and marine domains, which include greening and innovating the fisheries and aquaculture sectors, monitoring marine and coastal biodiversity, restoration of river systems, waste water treatment, water reuse, flood protection, offshore energy parks, upgrading of port infrastructure, coastal tourism, greening and digitalisation of ports and shipyards and investments in green shipping. Alignment of regional initiatives through INTERREG programmes is also regarded as an important channel for funding mobilisation that was also underlined by workshop participants.

Financial and advisory services

The scaled-up equity initiative InvestEU Blue Economy that builds on the BlueInvest Fund pilot under EFSI, and brings together the EMFAF, the EIB Group and InvestEU finance is expected to result in €1.5 billion of risk-financing available to innovative and sustainable blue economy SMEs and start-ups, via financial intermediaries [(96)]. Agreement for cooperation with the European Investment Bank (EIB) to reduce pollution in European seas and invest in blue innovations and blue economy is underlined as one of such milestone achievements in forging a synergetic funding framework for the Mission [(97)]. A six-month long EIB market assessment study is currently being implemented with an ultimate objective to select 25 priority projects from the EIF Blue Invest II project portfolio for further investment ([(98)]).

Overall, the **scale of funding available at the EU level appears to be appropriate** for undertaking the broad range of the envisioned actions. The partial mapping of current

[(96)] https://www.eif.org/what_we_do/equity/news/2022/commission-and-eif-agree-to-mobilize-500-million-with-new-equity-initiative-for-blue-economy.htm

[(97)] https://sciencebusiness.net/network-updates/eib-group-and-european-commission-join-forces-protect-oceans-and-boost-investment

[(98)] Information collected by the external study team though a targeted interview with EIB representatives.

appropriations across multitude of instruments indicates that EU contributions to the Mission may reach tens of billions of euros per year. While there is no dedicated modelling undertaken to estimate the overall funding needs for reaching Mission's objectives, the initial estimates of the Mission board for the overall investment needed to reach the goals outlined in the Mission proposal was €500 billion over the period 2021-2027. This amounts to €70 billion annually or 0.5% of the EU GDP in 2019 (European Commission, 2020). This highlights the need to mobilise considerably more funding from national, regional and private sources to achieve the Missions' objectives.

Nevertheless, there is quite a large share of survey respondents that do not hold enough knowledge to make an informed assessment about the allocated funding sources (from 20% on European funding sources to 41% on local funding sources). The same sentiment is echoed by the interviewees who acknowledge that, at the moment, there are **no clear overviews of the plethora of funding mechanisms at play**. The Mission implementation platform and the lighthouse CSA projects will provide guidance to stakeholders regarding this aspect.

The success of the Mission relies on its ability to serve as an overarching structuring and coordination vehicle connecting and aligning various ongoing and planned instruments and initiatives in the area of ocean and waters. Forging synergies and coherence are at heart of this approach. Synergy occurs when the sum of (expected) results of programmes/initiatives as a whole is greater than the sum of the parts. Coherence concerns the quality of being logically integrated and consistent. It implies clear goals, and consistency in applying multiple policy or programme efforts towards achieving that goal in a non-contradictory way (European Commission, 2022a). The Mission activities are clearly showcasing the opportunities for synergistic arrangements.

4.6 Key conclusions from the external assessment

The ocean and waters are the life-support system sustaining our existence, our planet's ecosystems and our economy. Due to unprecedented human-made pressures the health of our water systems faces existential tipping points. To reverse and improve the situation a large-scale systemic change is necessary. **Addressing hydrosphere as a connected system of ocean, seas, coastal and inland waters is perceived as bold, inspirational and necessary** provided the existential challenges that the degradation of the water ecosystems are posing. By providing a systemic framework that is based on the existing legislative and regulatory measures and brings together different related initiatives connected to the entire water lifecycle beyond the institutional fragmentation the Mission is **likely to create added value compared to existing initiatives or instruments at EU level**.

Mission's **goals are measurable and time bound**, yet the criteria of the Mission **goals being realistic to achieve by 2030 is somewhat challenged**. The external study analysis suggests that the defined targets to which the Mission contributes to, are rather ambitious, but they reflect the urgency and scale of the challenge. Yet the achievability of some individual targets, such as the restoration of 25,000 km of free-flowing rivers by 2030 and the reduction of nutrient losses by at least 50% by 2030 could be questioned. Despite the awareness that not all goals may be reached by 2030, the Mission provides an **important**

impetus through the achievements of joined up policies, instruments and solutions that put Europe on an accelerated track to achieving all outlined goals.

While the systemic approach to the water system challenges is strongly endorsed, from the operational perspective the scope of the Mission presents a very complex framework that remains difficult to put in practice. The multiple sub-objectives involve distinct parts of the water lifecycle each with their own specificities and expertise requirements. There is a **risk that the broad scope of the Mission may dilute the necessary mobilising effect**. The Missions' focus on key areas for addressing water system challenges (as opposed to a comprehensive coverage of all existing challenges related to the water cycle) should be more clearly communicated to gain wider stakeholder buy-in.

The Mission selection process has been transparent with many opportunities for co-creation and stakeholder engagement. The high number of citizen engagement initiatives implemented successfully indicates that there is a great source of energy and goodwill at the level of society which presents an important opportunity for the Mission. Overall, there is confidence that **Mission scope and objectives are strongly endorsed by the broader public**.

The established Mission governance model has been an important step forward in carrying out the cross-cutting Mission steering work. The **progress with the established DG MARE and DG RTD cooperation matrix is regarded as a promising start**. There is a recognition that within the EC services there is a significant commitment and efforts being made to ensure the Mission activities are being implemented in the best possible way within the available organisational and human resource limitations.

Up to now the **political attention to the Mission has been uneven** among the involved Commission's DGs and other EU institutions. While some horizontal coordination efforts work well, other aspects are hindered due to diverging policy approaches or conflicting policy priorities among the involved DGs. There is **scope for further conscious development of cross-departmental governance structures** in the Commission. Higher level political steering emanating from the European Council needs to underline the political priorities of the Mission to support the alignment of action plans at cross-departmental level.

The **scale of funding available at the EU level appears to be appropriate** for undertaking the broad range of the envisioned actions. Yet the Mission board estimates highlight that multiple times more funding is necessary to mobilise from national, regional and private sources for Mission's implementation. This signals that achieving mobilisation effect has reached a critical turning point. The momentum has been created with the charter signatory process, the launch of first Mission projects, lighthouse preparatory actions and the Mission implementation platform. **This momentum needs to be sustained through visible results on the ground** showing success and flagging political opportunity.

4.7 Self-assessment of the Mission 'Restore our Ocean and Waters by 2030'

Making peace with our blue nature by **reconciling the protection and restoration of marine and freshwater ecosystems with the ever-growing pressures on aquatic**

resources remains a defining task for Europe to become a truly sustainable Blue Union in the coming decade and beyond.

The Mission is providing a step change by accelerating the development and deployment at scale of innovative solutions to restore our ocean and waters. For the first time, this Mission treats the interconnected ocean, seas, rivers and inland waters as one interconnected system. The implementation of the Mission is following its implementation plan, with major milestones including the **launch of the four Mission lighthouses** with strong support of Member States and regions, **broad mobilisation of citizens and stakeholders with over 480 bottom-up actions submitted under the Mission Charter**, a portfolio of projects including key support mechanisms for the Mission delivery.

4.7.1 An ambitious yet realistic Mission goal

The Mission is key contributor to the implementation of the European Green Deal, specifically supporting the fulfilment of 2030 targets for the protection and restoration of biodiversity in line with the EU Biodiversity Strategy and Nature Restoration Law proposal), the prevention and elimination of pollution (in line with the EU Zero Pollution Action for Air, Water and Soil) and for making the blue economy carbon-neutral and circular (in line with the EU Climate Law and Strategy for the sustainable Blue Economy).

The transboundary nature of the ocean and water challenges calls for a strategy spanning across EU programmes, ensuring alignment and complementarity of policies and instruments, and providing attractive incentives to achieve the critical mass needed to reach the ambitious Mission targets in 2030 and beyond.

In this regard, the Mission Ocean and Waters is setting- up **an inclusive, systemic, transformative framework**, leaving no one behind, bundling all existing efforts at EU, national and regional levels. The Mission will thereby help to overcome the fragmented, partial, often sectoral governance frameworks, and putting in place new initiatives to delivering on the European Green Deal and SDG 14, by "putting the blue into the green".

The Mission lighthouses established in four major EU sea and river basins are the main toolbox to achieve the Mission objectives. They are mobilising and bundling efforts from the EU, Member States, regions and other key partners for concerted action at basin level. The good progress in **bringing together and creating synergies between different EU and MS programme**s and financial instruments is evidence for the success of the lighthouse approach, which will help to achieve the necessary critical mass of resources that is needed to create a real Blue Union.

The **Mission Charter** launched in July 2022, at the UN Ocean Conference has already engaged hundreds of stakeholders, spanning from citizens, public authorities to NGOs and businesses in Europe and beyond, **mobilising more than EUR 3.72 billion in the form of over 480 concrete actions submitted** in support of the Mission objectives.

The Mission has also gained **strong political commitment** from Member States, through a participatory process of co-creation and engagement for the launch of the Mission lighthouses and through the Mission Charter.

Also, the Mission is in the process of mobilising **communities of actors** such as ports, islands, waterfront cities, coastal regions, shipping, fishing and conservation communities, which are distinct to this Mission and can take up and deploy solutions.

Moreover, the "associated regions" scheme implemented in all actions funded under the Mission, together with financial instruments such as BlueInvest and the Blue Champion mechanism co-designed with the EIB, provide a high potential for upscale and replication of innovative solutions.

The European Digital Twin Ocean, the key digital component of the Mission Ocean and Waters, aims at making ocean knowledge readily available to citizens, entrepreneurs, scientists and policymakers and actively engaging them through an innovative set of user-driven and interactive tools. Activities are on track to ensure the delivery of a prototype already by 2024.

The actions undertaken up to now give confidence that **progress to achieve the ambitious goal of the Mission is well on track**.

4.7.2 The Mission's added value

The Mission's added value lies in:

Addressing pan-European challenges

The Mission addresses in a systemic way the three main and interdependent drivers that severely threaten the health of our ocean, seas, coastal and inland waters – unsustainable exploitation of marine and water ecosystems, pollution and climate change.

Allowing effective coordination and cooperation at EU and regional level

The Mission is steering **and ensuring efficient cooperation** between different MSs and ACs, different stakeholders, including civil society, and involving international, European, national, regional and local levels, to restore our ocean and waters through its four **sea/river basins 'lighthouses**'.

Pooling and leveraging resources

The Mission is acting as a catalyst for synergies and complementarities across different EU, national and regional programmes, already pooling funds beyond R&I.

The Mission is mobilising and aligning in particular with **EMFAF** national plans, **BlueInvest** with EUR 1.5 billion in risk finance, the "**Blue champions" pilot scheme** [(99)] agreed with the EIB, **Recovery and Resilience Funds**, **LIFE**, **Interreg**, **Copernicus**, and **Digital Europe**.

Beyond these, through the **Mission Charter**, Member States, regions, local authorities, international partners [(100)] and many different stakeholders, are expressing strong political support and taking concrete measures: **more than 480 actions have been pledged so far representing a budget of 3.72 billion EUR**.

[(99)] Expected to be launched in Q1/Q2 2023.

[(100)] Union for the Mediterranean Ministerial Declaration, June 2022; All-Atlantic Ocean Research and Innovation Alliance declaration (July 2022).

Figure 10: The Charter of the EU Mission Restore our Ocean and Waters 2030 ([101]) calls for joining efforts to achieve the three objectives of the Mission Restore our Ocean and Waters by 2030

Delivering a wave of innovative solutions

The Mission is accelerating the scaling-up of research and innovation solutions covering the whole cycle from research and innovation to deployment, investment and regulation as well as replication in "associated regions".

Engaging citizens, stakeholders and communities

The **Mission Charter** provides a clear added value, being conceived as a simple, inclusive, efficient and inspirational framework to enhance cooperation and achieve critical mass to deliver on Mission objectives. Through citizen science, literacy programmes, participatory and community-led management approaches, the **Mission is empowering European citizens** to take action to preserve one of their most precious common goods.

4.7.3 The Mission's R&I content

The **Horizon Europe** Mission work programme is the main instrument to support the R&I component of the Mission.

The WP is mostly implemented via **Innovation Actions** (IAs) involving associated regions other than those involved in the projects, to demonstrate the viability and replication of innovative solutions (validation, testing, demonstration, prototyping, piloting), addressing restoration and pollution as well as blue sectors. Innovation actions are implemented at basin level or cross-basins, ensuring a broad European coverage. A recurrent topic supports the establishment of European Blue Parks. The WP also supports coordination activities in each basin.

[101] https://ec.europa.eu/eusurvey/runner/MissionOceanWatersCharter

Finally, the WP includes calls supporting **enabling activities**: The Ocean digital knowledge system and public engagement as well as foresight and other studies in marine and maritime domains.

A **portfolio analysis carried out** of 16 different EU funding programmes including Horizon Europe has shown that 841 projects with a funding of about EUR 4 billion contribute to the Mission. This analysis is presented in a Dashboard and a report with a structured overview of the EU funded actions contributing to the objectives and enablers of the Mission.

Overview of the R&I priorities addressed up to now, along the lines of the Implementation Plan

- To protect and restore marine and freshwater ecosystems (**Objective 1** addressing two basins: Danube River basin and Atlantic-Arctic) calls have been launched to develop solutions for sediment management, wetlands and marshes ecosystems and the restoration of fresh and transitional water ecosystems as well as resilience to climate change and issues relating to landscape water retention at regional scale. Natural lakes' protection and restoration was also covered. The Blue Park initiative supports the establishment of Marine Protected Areas and actions to restore marine and coastal areas

- To prevent and eliminate pollution (**Objective 2** covering the Mediterranean basin) calls to develop solutions for addressing litter, plastic, microplastics, chemicals and nutrients; calls for low environmental impact fishing gears have been launched; a specific topic addresses waste-free European rivers and for nature-inclusive concept for off-shore windmills; a study to assess option for repurposing off-shore aged/unused platforms is ongoing.

- Under the Blue Economy (**Objective 3** addressing the Baltic and North Sea basin) topics addressing low-impact aquaculture and multipurpose use of marine space, greening and energy efficiency of small-scale fishing fleets, the development of algae-based products and applications are launched together with pilots for community driven business models for regenerative ocean farming.

- Projects for the development of the **European Digital Twin Ocean** are addressing its underlying public infrastructure as well as the integration of underlying models into the DTO. Specific topics addressed the integration of biodiversity monitoring data and of socio-ecological models as well as the development of a roadmap for the integration of inland waters. A e-DNA library of marine and freshwater species was also supported.

- Many activities have been launched to support **citizen engagement and citizen science**, addressing different segment of our society: the young generations through the Blue Schools and a foresight study on their relation with the sea; consumers through "Choose your fish" campaigns addressing sustainability of our choices; the artistic sector through a topic supporting artistic projects; citizen science through the Europeanisation of the Plastic Pirates.

- **Governance and support services** at basin level as well as monitoring of the implementation of the Mission is being addressed through 4 basin-specific CSAs and through the Mission Implementation Platform.

4.7.4 Ensuring implementation is feasible, measurable, and time-bound

Since the launch of the Mission, significant progress has been made towards reaching the Mission objectives and targets. The **Mission lighthouses have been launched** generating strong political support from Member States, regions, communities of actors and other partners. A **broad array of policies, programmes and initiatives are supporting the implementation** of the Mission at EU level and mobilising significant resources, including through bottom-up initiatives under the Mission Charter.

To maintain political momentum, mobilise further resources, and strengthen the Mission communities supporting the restoration of the ocean and waters, an annual **Mission Forum will be held** on the basis of the successful event organised in 2023, in addition to regular high-level conferences for each of the lighthouses. The steady growth of submissions to the Charter by stakeholders will be complemented by **actions to mobilise additional resources to further demonstrate, deploy, upscale and replicate innovative solutions** across the Union to ensure that the Mission targets will be achieved by 2030. Building on key milestones to be achieved in the second-half of 2023, 2024 and 2025 covering all objectives, the Mission will:

- Deliver **first replication plans** by associated regions and other stakeholders (2025); 2nd annual Mission Forum (2024); New business models developed (2024); First calls for scale up actions (2024);
- **Enhance the Digital Ocean and Waters Knowledge system:** 2nd Digital Ocean Forum (mid 2023); deliver the core infrastructure for the EU DTO (by end 2024) and underlying models (by 2025): deliver local Digital twins demonstrators (ILIAD) (by 2025);
- **ensure public mobilisation and engagement: by setting-up o**perational citizen assemblies for the four lighthouses areas (by 2024).

The Mission is setting up a **dynamic monitoring system** to track progress and report on the Mission implementation. It also allows informed and flexible adjustments of the activities, when and if necessary. The Mission Ocean and Waters Implementation Support Platform (MIP), launched in December 2022, is tasked to develop this indicator-based monitoring and progress tracking system by June 2023, to be visualised through a Mission progress dashboard.

4.7.5 Securing buy-in

Major EU legislative acts and initiatives under the European Green Deal and beyond are explicitly referring to the Mission as a key enablers for their implementation, including:

- EC Proposal for a Nature Restoration Law (COM(2022)304);
- Outermost Regions (COM(2022)198);
- New EU Arctic Policy (JOIN(2021));
- Sustainable Blue Economy Approach (COM(2021)240);

- Zero Pollution Action Plan (COM(2021)400) ;
- Towards a Strong and Sustainable EU Algae Sector (COM(2022)592);
- EC Communication on the Energy Transition of the EU Fisheries and Aquaculture sector, adopted on 21 Feb 2023;
- EC Communication on EU action plan: Protecting and Restoring Marine Ecosystems for Sustainable and Resilient Fisheries, adopted on 21 Feb 2023 (COM(2023)102 final);
- EC Communication on the common fisheries policy today and tomorrow: a Fisheries Pact towards sustainable, science-based, innovative and inclusive fisheries management, with accompanying Staff Working Document, adopted on 21 Feb 2023 (COM/2023/103 & SWD/2023/103);
- Council Conclusions on International Ocean Governance (in preparation).

At **international level**, several declarations adopted in the last few months show **convergence and mutual support around the Mission's objectives**: Union for the Mediterranean Ministerial Declaration [(102)]. All Atlantic Research and Innovation Alliance Declaration [(103)], G7 Science Ministers Communiqué, Kunming-Montreal agreement global biodiversity framework [104)], BBNJ Treaty [(105)].

The EU has put the Mission forward as a key commitment to international processes, such as the Our Ocean Summit presented by President von der Leyen [(106)], the Our Ocean

[(102)] First Union for the Mediterranean Ministerial Conference on Research and Innovation Declaration, 27 June 2022.

[(103)] https://research-and-innovation.ec.europa.eu/system/files/2022-07/ec_rtd_all-atlantic-ocean-research-alliance-declaration.pdf

[(104)] https://www.cbd.int/doc/c/e6d3/cd1d/daf663719a03902a9b116c34/cop-15-l-25-en.pdf

[(105)] https://www.un.org/bbnj/sites/www.un.org.bbnj/files/draft_agreement_advanced_unedited_for_posting_v1.pdf

[(106)] Speech by President von der Leyen at the One Ocean Summit, 11 February 2022: https://ec.europa.eu/commission/presscorner/detail/en/speech_22_962

Conferences 2022 [107] and 2023 [108], the UN Ocean Conference 2022 [109], the UN Water Conference 2023 [110].

4.7.6 Citizens and stakeholder engagement

Member States and regions are including Mission-related activities in their national and regional plans, ensuring complementarities and synergies, notably through the macro-regional strategies (the Danube Strategy and the Mediterranean strategies, EUSAIR [111] and West Med in particular) and through the EMFAF shared management.

The Mission has also gained **strong political commitment** from Member States, through a participatory process of co-creation and engagement for the launch of the Mission lighthouses and through the Mission Charter.

To mobilise those **communities of actors** that contribute to restoring our ocean and waters on the ground, a series of workshops with communities such as ports, islands, fleets, waterfront cities, coastal regions, fishing and conservation communities is being held in 2023.

A series of actions are being channelled towards **citizens' mobilisation, engagement and literacy** in favour of the Mission. Examples include the Plastic Pirates campaign, the EU4Ocean Coalition, student and school initiatives through the Blue School Network, campaigns to support sustainable consumption such as "Choose your fish", community-driven business models and citizen science initiatives.

4.7.7 Progress, achievements, and milestones

Since September 2021, great progress has been made to implement the Mission Ocean and Waters, namely:

Objective 1: Protect and restore marine and freshwater ecosystems and biodiversity

- **Launch of two basin scale restoration lighthouses**: one in the Danube River basin and one on the Atlantic and Arctic coast as sites to pilot, demonstrate and deploy the Mission solutions across EU sea and river basins. At the high-**level**

[107] Council of the European Union. 6062/1/22. List of EU commitments for the 'Our Ocean Conference' (Palau, 13-14 April 2022): https://data.consilium.europa.eu/doc/document/ST-6062-2022-REV-1/en/pdf

[108] Council of the European Union. 6119/23. List of commitments to be presented by the European Union at the Our Ocean Conference (OOC) (Panama, 2-3 March 2023) https://data.consilium.europa.eu/doc/document/ST-6119-2023-INIT/en/pdf

[109] The 2022 United Nations Ocean Conference: an opportunity not to be missed for the blue planet: The 2022 United Nations Ocean Conference: an opportunity not to be missed for the blue planet (europa.eu)

[110] Council of the European Union 7443/23: List of voluntary commitments for the Water Action Agenda to be presented by the European Union for the UN 2023 Water Conference (New York, 22-24 March 2023).

[111] EU Strategy for the Adriatic-Ionian Region.

launch conferences for the Atlantic-Arctic in November 2022 in Cork, Ireland and in April for the Danube in Bucharest, Romania **several Member States and associated countries as well as regions and stakeholders expressed their strong political support.**

- Launch of 10 innovation actions to protect and restore marine and freshwater ecosystems, in support of the Danube and Atlantic-Arctic lighthouses as well as the Blue Parks initiative.
- Synergies with HE Partnerships developed in Biodiversa+ SRIA.
- Baseline study report for the implementation of the Arctic/Atlantic, Danube lighthouses, published.

Objective 2: Prevent and eliminate pollution of our ocean, seas and waters

- Launch of a **lighthouse in the Mediterranean Sea** to connect and structure existing activities, disseminate and upscale solutions and mobilise relevant actors, as sites to pilot, demonstrate and deploy the Mission solutions across EU sea and river basins. During the **Mediterranean lighthouse conferen**ce in Marseille in June 2022, **France and Italy** announced their support for the Mission and its implementation in the Mediterranean, **supported by a number of cities and regions** in the basin [(112)].
- Launch of 8 innovation actions to prevent, minimise and remediate litter and plastic pollution, including -from fishing gear, microplastics as well as chemical pollution in support of the Mediterranean lighthouse.

In addition, synergies with HE Partnerships were established: PRIMA call 2023 open for thematic area" Water management" seeking complementarities with Mission objectives.

Objective 3: Make the blue economy carbon-neutral and circular

- Launch of **a lighthouse in the Baltic and North Sea** to efficiently use marine and coastal resources to reduce net greenhouse gas and other emissions, as sites to pilot, demonstrate and deploy the Mission solutions across EU sea and river basins. The **high-level launch took place on 25-26 April 2023** in Hamburg, Germany.
- Launch of 4 innovation actions on low impact aquaculture, sustainable algae products and multi-purpose use of marine space in support of the Baltic-North Sea lighthouse.
- Zero emission waterborne transport Partnership: complementary topics included in the 2021-2024 calls addressing Mission objectives.
- Sustainable Blue Economy Partnership (SBEP) call 2023 include topics complementary to the Mission.
- Baseline study report for the implementation of the lighthouse in the Baltic and North Sea basin (published).

[(112)] Mediterranean lighthouse gains momentum at Mission Ocean and Waters event in Palermo (europa.eu)

Enabler 1: Digital Ocean and Waters Knowledge system

- Development of the core infrastructure for the EU DTO.
- Digital Ocean Forum organised in Paris in 2022, with the second edition in June 2023 in Brussels.
- Launch of 4 projects supporting the development of the EU DTO and the ocean and waters knowledge system.

Enabler 2: Public mobilisation and engagement

- Mobilisation of **communities of actors**, through organisation of dedicated workshops in 2023.
- Launch of 7 projects on citizen science, engagement and empowerment of students, youth and communities.
- Citizen/stakeholder engagement and citizen science initiatives targeted in 9 dedicated topics resulting in min. 11 selected projects, as well as participatory approaches embedded in all funded projects. Activities ongoing until 2024.
- More than 160 conferences organised.

In addition, several milestones covering all objectives were achieved:

- Governance structure established for the 4 basins.
- Mobilisation of approx. 100 associated regions and other stakeholders with plans for replication of innovative solutions is in place or has started.
- Launch of the Mission Charter (more than 350 submitted) mobilising funding of more than EUR 2.25 billion in support of the Mission.
- Organisation of the 1st annual Mission Forum event in Brussels.
- Organisation with EAC and REA of Cluster event to connect MSCA fellows and EIT projects with the Mission.
- Mission Implementation Platform established as one common portal for all Mission stakeholders (providing information, communication and dissemination, technical assistance, Mission-specific monitoring platform).
- Major EU legislative acts, international declarations mention the importance of Mission Ocean Synergies with other EU programmes established.

4.7.8 Current estimation of the budget

The Mission is acting as a catalyst for synergies and complementarities across different EU, national and regional programmes, already pooling funds beyond R&I. In line with the legal basis, Horizon Europe supports the implementation of the EU Mission Ocean and Waters with approx. EUR 344 million for the period 2021-2023.

Complementary activities under Horizon Europe are supported in the context of the following key European partnerships and Joint Undertakings, which are particularly relevant for the Mission Ocean and waters and cross-references are included in the respective Strategic Research and Innovation Agendas (SRIA) and/or calls for proposals.:

- Sustainable Blue Economy partnership, contributing to Mission objective 1,2 and 3: EUR 450 million.
- Zero-Emission waterborne partnership, contributing to Mission objective 3: EUR 150 million for the period 2021-2024.
- Biodiversa+, contributing to Mission objective 1: EUR 40 million.
- PRIMA, contributing to Mission objective 1: EUR 8.2 million.
- Water4All, contributing to Mission objective 1 and 2: EUR 420 million.
- The public-private partnership Joint Undertaking on Circular Bio-based Economy (CBE-JU) cross-refers to the Mission in its call: EUR 39 million (Work Plans 2022-23).

EMFAF direct management calls launched in 2022 on blue career and regional flagships in EU sea basins (indicative budget EUR 15.1 million in 2022) have been designed to complement activities implemented by the Mission in its WP 2021 and 2022.

EMFAF national plans under shared management are all very relevant to the Mission objectives. 26 MSs (LU opted out of EMFAF) explicitly refer to the Mission in their operational programme and 17 in their Partnership agreements. It is however, not possible to provide any figures at this point in time.

Under the **LIFE** programme an expert portfolio analysis is mapping ongoing and past Life projects suitable for replication and deployment in line with the Mission objectives. LIFE projects focussing on marine and coastal themes amount to EUR 320 million.

Under the **RRF**, several reforms and investments planned in MSs plans under blue economy and marine domains, including marine data and monitoring, mobilising a budget of the order of EUR 10.7 billion.

BlueInvest: EUR 500 million available to bridge the finance gap for blue technology SMEs and start-ups developing and marketing solutions for the blue economy, notably addressing the objectives of Mission Ocean and Waters. The **EIB 'Blue Champions'** pilot scheme will be launched in Q1/Q2 2023, for 15 companies contributing to the Mission objectives that will receive advisory support to qualify for EIB scale-up funding

Digital Europe: The 2023-2024 Work Programme will pilot the interoperability between Destination Earth and the Digital Twin Ocean (DTO).

In Germany, 41 programmes and initiatives implemented by the Federal authorities make up the preliminary German roadmap of relevant actions amounting to EUR 335 million overall.

5 100 CLIMATE-NEUTRAL AND SMART CITIES BY 2030

EU ADDED VALUE

- Worldwide, cities account for more than 65% of energy consumption and for more than **70% of CO2 emissions**.
- The cities have therefore the potential to be in the vanguard of efforts to deliver on the **European Green Deal.**
- The political importance of the Cities Mission has been highlighted *inter alia* in the RePowerEU Communication, in the package "Saving Energy for a Safe Winter", in the Zero Pollution Action Plan and in the Sustainable and Smart Mobility Strategy.
- A number of Mission cities have **reorganised their administration** to reflect better the crosscutting nature of the climate transition work (e.g. Lisbon has nominated a Director for Climate who reports directly to the mayor).

CITIZEN AND STAKEHOLDER ENGAGEMENT

- **Citizens are involved in the CCC co-creation**, and the Mission Platform supports cities in finding the most suitable forms of engagement.
- **The Cities Mission is showcasing the European Green Deal at local level through citizens' engagement and social innovations.** For example, in Barcelona 1000 organisations and schools have been actively engaged.
- **National and regional support structures** for the Cities Mission have been established in many countries including additional funding streams (notably in AT, ES, SE, EL).
- The **CapaCITIES** project was launched to support Member States in the set-up and further development of national networks and to connect the national networks with each other.
- Mission cities use **collaborative platforms** (SynAthina in Athens or Better Reykjavik), **training programmes** (Smart House in Tartu), **city labs** (on the energy transition in Mannheim), **participatory budgeting** (in Bologna), **urban co-design** (superblocks in Barcelona and Vitoria-Gasteiz) and **citizens' assemblies** (Leuven).

LEVERAGING FUNDING AND GENERATING IMPACT

- The **total Cities Mission Budget** for the first three years of Horizon Europe is about **EUR 360 million**.
- The Call for Expression of Interest to cities to join the Cities Mission resulted in **applications from 377 cities**, of which **112 were selected**.
- Mission Implementation Platform (**NetZeroCities**) assists cities in preparing **Climate City Contracts**.
- The Mission Platform's online portal has **more than 1400 active users**.
- The Cities Mission is referenced in the **Digital Europe Programme** and cooperates closely with initiatives like **living-in.eu** and the **Smart Cities Marketplace**.
- Synergies have been achieved for example with the **Connecting Europe Facility (CEF)** (calls with a total of more than EUR 5 billion), the **LIFE Strategic Integrated Projects** (EUR 30 million), **the Digital Europe Programme** (current call EUR 18 million) and **Urban Innovative Actions** (part of the European Urban Initiative, EUR 120 million in total).
- Many Member States or regions are referring to the Cities Mission in their **regional operational programmes,** notably in PL, EL, CZ, SK, HU, RO, BG, HR, SE, SI, IT, ES, PT. Additional funding streams at national level include a Green Fund (EUR 10 million) in Greece and a co-funded national platform (seed fund of EUR 800 000) in Spain
- **The Cities Mission is mobilising private sector investments. Horizon Europe Partnerships with industry are being used successfully as multipliers**. A first concrete synergy is a joint call between the Cities Mission and the Partnerships for zero emission mobility (2Zero) and for connected and automated mobility (CCAM) (EUR 50 million).

5.1 Mission goal and objectives

The Mission has **two general objectives**, 1) 'to deliver at least 100 European climate-neutral and smart cities by 2030', and 2) 'to ensure that these cities also act as experimentation and innovation hubs for others to follow, to enable all European cities to become climate-neutral by 2050'. The Mission goals were suggested by the Mission board and fully taken on board by the EC.

The implementation plan breaks the two general objectives of the Mission down into **seven 'specific objectives'**:

- **Specific objective 1:** To develop and support a "demand driven" and city-focused process, based on research and innovation, and focused on the preparation of Climate City Contracts (CCC) including investment plans for deployment of innovative and smart solutions for climate neutrality.
- **Specific objective 2:** To support tailored R&I pilots and demonstrators within the Mission platform to be funded by Horizon Europe and to scale-up and replicate solutions developed in past R&I programmes.
- **Specific objective 3**: To develop synergies and complementarities and facilitate mutual support with existing Commission initiatives, including those policies focused on delivering co-benefits of climate neutrality, while reducing administrative costs for cities related to the need to work with many different EU initiatives on similar issues.
- **Specific objective 4**: To give access to city administrations and their local businesses to EU-wide skills and expertise and help cities connect in international networks (e.g. Global Covenant of Mayors, URBACT) in order to accelerate learning, replicability and scaling-up of solutions through sharing of good practices and joint actions and ultimately serve as an inspiration for cities across the world.
- **Specific objective 5**: To help cities develop, where necessary, the administrative, financial and policy capacity through innovative governance to overcome a silo approach and to ensure buy-in and commitment from citizens, local public and private stakeholders (i.e. industry, businesses) as well as regional and national authorities.
- **Specific objective 6**: To put in place a strong and transparent system of measuring and monitoring the progress towards climate neutrality for cities building on existing practice and methodologies.
- **Specific objective 7**: To increase the level of assistance from national, regional and local authorities as well as from National Promotional Banks (NPBs), municipal banks and private sector investment, through regulatory, funding and financing levers to help cities implement the Mission. Where cities selected by the Mission are also part of the entities that engage in the Mission Adaptation to Climate Change (Objective 2), synergies will be sought between cities and these entities to ensure that climate neutrality activities also take into account climate adaptation requirements and vice versa.

5.2 The Mission's selection process

The literature on Mission-oriented innovation policy stresses the importance of considering a wide range of stakeholders and involving citizens in the co-design of Missions to give societal ownership and ensure the longevity of the Mission. [113] The one-year development process leading up to the final report of the Mission board provided opportunities for both leading experts and local stakeholders to participate in the selection process.

The analysis conducted in the context of the external study underpinning the assessment of the EU Missions suggests that the Mission board represented a powerful instrument for bringing together expertise from varied domains and developing a cross-national expert community dedicated to the success of the Mission well beyond the development process. The commissioning of a foresight study running in parallel to the development process made sure that the Mission board could rely on independent expert support and feedback throughout the whole process. The Mission board specifically gathered experiences from frontrunner initiatives such as the Swedish 'Viable Cities' programme and the transnational 'healthy, clean cities' Mission, key elements of which have been taken up in both the Mission board's recommendations and in the final implementation plan. According to the external study, the **EC was able to learn from previous initiatives and gain strong support from key stakeholders across Europe**. The consultation of experts and stakeholders in the context of the study confirmed that the Mission is being carried by a **highly motivated and dedicated group of individuals who have taken ownership of the Mission**, many of whom have been involved since the early stages of the Mission's development. Overall, most stakeholders participating in the external study's survey judged the Mission selection process as both transparent and sufficiently **inclusive**.

With respect to the involvement of citizens, the board held a series of **citizen engagement events**, whereby care was taken to include participants from various socio-demographic backgrounds. Despite logistical challenges due to the COVID-19 pandemic, it was possible to interact with urban residents from 13 cities and at least eight Member states. The feedback obtained from citizens provided confirmation to the Mission board that the proposed Mission would be met with societal acceptance and that a Mission on climate-neutrality would address many key priorities for citizens.

Despite the involvement of citizens, the **formulation of the Mission was predominantly based on expert judgments and political considerations** related to the Mission's correspondence to the Mission Area as defined by the European Parliament and the European Council. The experience of consulted stakeholders in the context of the external study reveals that 'climate-neutrality' and 'smart' are difficult to communicate to the public, suggesting that a more participatory and open-ended co-design process would have likely led to different formulations of the Mission. Furthermore, it is noteworthy that the Mission board's proposed emphasis on citizens rather than smart solutions has not been taken up in the final formulation of the Mission.

[113] Hill (2022), Mazzucato (2019), Wiarda et al. (2023).

The analysis and stakeholder consultation conducted by the external consultants confirms that **the formulation of the Cities Mission represents an exemplary case of Mission-oriented innovation policy, combining a holistic and highly ambitious vision with a clear target**.

Climate neutrality: scope of emissions

The EC followed the Mission board's proposal to **focus efforts on territorial (scope 1 and 2) GHG emissions** [114] **and tackle remaining, indirect GHG emissions (scope 3) beyond 2030**, reasoning that it is much more difficult for city authorities to influence that **addressing territorial and indirect emissions at the same time would overburden city administrations and render the 2030 objective unrealistic**. Some stakeholders interviewed within the context of the external study suggested that it may not be necessary to include indirect emissions within the scope of the Mission since many cities are planning to take them into account regardless. However, other interviewees cautioned that this approach may incentivise the externalisation and outsourcing of production processes, potentially increasing the divide between cities and rural areas.

The external study suggests that this may pose (long-term) risks for the alignment of climate neutrality in cities on the one hand and value chains on the other. An important measure to mitigate such risks is to communicate the focus on territorial GHG emissions in a transparent way. While the handling of indirect emissions does not fundamentally affect the relevance and boldness of the Mission, using a more encompassing accounting framework in the communication of the Mission nonetheless risks that a part of scope 3 emissions [115] will not be covered in the first phase of the implementation of the Mission. [116 Nevertheless, it should be highlighted that the 'Info Kit for Cities' ([117]) does not explicitly neglect Scope 3 emissions. While it recommends that transport-related scope 3 emissions are considered by 2030, it clarifies that "The Mission will re-evaluate the possibility of including other Scope 3 emission sources in the post-2030 era, when leading cities have achieved climate neutrality as currently defined".

While the neglect of indirect emissions does not fundamentally affect the relevance and boldness of the Mission (see assessments of survey participants in annex), using a more encompassing accounting framework in the communication of the Mission nonetheless

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[114] Scope 1 and 2 include, amongst others, GHG emissions released into the atmosphere within city borders (e.g. from industrial processes, fuel consumption of transport vehicles) and those generated from purchased energy (e.g. consumption of electricity, heat). Climate-neutrality includes also 'negative' emissions (i.e. GHG removed from the atmosphere).

[115] In global cities, indirect emissions account for approximately 30% of consumption-based GHG emissions (Wiedmann et al., 2021).

[116] Shabb et al. (2022) also take note of ambiguities in the implementation plan regarding scope of the Mission due to inconsistent use of the notions of "climate neutrality" and "carbon neutrality".

([117]) https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/Mission-climate-neutral-and-smart-cities-info-kit-cities-now-available-2021-10-29_en

risks that a significant share [118] of city-related GHG emissions will be overlooked in European and urban climate policy. [119]

2030: temporal scope

Although a clear time frame represents a core element of Mission-oriented innovation policy, [120] the external study analysis suggests that the 2030 goal should not be overrated vis-à-vis the long-term objective of European cities to become climate-neutral by 2050. With 2030 approaching fast and the goal looking increasingly unrealistic for all 100 cities, failing to meet the goal could undermine the legitimacy of an initiative that has already taken significant steps towards meeting the important long-term objective. Furthermore, it was suggested that **the strict time frame and monitoring procedures of the Mission can have a flavour of top-down** control if it is not accompanied by sufficient support for cities to make the Mission's goal attainment realistic.

Selection of cities: geographical scope

In terms of geographical scope, the EC followed the Mission board's recommendation to adopt a flexible definition of cities to take into account varied geographical delimitations (e.g. districts, cities, city agglomerations) and city sizes across member states. [121]

Cities are at different stages in the transition to climate neutrality and face varied challenges depending on factors such as local political support, the roles of civil society and research organisations, and the conditions of the built environment. [122] To address this diversity and create the conditions for large-scale implementation across European cities the Cities Mission is based on a "demand-led" and broad-based approach to transformation that takes the individual needs of cities with different local conditions as a starting point. [123] In creating a pathway that links the activities of 'frontrunner' cities with the wider ambition of realising climate neutrality across all European cities by 2050, **the Cities Mission adds an important element to previous cross-city initiatives that addresses recent calls in the scientific community to turn attention in climate governance towards the scaling of local solutions**. [124]

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[118] In global cities, indirect emissions account for approximately 30% of consumption-based GHG emissions (Wiedmann et al., 2021).

[119] Shabb et al. (2022) also take note of ambiguities in the implementation plan regarding scope of the Mission due to inconsistent use of the notions of "climate neutrality" and "carbon neutrality".

[120] Mazzucato (2018).

[121] European Commission (2021a).

[122] Haupt et al. (2022), Huovila et al. (2022), Pietrapertosi et al. (2019), Reckien et al. (2018).

[123] European Commission (2021a).

[124] Grönholm (2022), Kern (2019), van der Heijden (2018, 2022), Wurzel et al. (2019).

Ahead of a call for expression of interest (EOI) in November 2021, the EC released an info kit for cities outlining the main building blocks of the Cities Mission, the key sectors and activities with regard to urban climate neutrality, and the criteria of selection. [125] To secure a high level of inclusiveness, the Mission set out to select at least one city from each Member State. Additional criteria considered in the selection process were the ambitions to achieve climate neutrality as well as diversity in terms of levels of preparedness and decarbonisation pathways. The launch of the Mission generated significant interest among European city administrations, leading to 377 (362 eligible) EOI from cities. [126]

The high number of applications made it possible to select at least one city from each Member State and consider cities of various backgrounds, including cities from eight associated countries. [127] Indeed, the number of applications would have been sufficiently high to support more than 112 cities to allow for failures and mitigate the risk of jeopardising the achievement of the first general Mission objective. The analysis developed by the external consultants suggests that it may be optimistic to hope that around 90% of cities would achieve the goal of climate-neutrality by 2030.

According to the external study analysis, the EOI was able to attract interest from both cities with well-established links to other cities and climate initiatives, as well as from cities that were less integrated in transnational activities. Overall, the same study finds that the **sample of selected cities is well balanced, including global frontrunners in terms of climate ambition, a significant number of capital cities, and cities of varying size**. [128] The main difference between selected and non-selected cities identified in the study concerns previous participations in EU-funded projects. [129] Whereas 72% of selected cities were previously involved in international projects, only 2% of non-selected cities had this experience. At the same time, this is evidence that the Mission was successful at integrating a significant share of cities (28%) into European R&I networks that were previously unable to benefit from EU-level funding programmes. The experience and efforts of the same cities will likely be instrumental in scaling climate initiatives to other, non-selected cities with a comparable lack of previous involvement.

5.3 Management arrangements and governance structure

The governance structures put in place to realise the Mission's objective are **geared towards decentralised actions at the city level to foster local experimentation, citizen**

[125] See European Commission (2021b).

[126] European Union (2022a).

[127] European Union (2022b).

[128] The interviews conducted within the scope of the external study corroborate this finding. One interviewee, however, suggested that it is regrettable that none of the nine selected cities from Italy is located south of Rome.

[129] The study examined the involvement of cities in the following European funding programmes: H2020, Urban Innovative Actions, Interreg Europe, Interreg MED, LIFE, and URBACT (Salvia et al., 2022).

engagement, and cross-city learning. Taking inspiration from previous initiatives such as the Covenant of Mayors and C40, the Mission is based on a polycentric and experimental governance model that puts cities in the driving seat by building local governmental capacities for effective climate action and creating favourable conditions for the scaling of solutions. [130] The **empowerment of cities is confirmed by the consultation of stakeholders and the scientific literature** [131]**.** Conducted in the context of the external study underpinning the assessment of EU Missions, the two methods highlight that many cities have taken a leadership role in taking ambitious climate action. Stakeholders also stress that cities are closer to citizens and therefore in a good position to develop solutions that meet local needs and find broad stakeholder support. Moreover, the bottom-up experimentation approach is in line with the tenets of Mission-oriented innovation policy. [132]

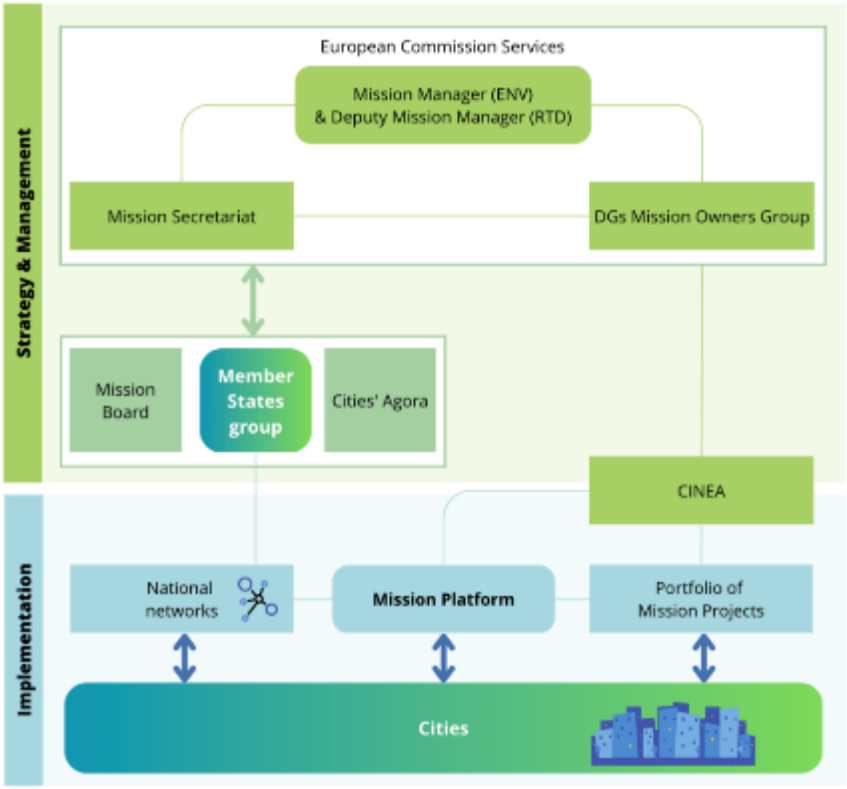
While the empowerment of cities is widely embraced, **feedback on the suitability of governance setup for steering and implementing the Mission is mixed**. The main issue relates to the challenges in aligning resources across different governance levels, but the experts and stakeholders consulted via the external study have also identified redundancies and gaps in the existing governance arrangements.

[130] Grönholm (2022), Shabb & McCormick (2023).

[131] See Huovila et al. (2022) and Kern (2019).

[132] Mazzucato (2019), Wanzenböck & Frenken (2020).

Figure 11: Governance structures for the EU Mission Smart Cities



Source: EFIS study

Governance structures in the EC

The analysis conducted by the external study consultants confirms that cross-Commission buy-in will be pivotal for the Mission's success and that as implementation progresses, departments other than DG RTD will need to assume a more important role to support urban transitions towards climate-neutral and smart cities. Study analysis indicates that **some DGs have not yet given high priority to the Mission**. Whilst representatives from multiple DGs are included in the formulation and implementation of the Mission, cross-departmental co-creation arrangements do not extend to the conception of other EU-policy instruments relevant to achieving climate neutrality in cities. **To realise a 'whole-of-government' approach in the EC towards the achievement of the Mission, all relevant DGs need to move from participation to action.**

In addition to Mission-specific governance arrangements, the Mission manager needs to liaise with the **Horizon Europe steering board**, which oversees all Missions. The external study argues that this arrangement may not be relevant anymore as the development of the Mission moved from design to implementation and tailored approaches become more important vis-à-vis one-size-fits-all solutions for all Missions. **The implementation could thus be accelerated if the Mission manager was given more autonomy in matters of operational management**.

Multi-level governance arrangements

A matter of concern expressed by several stakeholders in the context of the external study consultation activities is the relatively **low involvement of national governments**. The general impression is that some national governments have not shown the necessary support for the Mission to date and that the EC could be more proactive in mobilising support at the national level. Regarding the EC's mobilisation activities, this task has so far mainly been fulfilled by the Mission manager, who held bilateral meetings and visited 20 Member States to date. However, the study concludes that for the Mission to be taken more seriously by national governments, commissioners and the EC's President need to clearly endorse the Mission. To date, there are **still uncertainties at the local, regional, and national level regarding the level of commitment of the EC**.

The engagement of citizens and civil society organisations should be a core pillar of the Mission's governance. With citizen engagements being decentrally organised in cities, it is unclear at this stage whether the Mission can make a significant contribution to participative and inclusive urban governance. In the scientific community, the commitments and guidance of the EC with respect to citizen and stakeholder participation in the Mission are described as somewhat ambiguous, lacking clarity about how citizens will be included in decision-making processes. [(133)] In line with this, more than half of stakeholders consulted through the external study survey indicated that it is unclear how stakeholders can become involved in the Mission. This lack of support creates **pressures on local governments to navigate possible tensions between the requirements at the Mission level, on the one hand, and the management of local participation and communication processes, on the other**.

5.4 Progress to date

The progress made since the EC proposed the Mission Area in 2018 until the end of 2021 entails the formulation of an actual Mission, the development of an implementation plan, devising and implementing the governance structure of the Mission implementation, including a cross-DG coordination mechanism, and the Mission platform as a crucial delivery mechanism.

- The call for expression of interest for becoming Mission cities closed in January 2022 and resulted in applications from 377 cities. The selected 112 cities were announced by the EC in April 2022. The following kick-off conference took place in June 2022.
- The Mission platform has been operational early, as it could build on a precursor project from Horizon 2020; the contract was signed in September 2021. Its main task is currently to guide the cities during the process of delivering the CCC with the support of 13 advisors. The platform further delivers content for the NetZeroCities online platform to guide the Mission cities, facilitates their networking, it also coordinates occasional calls for proposals, and produces knowledge diffusion for non-selected cities via a repository. The portal has nearly 1 400 active users in March 2023.

[(133)] Boeri et al. (2021), Shabb et al. (2022).

- In September 2022, the Mission platform launched a call for pilot cities to advance the process. This resulted in 103 applications (involving 159 cities from 33 countries), of which 53 pilots were selected by 1st March 2023. Selected cities receive grants of between EUR 0.5 and 1.5 million for a two-year programme. The calls were open to all cities from H2020, and associated countries and selected pilots do not only include cities that are preparing a CCC.
- Following the successful mandate of the first Mission board from 2019-2020 and the activities around that time, a new Mission board has been in place since October 2022 to help guide the Mission, which provides feedback and reach out to countries and cities.
- The first cities signed their CCC in April 2023. These include cities from Sweden and Spain where support from the national level is strong, and government representatives are likely to be involved in a supporting role. A larger group of cities is expected to sign their CCC in the autumn of 2023. In March 2023, 46 mayors of Mission cities re-confirmed their engagement in an open letter addressed to the EC.
- The review of these CCC is carried out by the Mission platform (completeness check), the Mission secretariat (commitment part), the Joint Research Centre (climate neutrality action plan) and independent financial experts (climate neutrality investment plan). After consultation with the Mission board, the Mission owners group representing 12 DGs recommends the CCC for endorsement, which is then finalised by the Mission manager. Cities whose CCC are endorsed will receive a Mission label as a seal of quality, which should lead to easier access to funding and financing.

The external study confirmed that according to most surveyed stakeholders, **the Mission is progressing according to the implementation plan**. The study analysis suggests that, looking at the timeline included in the Mission's implementation plan, the Mission implementation was on track until early 2022

Political support at various levels is seen to be the most important leverage for the Mission implementation. Though, **the Mission has so far received somewhat stronger support at national level in selected countries**. Sweden has played a model for some parts of the Mission implementation via its Viable Cities programme, but also Spain and France could build on already existing national or local structures for the aim of climate neutrality. National governments have launched national support platforms for their cities, including Sweden, Spain, Greece, Portugal, France, the Netherlands, Austria and Belgium. Some additional countries integrated the EU Mission into national and regional strategies (e.g. in Poland). There has been some success in redirecting financial flows, with the external study analysis pointing out that funds from the RRF and Cohesion Policy have been directed to some cities in selected countries. Other Member States are drawing up and updating the national energy and climate plans in 2023, and they are doing the same for the RRF. Therefore, to influence these decisions, the EC and/or the cities would need to react quickly if this is not already part of the discussion in the preparation of the CCC. There are some early signs that **national governments are also providing additional funding to complement EU-level support for Mission cities**.

5.5 Budget and funding leveraged

Due to its co-financing character, the EU has an important gravitational effect on domestic public and private funding in cities. Beyond the EU financing context, Member State's public sector instruments are also crucial.

> *"Cities generally cannot acquire money in the same ways as national governments: they lack creditworthiness in international financial markets, they do not have the authority to borrow funds independently, and they face restrictive requirements for bidding and procurement (Brugmann, 2012; Lall & World Bank, 2013; Mori, 2012)."*

However, this is not seen as universally true and depends on the national set-up. In Sweden, for example, city administrations have formed a cooperative (KOMUNINVEST) that issues bonds directly to the financial markets (where the cities' pooled rights to collect taxes serves as collateral), whilst in Germany cities are shareholders of 'Sparkassen' which can jointly access financial markets. Yet although certain Member states, such as Austria, Spain, Sweden and Greece, have established support structures for the Mission and some have set up dedicated funds, the latter are understood to be small. As part of the consultation activities carried out within the external study supporting the Missions' assessment, **insufficient domestic financial support for the Mission, averaged across national, regional and local levels, was said to be a major concern by some 65% of survey respondents**. Certain more advanced cities have begun to search for creative solutions to fund their climate agendas, including revolving loan funds, property assessed financing, and green bonds (van der Heijden, 2016). In cases where it is not the cities themselves which seek financing, but rather companies providing public services, a variety of public-private financing arrangements are potentially available. To assess with any degree of accuracy the overall potential contributions to the Mission of domestic funding instruments, much will depend on commitments entered in the CCC still to be finalised and approved.

As regards potential private sector investment, the situation is less easy to depict and is likely difficult to include in the CCC in a sufficiently detailed manner. The study reports the views of some stakeholders suggesting that EU instruments were sufficient to de-risk key investment areas and trigger substantial private financial input. Nonetheless, concern was voiced via the external study stakeholder consultations about overall market conditions, such as the price of electricity generated from renewables, which if too low could prevent certain private investors from covering their costs. There was also concern about the schedule for preparation of the Mission's lending and blending facility, which was said to be coming too late.

Yet at this early stage, the external study analysis suggested that **the EU funding for the Mission appears 'front-loaded' in general, in the sense that domestic national and private sector funds are expected to play an ever-greater role as the Mission progresses**. Commitment periods currently in place for EU funds support this view. Horizon Europe funding dedicated to the Mission is only committed up to 2023 at present, whilst RRF financing must be spent by the end of 2026. Cohesion Policy funding will be subject to a mid-term review process, only after which the precise allocations for 2025-2027 will be known. It is clear the European Commission's intention is to encourage domestic public financing and private sector investment to take over responsibility for

implementing the Mission as it progresses. However, cities still face a high level of uncertainty on how to finance their way to climate neutrality, according to the study.

The Cities Mission needs to provide the direction and operational framework for interaction between a particularly wide range of instruments. The Mission is the 'glue' that should bring all the relevant initiatives together. While it is very early to determine with certainty how well the Mission is succeeding in this role, the study suggests that the Mission adds value to existing instruments and initiatives.

Regarding synergies with Cohesion Policy, EC officials consulted in the context of the study emphasised positive commitments to the Mission which they had obtained in the wording of relevant Cohesion Policy programmes for 2021-2027, as well as in NRRPs, from around half of the EU Member States. The study also suggested that there is an opportunity to further strengthen ties with EU Cohesion policy and its related funds.

Whilst the above **recent developments in building synergies between the Mission and other (non-R&I) EU instruments represent an encouraging start**, this kind of activity will **need to be strengthened** as the Mission implementation progresses, in order to lever in EU and domestic public and private financing of sufficient scale. The **CCCs** themselves will be **key tools for directing attention** onto the mix of instruments which Mission cities feel they will be able to access, as will the lending and blending facility foreseen. Further **cross-DG reflection appears necessary on the deployment of the Mission label** to make this a more convincing tool for the Mission cities.

5.6 Key conclusions from the external assessment

In less than two years, the Cities Mission has been able to bring together 112 European cities from Member States and associated countries, with more cities soon to be added through a 'twinning' programme. In addition, several Member States have set up their own platforms and programmes in support of the Mission to extend support to non-selected cities. On top of a growing network, the Cities Mission has also delivered tangible results in the form of a transnational NetZeroCities platform and the publication of the first Climate Cities Contracts, which outline city-level transformation pathways and investment plans to achieve climate neutrality by 2030.

The external study underpinning the assessment of EU Missions highlighted the following **success factors** for the Cities Mission:

- A Mission that is perceived as bold and inspiring by key stakeholders;
- A Mission design process that built on the experiences made in previous initiatives;
- A transparent and inclusive Mission selection process;
- A large group of highly motivated and committed individuals who have taken ownership of the Mission and are promoting it across different levels of government and Member States;
- A high level of trust at local level in the EC's commitment to the Mission, given that the details could not be worked out at the outset;

- Finally, a clear added value through the focus on holistic solutions and the introduction of novel policy instruments (in particular, the climate city contracts and the Mission label).

The same factors were instrumental in overcoming key challenges associated with the launch and implementation of the Cities Mission, which introduced cities to a new form of interaction with R&I funding at European level. From the perspective of local governments, the launch of the Mission was very much appreciated, but also accompanied by uncertainty about the level of longer-term EC commitment and the specific benefits for selected cities. **The early phase of implementation was characterised by efforts to manage mutual expectations and establish a culture of learning**, against a background where stakeholders have become accustomed to managing R&I projects rather than cross-sectoral societal transitions. Resisting the 'projectification' of transition processes and refocusing efforts on the broader challenges of developing appropriate governance structures, securing multi-level and cross-departmental buy-in, and establishing appropriate financing arrangements are likely to remain critical well beyond the initial implementation phase.

The review of the CCCs will provide a clearer picture of where cities stand and what they need to realise the Mission's ambitions. However, the expertise and feedback from key stakeholders involved in the development and implementation of the Mission collected for the external study assessment of the Mission point to a range of issues that can be addressed immediately. Furthermore, their perspectives add an important layer to the information contained in Climate City Contracts by providing indications of the key challenges in the governance of the Mission and in the 'scaling' of solutions beyond individual cities. On this basis, the assessment revealed three areas in which further action is needed to achieve the Mission objectives: demonstrating commitment, local capacity building, and citizen engagement.

There is consensus among stakeholders that Member States and regions will need to become more active on a broader basis for the Mission to succeed, because this has been variable so far. As political leadership is of paramount importance, it is probably best addressed at this level, hence **political leadership in the EC could be strengthened** so that the EC can engage more effectively with the Member States on this issue.

The work of national networks as neutral intermediaries between different levels of government and at the local level can be an important mechanism for learning and mediating but should not be overestimated. **Implementation capacity is needed in cities** and other relevant local actors to develop workable projects. This means building capacity in the cities, while avoiding too much advisory work. The scope of this goes considerably beyond what is now being offered.

While much emphasis has been placed on citizen engagement in the Lamy report [(134)], in the expert reports prepared prior to the launch of the Mission [(135)], and in the implementation plan, evidence of **how citizens are being involved in the Mission will**

[(134)] EC (2017).

[(135)] Mazzucato (2019).

only become clear once the first wave of the Climate City Contract will have been assessed. The evidence gathered by the external assessment study suggests that the level of citizen involvement in the preparation of Climate City Contracts has the potential to increase further but it should be stressed that any consultation process of citizens will rely on the methodologies put in place by the local authorities themselves. Given the impact of climate neutral and smart cities on everyday urban life, high levels of investment will also be required from local stakeholders, businesses, and households: Given the behavioural changes expected from local stakeholders and private households, awareness of the Mission should be further increased among European citizens including how they can become more involved.

5.7 Self-assessment of the Mission '100 Climate-Neutral and Smart Cities by 2030'

The two goals of the Cities Mission 1) to achieve 100 climate neutral and smart cities by 2030 and 2) to ensure that these cities also act as experimentation and innovation hubs to put all European cities in a position to become climate-neutral by 2050 have been identified in the report from the Climate Neutral and Smart Cities Mission Board and confirmed in the subsequent Implementation Plan adopted by the Commission. It is the first time that climate neutrality of cities has been put forward as the central point of attention of an EU initiative and that a clear timeline is attached to it.

The implementation of the Cities Mission is generally following the Cities Mission Implementation Plan. The Call for Expression of Interest to cities to join the Cities Mission that closed in January 2022 resulted in applications from 377 cities which indicates the readiness of the cities to embrace this goal. 112 cities were selected in April 2022 and are now working on the development of their Climate City Contracts (CCC), with the hands-on support of a Mission Platform (managed by the NetZeroCities project), which has been operational since September 2021. The first CCCs have been submitted to the Commission in April 2023. Moreover, a first group of 53 pilots were selected in March 2023 by the Mission Platform [(136)]. A twinning programme launched in May 2023 will allow more cities to benefit from the approaches that are being tested by pilot cities. Further calls for pilot cities are planned. In addition, the Mission Platform has established a repository of best practices and solutions for cities that is accessible also to non-selected cities.

[(136)] These Pilot Cities will experiment with new ways to rapidly decarbonise over the course of a two-year programme to advance local solutions to the challenges of the climate transition; Getting to Climate Neutrality: 53 Pilot Cities Offer a Path Toward Transformation - NetZeroCities.

5.7.1 An ambitious yet realistic Mission goal

The goals of the Cities Mission are very ambitious as only a limited number of cities have adopted the goals of climate neutrality, and only a handful by 2030[137].

Cities take up only 4% of the EU's land area [138] but are home to 75% of EU citizens [139]. Worldwide, cities account for more than 65% of energy consumption and for more than 70% of CO2 emissions [140] [141]. The cities have therefore the potential to be in the vanguard of efforts to deliver on the European Green Deal, helping to enable the EU to reduce climate emissions by 55% by 2030 and to become climate-neutral by 2050. Through the selection of the 112 Mission Cities, cities of different sizes and from all corners of Europe have been brought within the scope of the Mission, but most of all, these cities have very different starting points in terms of climate neutrality.

Through the Mission Platform that provides tailor made support to cities for preparing their CCCs, Mission cities have become a powerful community where they exchange best practice, work together and link up with other ambitious cities in their country to address and discuss common issues related to accelerating climate-neutral solutions.

By design, the CCC process involves citizens from the outset. Citizens are involved in the CCC co-creation, and the Mission Platform supports cities in finding the most suitable forms of engagement. As the CCC provides a holistic picture of the current state of emissions, the actions necessary to achieve climate neutrality and the investment needs, they provide an ideal basis for engagement.

The challenge is now how to ensure that supporting funds and finance for cities can be mobilised in an integrated cross sectoral manner from the large variety of sector specific resources, for individual cities to deliver climate neutrality on a tight timescale. The review of the first waves of CCC's will provide more insight in the financing needs of the cities for implementing their climate neutral action plans to achieve climate neutrality by 2030. The Cities Mission Label will have to prove its value for cities to access these public and private funds and only then a view can be given how realistic the goals of the Cities Mission are. However, until now all essential building blocks of the Cities Mission have been successfully put in place in line with the Implementing Plan indicating that the Mission goals are realistic.

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[137] JRC Covenant of Mayors database.

[138] European Environment Agency, Analysing and managing urban growth, European Environment Agency, Copenhagen, 2019, https://www.eea.europa.eu/articles/analysing-and-managing-urban-growth

[139] https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?locations=EU

[140] https://www.c40.org/why_cities

[141] This global figure includes emissions beyond cities (e.g., emissions physically taking place well outside a city but "triggered" by the cities). The estimate for EU-27 using the Eurostat definition of cities (i.e., more than 50,000 inhabitants) would be 36% of GHG coming directly from cities.

5.7.2 The Mission's added value

A number of positive developments have taken place since the launch of the Cities Mission that would not have happened without it. **The Cities Mission has created a powerful community of ambitious cities.** Participating cities work together and link up with other ambitious cities in their country and beyond. Both 'Mission Cities' and other interested cities are actively using the Mission Platform's online portal (with more than 1400 active users) to work in groups across borders. The Cities Mission is very inclusive and engaging all EU Member States, covering most of the EU capital cities and 12% of the EU population. Member States are being engaged systematically via country visits and the CapaCITIES project, whose task it is to support national networks and to connect them with each other.

The Cities Mission is breaking silos. Next to developing cross-sectoral innovative solutions, the Cities Mission has also resulted in innovative governance in city administrations and at regional and national level. A number of Mission cities have reorganised their administration to reflect better the crosscutting nature of the climate transition work (e.g. Lisbon has nominated a Director for Climate who reports directly to the mayor).

The Cities Mission is showcasing the European Green Deal at local level through citizens' engagement and social innovations. All cities have committed themselves to co-create their CCC with the local community and citizens. For example, in Barcelona 1000 organisations and schools have been actively engaged. The Mission Platform provides guidance on best practices for engaging citizens in the CCC process and runs an 'observatory' on social innovation.

The Cities Mission uses "smartness" as an enabler for the climate transition. Next to dedicated digital topics in the Mission Work Programme (e.g. on digital twins for Positive Energy Districts), the Cities Mission is referenced in the Digital Europe Programme and cooperates closely with initiatives like living-in.eu and the Smart Cities Marketplace.

The Cities Mission establishes synergies with existing Green Deal initiatives: 11 out of 15 cities awarded as European Green Capital and 5 out of 15 cities awarded as European Green Leaf [(142)] were selected for the Mission, and 35 of the selected cities were signatories of the Covenant of Mayors and the Green City Accord [(143)] at the same time. A significant number of cities have a long-standing commitment with climate change and environment.

The Cities Mission is leveraging financial contributions from other EU programmes and in Member States. Synergies have been achieved for example with the Connecting Europe Facility (CEF) (calls with a total of more than EUR 5 billion), the LIFE Strategic

[(142)] Since 2010, the European Commission awards one city as European Green Capital and one or two cities as European Green Leaf, recognising local efforts to improve the environment and to fight against climate change.

[(143)] The Covenant of Mayors for Climate and Energy is an initiative supported by the European Commission by which local governments voluntarily commit to implement EU climate change and energy objectives. In a similar way, the cities that join the Green City Accord commit to addressing five areas of environmental management: air, water, nature and biodiversity, circular economy and waste.

Integrated Projects (EUR 30 million) the Digital Europe Programme (current call EUR 18 million) and Urban Innovative Actions (part of the European Urban Initiative, EUR 120 million in total). Many Member States or regions are referring to the Cities Mission in their regional operational programmes. Additional funding streams at national level include a Green Fund (EUR 10 million) in Greece and a co-funded national platform (seed fund of EUR 800 000) in Spain.

The Cities Mission is mobilising private sector investments. Horizon Europe Partnerships with industry are being used successfully as multipliers. A first concrete synergy is a joint call between the Cities Mission and the Partnerships for zero emission mobility (2Zero) and for connected and automated mobility (CCAM) (EUR 50 million).

The Cities Mission is a complementary tool to implement the New European Bauhaus (NEB) in urban areas. The Mission cities are invited to take on board the NEB principles when developing their CCCs. An explicit reference to NEB is already included in the CCC of the Swedish cities and the Spanish cities are preparing to do the same.

The Cities Mission is well connected internationally. An Urban Transitions Centre, launched in December 2022, supports the Cities Mission's international outreach activities and links to the global Urban Transitions Mission of Mission Innovation.

5.7.3 The Mission's R&I content

The HE Work Programmes of the Climate-Neutral and Smart Cities Mission, in line with the Implementation Plan of the Cities Mission, fosters the implementation of the Mission through actions that will continue to provide a strong and direct support to cities that will commit to climate neutrality and enable them to roll out their climate action plans and achieve climate neutrality by 2030, in synergy with significant progress towards zero pollution. The HE calls continue to work on developing and scaling up R&I activities and solutions while fostering synergies and joint actions with Horizon Europe Partnerships as well as other EU Missions. For example, the 2023 Cities Mission Work Programme agreed in December 2022 aims at:

- Accelerating the transition of European cities to climate neutrality by exploiting the potential of electric, automated and connected as well as shared people mobility and freight transport through a joint action with the Horizon Europe Partnerships dedicated to Zero-emission Road Transport (2Zero) and Connected, Cooperative and Automated Mobility (CCAM);
- Engaging cities in decisive climate mitigation and adaptation efforts to reduce emissions, based on innovative use of urban greening and nature-based solutions through a joint action with the Adaptation to Climate Change Mission;
- Developing and testing a digital twin of a Positive clean Energy District (PED) covering modelling, management, citizen interaction, self-optimization, decision support/scenario analysis.

A portfolio[144] of relevant projects and actions has been established based on agreed keywords. Among projects from FP7, H2020 and Horizon Europe, 1800 projects were validated as relevant and were mapped geographically against cities participating in the Mission:

In September 2022, the Mission Platform launched a **call for pilot cities** that closed in November 2022 and resulted in 103 applications. 53 selected cities will receive grants between EUR 0.5 and 1.5 million to help them advance local solutions to the challenges of the climate transition.

A direct innovative effect of the Cities Mission can already be found in the area of cross sectoral and multilayer governance with respect to the transition to climate neutrality at cities level and at national level. Examples are the mirror groups established in Spain, the creation of national platforms in several Member States that support selected and non-selected Mission cities and cross-sectoral local transition teams.

5.7.4 Ensuring implementation is feasible, measurable, and time-bound

The Cities Mission's first goal of achieving 100 climate neutral cities by 2030 is highly ambitious and was proposed by the first Mission Board. This ambition was subsequently incorporated in the Implementation Plan agreed by the Commission. Also, a foresight study was undertaken at that time which concluded that the target was ambitious but realistic (see the Foresight reports for EU Missions in Horizon Europe)[145]. The fact that 377 cities from MS and associated countries submitted an expression of interest in joining the Cities Mission provides an indication of the feasibility as perceived by the cities.

[144] Climate-Neutral and Smart Cities Mission portfolio v2 | App overview - Qlik Sense (cec.eu.int)

[145] https://ec.europa.eu/info/publications/foresight-reports-missions-horizon-europe_en

The implementation of the Cities Mission is progressing in line with the goals and timing as set out in the Implementation Plan. The overall 'measurement methodology' is straightforward: 112 cities have been selected to participate in the Mission to fulfil the first objective and their progress towards climate neutrality will be monitored through their CCCs. An important milestone will arrive in 2025 when all Mission cities should have completed their CCCs in view of realistically having a chance to achieve the 2030 target.

5.7.5 Securing buy-in

The political importance of the Cities Mission has been highlighted *inter alia* in the RePowerEU Communication, in the package "Saving Energy for a Safe Winter", in the Zero Pollution Action Plan and in the Sustainable and Smart Mobility Strategy.

Even when the Cities Mission only formally started its implementation in September 2021, synergies have already been achieved in relation to several EU programmes as well as national and regional programmes. All relevant calls of the Connecting Europe Facility (CEF) that opened in September 2022 for projects on the TEN-T network (in total more than EUR 5 billion) include participation in the Cities Mission as an award criterion under "priority and urgency". This is to be carried on also in future CEF calls. In calls for LIFE Strategic Integrated Projects - Climate Action (EUR 30 million), climate neutrality plans for cities as part of the Cities Mission are one of five possible objectives.

Many Member States or regions committed that interventions in their regional operational programmes will contribute to the Cities Mission objectives, in particular in the selected cities, notably in PL, EL, CZ, SK, HU, RO, BG, HR, SE, SI, IT, ES, PT.

National and regional support structures for the Cities Mission have been established in many countries including additional funding streams (notably in AT, ES, SE, EL). Many other Member States are in the process of building support structures. In Greece, for example, a Green Fund was set up with a national commitment of EUR 10 million for their six Mission cities, and an additional EUR 500 000 for the preparation of the Climate City Contracts. In Spain, the national government co-funds a national Mission platform (starting with a seed fund of EUR 800 000) to offer support to cities, including capacity building and financial support. It also committed to reinforced funding for comprehensive actions towards climate neutrality and to co-governance in European funds.

In Sweden, a national Climate City Contract programme already exists, with similar support to that provided in Spain.

5.7.6 Citizens and stakeholder engagement

Cooperation with Member States is pursued systematically via country visits and regular meetings of the Cities Mission Working Group of the HE Strategic Programme Committee. In addition, the CapaCITIES project (a Coordination and Support Action) was launched to support Member States in the set-up and further development of national networks and to connect the national networks with each other. Some governments are already taking a very active role, whereas others may need some further encouragement in cooperation with CapaCITIES.

Citizen engagement is not centrally organised at EU level, but locally where it is directly relevant to cities' transformations. For example, Spanish Mission cities are building on a

model of annual citizen and stakeholder consultation developed in Barcelona, stemming from their climate emergency plan. Other Mission cities use collaborative platforms (SynAthina in Athens or Better Reykjavik), training programmes (Smart House in Tartu), city labs (on the energy transition in Mannheim), participatory budgeting (in Bologna), urban co-design (superblocks in Barcelona and Vitoria-Gasteiz) and citizens' assemblies (Leuven). In the process, they are shifting to a more relational approach with their inhabitants and pave the way for involving citizens in the European Green Deal in their multiple roles as users, producers, consumers and asset owners.

Additional citizens engagement activities are being prepared with the Mission cities in the coming few months including hackathons events in all Member States.

As regards engagement with the private sector, Horizon Europe Partnerships with industry are being used successfully as multipliers. A letter to all relevant partnerships by the Mission Manager and Deputy Mission Manager received very positive reactions. A first concrete synergy is a joint call in the Work Programme 2023 between the Cities Mission and the Partnerships for zero emission mobility (2Zero) and for connected and automated mobility (CCAM) with a combined budget of EUR 50 million. The call that opened in January 2023 asks industry representatives and cities to work together to develop shared zero-emission mobility solutions that respond to cities' needs, in particular by complementing public transport and/or freight delivery solutions. The co-creation approach is chosen to avoid a too strong technology focus of projects and to facilitate take-up of project results.

5.7.7 Progress, achievements, and milestones

Interest in the Cities Mission has been strong from the start. The Call for Expression of Interest that closed in January 2022 resulted in applications from 377 cities. The announcement of the selected cities in April 2022 received a lot of attention in the media, with thousands of press clippings. A kick-off conference took place in June 2022, and Mission cities have started their work on Climate City Contracts (CCC) with the help of a Mission Platform, which has been operational since September 2021.

CCCs must contain a commitment part, a Climate Neutrality Action Plan and a Climate Neutrality Investment Plan. The Mission Platform has provided cities with templates and guidance materials for all three parts. It has also assigned city advisors who provide cities hands-on support. In addition, cities have access to a Mission Platform online portal that allows them to work in groups, exchange experience and access a knowledge repository. Currently, the portal already has nearly 1400 active users.

In September 2022, the Mission Platform launched a call for pilot cities that closed in November 2022 and resulted in 103 applications. Selected cities will receive grants between EUR 0.5 and 1.5 million to help them advance local solutions to the challenges of the climate transition. 53 pilots were selected in March 2023 These Pilot Cities will experiment with new ways to rapidly decarbonise. Over their two-year journey, cities will reflect and learn as they go, providing opportunities for other cities to follow in their footsteps, replicating and/or scaling approaches and solutions relevant to their context. For this purpose, a twinning programme was launched in May 2023 that will match additional cities to Pilot Cities and allow them to benefit from their experiences.

The first cities submitted their CCCs by April 2023. Cities whose CCCs are reviewed positively by the Commission will receive a Mission Label that will acknowledge the quality of the process that the cities have developed and should facilitate access to EU and national funding, to financing and to private investment. The label itself will not generate any direct financial benefits. It will act more like a mark of confidence in the soundness of the cities' plans.

An informal agreement with the EIB on concrete support actions for the Cities Mission including targeted awareness raising for cities and a contribution to the CCC review process was confirmed in March 2023. Already now representatives of ELENA are taking part systematically in country meetings with Mission cities (meetings with DE, LT, LV, ET and PT have already taken place).

The Cities Mission Work Programme for 2023 was agreed and published in December 2022. It contains notably a joint call with the Adaptation Mission on urban regeneration, a joint call with the Horizon Europe Partnerships for zero-emission road transport (2Zero) and for connected and automated mobility (CCAM), as well as an action to associate Ukrainian cities to the Cities Mission.

A new Mission Board has been in place since October 2022. Members have been selected from more than 500 applicants.

In 2022, a number of "satellite" projects for the Cities Mission were launched:

- The CapaCITIES project, launched in October 2022, helps with the establishment and development of national support networks for the Cities Mission;
- The CrAFt project, launched in May 2022, connects the Cities Mission with the New European Bauhaus;
- The Urban Transitions Centre, launched in December 2022, supports the Cities Mission's international outreach activities and links to the global Urban Transitions Mission of Mission Innovation.

5.7.8 Current estimation of the budget

The total Cities Mission Budget for the first three years of Horizon Europe is about EUR 360 million. As regards access to other sources of EU funding, work is progressing in relation to a number of funding programmes:

- Connecting Europe Facility: All relevant calls that opened in September 2022 for projects on the TEN-T network (in total more than EUR 5 billion) include participation in the Cities Mission as an award criterion under "priority and urgency"; this is to be carried on in future calls.
- LIFE Strategic Integrated Projects - Climate Action: Funding for urban or community-based action plans pioneering the transition to climate neutral and/or climate resilient society, including climate-neutral cities plans and actions, for instance in the context of the EU Mission 'Climate-neutral and smart cities' (EUR 30 million).
- European Urban Initiative - Urban Innovative Actions: References to the Cities Mission and the Adaptation Mission are included in the call topic "greener cities" published in May 2023 (overall budget EUR 120 million)

- Digital Europe Programme: References to the objectives of the Cities Mission are included in relevant calls of the Work Programme (and in the same way, the Digital Europe Programme is referenced in the Cities Mission's calls in Horizon Europe). For example: The Commission is currently evaluating a call for an action supporting, through cascading grants, pilots combining data in the area of sustainable mobility, extreme weather events, energy and zero pollution. The action should establish links to the Cities and Adaptation to Climate Change Missions which would provide opportunities to experiment and upscale the use of the smart cities data space with local partners (EUR 18 million).
- European Innovation Council (EIC): Call to increase the procurement of innovative solutions by public and private buyers with specific reference to Cities Mission to be opened in June (CSA with a budget of up to EUR 3 million).

In addition, some funding for Mission cities has been mobilised at national level for example:

- Many Member States or regions committed that interventions in their regional operational programmes will contribute to the Cities Mission objectives, in particular in the selected cities, notably in PL, EL, CZ, SK, HU, RO, BG, HR, SE, SI, IT, ES, PT.
- In Greece, a Green Fund was set up with a national commitment of EUR 10 million for their six Mission cities, and an additional EUR 500 000 for the preparation of the Climate City Contracts.
- In Spain, the national government co-funds a national Mission platform (starting with a seed fund of EUR 800 000) to offer support to cities, including capacity building and financial support. It also committed to reinforced funding for comprehensive actions towards climate neutrality and to co-governance in European funds.

However, it is clear that public funds can only cover a fraction of the costs of the climate transition and that a large part of the necessary investment will have to be covered by private sources. There are already good examples of cities working successfully for example with pension funds and commercial banks. Contacts are ongoing with major financial institutions, notably the European Investment Bank, the European Bank for Reconstruction and Development and national development banks, with philanthropic organisations and with other private actors, in particular in relation to making the Mission Label a meaningful tool to facilitate access to funding and finance.

6 A SOIL DEAL FOR EUROPE: 100 LIVING LABS AND LIGHTHOUSES TO LEAD THE TRANSITION TOWARDS HEALTHY SOILS BY 2030

EU ADDED VALUE

- The Mission is **central to implementing the Green Deal;** it is integrated in more than a dozen Green Deal strategies and communications.
- The Mission is an important milestone in Europe's trajectory towards having all soils in a healthy condition by 2050, as stipulated in the **Soil Strategy** and the **Soil Health Law**.
- The **EU Climate Law** as well as the further development and implementation of the ambitious **EU's Land Use, Land-Use Change and Forestry target for 2030** and the proposed **carbon removal certification scheme** call for greater, cross-sectoral efforts which are supported by the Mission Soil.
- The Mission **promotes the digital transition** by unleashing the potential of precision tools, space observations and artificial intelligence for soil management, restoration, and monitoring.
- Through its activities on spatial planning and soil education, the Mission is supporting the **New European Bauhaus Initiative and the European Year of Skills.**
- The target of 100 LLs will result in a network of **more than 1000 testing sites all over Europe** that will experiment and scale up solutions for soil health in rural and urban areas.
- By promoting business models and certification methods for carbon farming and soil health, the Mission **supports industries in their moves to develop soil friendly and climate neutral value chains**,

CITIZEN AND STAKEHOLDER ENGAGEMENT

- The Mission has proven to be an effective tool for citizen and stakeholder engagement and **local, bottom-up actions on the ground**.
- More than **20 regions have identified 'soil needs'** and priorities for action. In addition, **35 regions are developing territorial management agreements** including strategies for investments in soil health.
- **A survey on citizens' perceptions** received more than 2,500 replies with **80% respondents considering that soil health matters for the quality of their lives.**
- A **business round table** has brought in the views of the private sector as regards Mission priorities and R&I needs. Private sector dialogue is pursued through networks such as the **Soil Health Law Coalition** and the **Global Coalition for Soil Health**.
- The Mission has been presented at more than **300 events across Europe** and beyond, with the **annual European Soil Mission Fair** becoming the main forum for the Soil Mission community.
- A **Mission Implementation Platform** has been established to provide a one-stop shop with tailored services for the various stakeholders.
- The Mission has become a **major flagship for multi/bi-lateral international cooperation**

LEVERAGING FUNDING AND GENERATING IMPACT

- Around **1,000 CAP Network Operational Groups amounting to EUR 350 million funding** will directly contribute to the Soil Mission objectives. In addition, the **European Partnership EIP AGRI is promoting and upscaling Mission results**.
- As Member States have integrated the Mission into their CAP strategic plans, the Mission is closely linked to **the allocation of about EUR 50 billion CAP funding for sustainable soil management**.
- **Through Horizon Europe (2021 to 2023) EUR 291 million have been allocated to mission R&I projects.** Funded projects **involve 400 participants/entities** out of which **25% are private for-profit companies.**
- Other parts of **Horizon Europe and EU Programmes** contribute to the Mission Soil such as: the Partnership for Research and Innovation in the Mediterranean Area **(PRIMA) with EUR 150 million**, the Circular Bio-based Europe Joint Undertaking **(CBE JU) with EUR 90 million,** the European Innovation Council **(EIC) with EUR 65 million** for a specific Accelerator Challenge, the **LIFE Programme with EUR 70 million** and the **European Joint Programme on Soil with EUR 40 million.** There are provisions for leveraging **30m€ from the Digital Europe Programme**.
- The **Mission's Manifesto was launched on 18 April 2023** in Brussels and has attracted so far more than **1000 signatories** out of which 100 are organisations including regional authorities and private organisations.
- The **wide take up of the Mission in Member States** is a major success: **more than 200 initiatives** implementing the Mission goals have been reported by **22 Member States.**
- The **European Investment Bank** is developing a **pipeline for large-scale soil investments in connection with InvestEU**. This is complemented by Mission projects on **(financial) strategies for soil decontamination and restoration**.
- **Several philanthropic organisations have announced complementary funding to the Mission Soil** and discussions with additional organisations are at an advanced stage.

6.1 Mission goal and objectives

The Mission's goal is to set up 100 living labs and lighthouses by 2023 as a means to promote sustainable land and soil management in urban and rural areas and achieving the EU's policy objectives of having all soils healthy by 2050.

The Mission's goal is substantiated by **eight specific objectives** that contribute to the achievement of existing EU policy targets related to: soil degradation, soil sealing, pollution and erosion, the protection and restoration of soil ecosystems and soil biodiversity, and soil carbon sequestration and protection. The Mission also aims at reducing the EU's global soil footprint and at increasing "soil literacy".

Each of the eight specific objectives is backed by a baseline, one or more policy targets and measurable indicators. Measuring progress on specific objectives and their targets is enabled by eight 'soil health indicator' categories [(146)] based on physical, chemical, biological and management/landscape parameters. One target can relate to one or multiple of those indicator categories. To meet these objectives, the Mission implementation plan proposes to carry out R&I activities in a joined-up manner together with local testing grounds, monitoring, training and engagement activities.

The potential for achieving significant improvements in soil health (more specifically on the proposed soil health indicators and specific objectives) **was tested through an exercise gathering more than 300 replies from the scientific community**. Responses to the online survey conducted in the context of the external assessment study confirmed that that **the Mission's goal, objectives and policy-based targets are grounded on realistic assumptions**, recognising that rapid change and combined efforts at a large scale are needed for the 2030 timeline to be met. The evidence – mostly coming from the area of agriculture - illustrates that a range of practices exist that can significantly protect and improve soil health, particularly if their uptake was more widespread and applied over a larger scale.

6.2 The Mission's selection process

Possibilities for stakeholder consultation during the Mission formulation were hampered by the COVID19 situation which limited the possibility for actors to come together. **Nevertheless, over 300 events were organised or attended in the period 2019-2023**, many of which took place on-site. This included the 'R&I Days' in September 2019, at which 150 stakeholders engaged in identifying important challenges in relation to the Mission Area and discussing the expected impact of the Mission. Other relevant events for

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[(146)] The notion of category reflects that the indicators are not always already captured by specific variables. The development and validation of those variables is still ongoing and is in fact one of the Mission's building blocks.

discussing soil health problems and solutions, that took place in November and December 2019, were, for example, the 'Outlook Conference' in Brussels and the International Green Week in Berlin, the Salon D' Agriculture in Paris, Moet Hennessy event on soil health or a Mission event as the EU's contribution to the global Aim for Climate summit in Washington DC. Moreover, there were also external communication and engagement initiatives of a digital nature, including the release of three videos [147], several articles and peer reviewed publications [148], the EIP-AGRI newsletter, a survey of 7000 contacts (with over 2000 stakeholders expressing their views on the Mission Area and needs to be tackled under the Mission) and social media activities (e.g. via Twitter) around the World Soil Day and other major events. ([149])

According to the stakeholders who answered the online survey distributed in the context of the external study, **there has been sufficient transparency and that relevant stakeholders were consulted** (30% respondents and 25% respondents respectively agree and strongly agree with the statement). Moreover, most respondents (55%° think that in terms of how it is programmed, **the Mission is encouraging broad engagement and active participation of stakeholders and citizens**.

Regarding the scope of the Mission, the external assessment study identifies the Soil Mission as ambitious, original, and well-grounded in terms of underlying analyses and foreseen actions for completing it. Part of this analysis is included in section 8 of the implementation plan, which reviews the evidence base on soil health conditions, proposes soil health indicators, and discusses evidence on 'management practices and outcomes in relation to Mission objectives'. This last point suggests that technically the overall Mission goals are realistic, based on the availability of well-tested management practices related to e.g., efficient (re)use of natural resources; reduced use of control chemicals' soil structure protection; and improved soil cover. [150] The challenge remains to enhance the actual application of such practices, which therefore receives prominent attention in the building blocks of the implementation plans. There is however only limited ex-ante evidence on how the living labs approach will work out at such as large scale and in a novel context.

One recurring observation is that the scientific discipline of studying soil health (or closely related concepts) has been around for decades, but that it has mainly focused on agricultural soils and food production. Broadening it up to other soil types and usages is a novelty, in itself. Moreover, by making it such a prominent element of one of the five EU Missions, it is likely that it will rapidly gain more attention and deliver impact on the ground. This could already have a positive effect, as more awareness of soil health issues is a precondition for taking action. According to the analysis carried out in the context of the external study, **there has been little policy progress at EU level in this field in the**

[147] Life on earth depends on soil. https www youtube com/watch?v=oJF_GTmrJGI&feature=youtube

[148] See e.g.: Soil priorities in the European Union - ScienceDirect; Activity update of the Mission Board of European Union on soil health and food - ScienceDirect; SOIL - Transforming living labs into lighthouses: a promising policy to achieve land-related sustainable development (copernicus.org)

[149] Presentation Mission Board Soil Health and Food (February 2020).

[150] See section 8C in the implementation plan: "Summary of evidence submitted by the scientific community on management practices and outcomes in relation to Mission objectives"

past decades, thus suggesting that the Mission can be of substantial added value. This would particularly concern the **potential for the Mission to tie together fragmented frameworks, policies, networks, etc**. that all cover a specific part of soil health without making connections between topics like experimenting, monitoring, changing incentives, and adapting regulations for soil management practices that affect different ecosystem services and soil health indicators. **As the term soil health is gaining momentum also at global level and in the private sector**, **the Mission is also considered to be pioneering efforts to put this concept into practice**. This is evidenced for example by the large interest shown and the number of initiatives emerging on soil and land management, carbon sequestration or regenerative agriculture and carbon farming driven by international public and private partners (e.g. Aim for Climate, Coalition 4SoilHealth, Coalition for a Soil Health Law also representing a large number of food and beverage industries, philanthropic institutions).

The vision and implementation plan for the Mission are in line with the imperatives proposed by Mariana Mazzucato's work on Mission-oriented innovation policy, in general [(151)], and EU Mission-oriented R&I policy, more specifically [(152)]. This notably concerns the philosophy of calling for multi- or even transdisciplinary research targeted at overcoming implementation and diffusion challenges. **Co-producing and spreading knowledge are at the core of Mission Soil**. This is evidenced by for instance the focus on living labs and 'lighthouses' as environments in which diverse stakeholders can experiment and exchange lessons regarding the physical/chemical as well as business and legitimacy aspects of innovative soil management practices. [(153)] The Mission assessment conducted by the external contractor identifies the focus on living labs as a means to achieve impact beyond more traditional R&I funding. Study evidence suggest that it is critical to address soil health in forests and urban lands, the more so as it has been neglected in research and practice in the past. The study analysis shows that agricultural actors are perceived as better organised and better positioned to respond to the living labs calls. The Mission is therefore facing (and already addressing) a major need to test the living lab approach beyond agriculture and seek for improvements in soil health across all land uses.

A perceived strength of the focus on living labs and lighthouses is that it still allows for plenty of variation in how actors like farmers, foresters, landowners, public authorities and citizens will experiment, interact and learn. This makes it robust for the high level of variation in soils, soil usage and institutional landscapes in regions across Europe. At the same time there is a notable demand for more clarity on what models and funding constructions might be used to establish/manage living labs and keep them running after the kick-start support of HE calls ends.

[(151)] Mazzucato, M. (2018). Mission-oriented innovation policies: challenges and opportunities. *Industrial and corporate change*, *27*(5), 803-815.

[(152)] European Commission, DG RTD, Mazzucato, M., (2018). Mission-oriented research & innovation in the European Union: a problem-solving approach to fuel innovation-led growth, EC Publications Office.

[(153)] "Living labs are collaborative initiatives to co-create knowledge and innovations while lighthouses are places for demonstration of solutions and exemplary achievements." Implementation plan soil health Mission (2020, p. 28).

Moreover, **the focus on soil literacy and citizen science** (e.g. citizens contributing to LL activities around experiment design and data gathering) **testify of a scope that aims to do more than conducting ground-breaking research**. It also considers socio-economic factors that determine the uptake of innovations. Crucial in this respect is the work on influencing and adapting related EU and national/regional policies, which will be discussed in more depth in the subsequent sections.

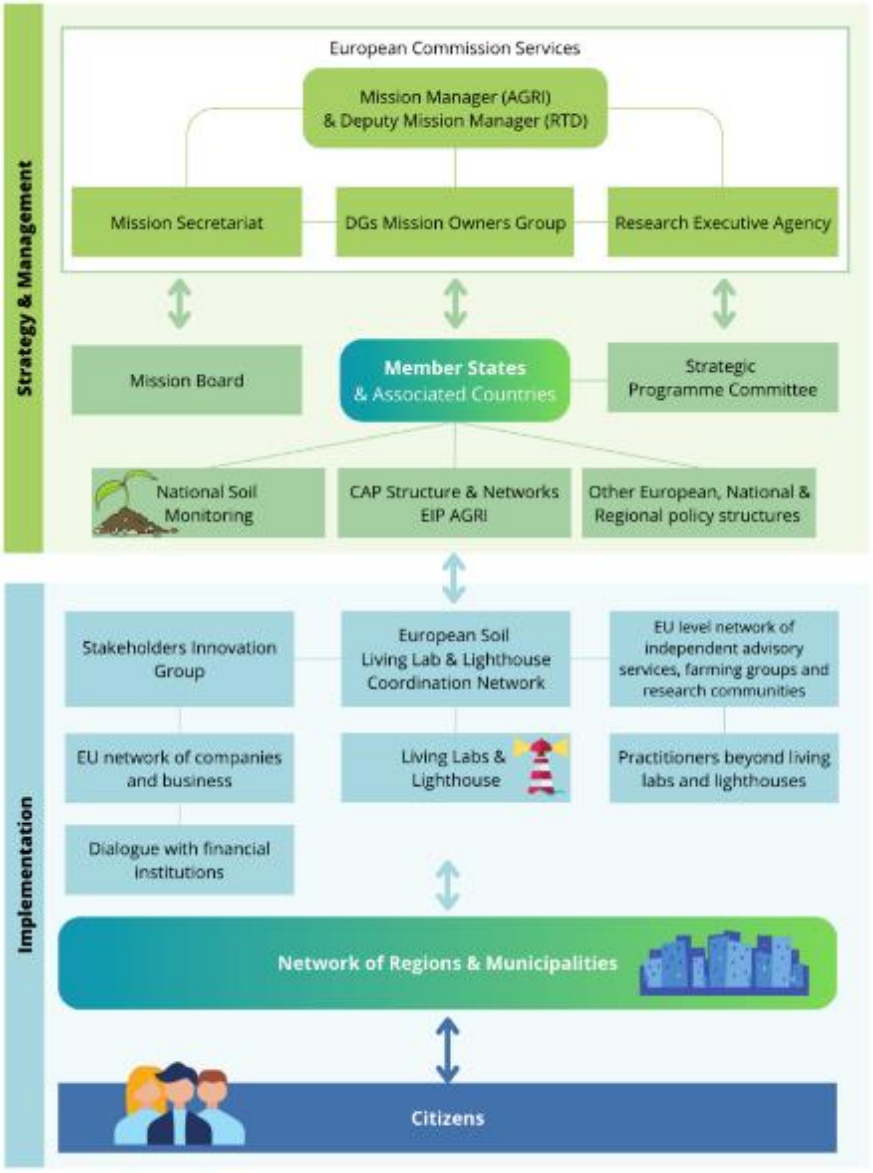
Finally, in addition to the eight specific objectives, **the Mission also aims to contribute to reducing the global soil footprint**. This is an example of a broad societal concern (inspired by the EU's commitment to the SDG's) for which allegedly only few policy instruments exist. Reducing the negative impacts of soil use requires robust indicators, as these are a basis for policy development as well as for engaging stakeholders. By investing in activities for aligning measurements as well as interests and instruments, the Mission Soil seems to make good use of the potential of Missions (as a policy tool for coordination) to bridge possible divides between countries and policy domains.

6.3 Management arrangements and governance structure

The governance framework for the soil deal Mission is common to those of other Missions. DG AGRI provides the Mission manager, and the deputy Mission manager comes from DG R&I. The Mission secretariat, tasked with Mission coordination, is provided by a DG AGRI team as well. The Mission owners group for inter-service coordination of Mission programming includes representatives of the DGs CLIMA, ENV, JRC, MARE, SANTE, ENER and MOVE among others, with different levels of involvement. Through an administrative agreement, the JRC is in charge of the Mission's building block on soil monitoring.

A new Mission board was established in September 2022. The 'Strategic configuration of the Horizon Europe Programme Committee' (SPC) is a structure which allows Member States and associated countries to contribute to and approve the Horizon Europe work programmes. Member States, of course, also play a role via their involvement in accepting and adopting other EU policies, like the common agricultural policy (CAP), and participating in relevant international networks, e.g. via the European Innovation Partnership on Agricultural Productivity and Sustainability (EIP AGRI). Finally, they provide the data that is used for soil monitoring activities as conducted as part of the DG JRC's EU Soil Observatory (EUSO). As a novelty**, a number of Member States have set up cross-sectoral mirror groups for Mission Soil**, these generally representing various ministries and stakeholders. Efforts are underway to strengthen the links between mirror groups and national hubs created by the European Joint Programme EJP Soil.

Figure 12: Governance structures for strategy/programming and implementation



Source: EFIS study

On the implementation side of the governance structure, an additional range of groups, institutes and networks helps to develop actions. An update with respect to the governance structure initially foreseen in the implementation plan is that there is no stakeholder innovation group, but other support structures have been created (e.g. an implementation platform and national mirror groups). One governance element to highlight is that the EC is mobilising and initiating various networks that prepare countries for establishing the LLs (and later lighthouses) that feature so prominently in the Mission Soil's implementation plan.

The consultations carried out through the external assessment study suggest that **stakeholders appreciate the constellation in which the responsible Commission DGs work together** and are responsible for implementing the main EU research and policy actions under the Mission. It is also suggested through that, as the Mission and the supporting vision already have been formulated, the advice role of the Mission board has de facto become less prominent. It now is seen as a collection of 'ambassadors' rather than

as a governance structure that has a strong mandate for safeguarding the implementation of the vision.

Moreover, **consulted stakeholders are generally positive about the suitability of the governance setup for steering and implementing the Mission**. In as far as more critical comments have been expressed, these concern the demand for better clarification of roles and responsibilities of the various elements in the governance structure; intensified support for Member State (MS) representatives in organising initiatives (beyond HE calls); more communication on e.g. how the opinions and comments of MS representatives are handled; and a more visible and accessible Mission board (chair). Collaboration with the Mission secretariat is qualified as effective and clear. Some survey respondents and interviewees have advocated for a **stronger involvement of financial stakeholders (investors) as well as public or private advisory organisations and extension services that support farmers** in discovering the benefits of adopting soil management practices.

Horizontal coordination at the EU level

Due to its strategic importance for major policy objectives and promoted through the governance structures described above, the Mission is part of several Green Deal-related strategies and policies (including Farm to Fork, the European Biodiversity Strategy, the Climate Adaptation Strategy and the new EU Forest Strategy, Communication on Sustainable Carbon Cycles, EU Soil Strategy); the CAP; and EU policies concerning the Digital Age (for instance via collaboration with Digital Innovation Hubs) as well as other topics (e.g. the Water Framework Directive, the Habitats Directive, the Marine Strategy Framework Directive, the Bioeconomy Strategy, and the Circular Economy Action Plan). InvestEU is also mobilised to contribute to the Mission.

It is still early to judge how effective the governance arrangements and policy linkages are. The Mission is relevant for many EU policies and the role of Mission is well established in the various strategies and policy documents. Still, some interviewees found it difficult to understand what how these linkages will materialise,. Several interviews conducted through the external assessment study note that, probably because of how it historically emerged, **DG AGRI, DG RTD and the JRC showed a particularly strong involvement in the Mission. There is also significant buy-in from DG ENV**, in particular as the Mission Soil is crucial for the success of the soil strategy and upcoming SL. Apart from providing essential indicators, the Mission leverages resources and networks for goals DG ENV has been pursuing through the LIFE Programme. Similarly, **DG CLIMA** has welcomed the Mission as a tool for strengthening its activities on counteracting climate change (as done via e.g. the LIFE programme [(154)]). The Mission contributes for instance to the creation of a framework for the monitoring, verification and reporting on carbon removal, which complements the LIFE Carbon Farming Scheme [(155)]. Moreover, one of many highlighted synergies is that directorates-general like DG ENV and DG CLIMA can propose support schemes and laws, and they would benefit from

(154) https://cinea.ec.europa.eu/programmes/life_en

(155) https://climate.ec.europa.eu/eu-action/sustainable-carbon-cycles/carbon-farming_en

increased means to support implementation and engage in stakeholder interactions that contribute to societal acceptance and participation. Hence, a particularly interesting feature of the Mission is that it offers possibilities for organising outreach, demonstration, co-creation and adoption.

Vertical coordination at the global, EU, national and regional levels

The EC, and in particular the Mission secretariat, has invested in a broad range of partnerships that contribute to getting soil health high on political and policy agendas around the world. An example is the Mission 's support to the UN's Global Soil Partnership , e.g. by contributing to the World Soil Days in 2021 and 2022. Other examples include the EC's efforts to promote the Mission at the UNFCCC COP27, the Japan Moonshot Programme event on agri/food science and technology, and during the Global Forum for Food and Agriculture at the Green Week 2023 in Berlin. In turn, the Mission benefits from the fact that soil health is receiving more attention and has achieved a prominent place in policy debates and events that traditionally would not highlight soil health as such. **The Mission Soil has become a major flagship for the EU's international cooperation** such as under the Agriculture Innovation Mission for Climate and the global Coalition of Action for Soil Health.

In terms of the added value of the Mission, the assessment study analysis points to "effective coordination between EU, national, regional, and local levels". Apparently, this is more of a concern than cross-policy coordination at the EU level itself. Interestingly, this holds for all Missions, and thus is not a specific issue for Mission Soil.

The survey conducted in the context of the study reveals that the Mission's objectives are perceived to be influencing the R&I policy agenda in particular at the supranational level, and to a lesser extent at the national level. Influence at the regional or local policy level is less clear, despite the Mission's focus on living labs and lighthouses being targeted mainly at that level. This is probably due to the fact that major R&I programmes are mostly run by national and not regional institutions. An exception are the operational groups funded under the CAP which provide for R&I and demonstration of solutions at local level and are instrumental to replicate solutions developed under the Mission. This is a unique resource – both of complementary funding and synergies between the Mission and its implementation at local levels.

A second survey question on this topic suggests that Missions are still less known at local level. Interestingly, survey respondents ascribe this primarily to insufficient coordination between policy-makers within a country. Accordingly, the most reported key enabling factor for Mission implementation is ensuring that also national policy plans/strategies include a focus on one or more Missions.

6.4 Progress to date

The external study analysis concludes that the progress made since the EC proposed the Mission Area, back in 2018, is overall positive. This particularly holds for the formulation of the Mission (goal, objectives, and indicators), the development of an implementation plan, and the first steps for putting the implementation plan in to action.

The Mission and its implementation plan, which were published only 18 months ago, are rolled out in three interconnected phases, with the pilot phase running until 2025. A consistent feedback point from consulted stakeholders is that the Mission projects implementation level at the time of this study is still in a very early stage. This is not surprising given the timing of calls, evaluations, and grant preparations. The first Mission projects funded under the WP 2021 started at the end of 2022 or early 2023, and the second projects are still in the selection phase (grant agreements foreseen for June 2023). Hence, only little can be said about what the possible outcomes of these projects. A positive observation is that the calls have yielded a large number of eligible proposals, allowing for the selection of the most promising ones.

Additionally, **the EC and in particular the Mission secretariat started a broad range of initiatives to promote the Mission and to implement actions complementing the Horizon Europe WPs**. For instance, in summer 2022, a consultation process was started for identifying regional soil needs, create an interactive map of already existing living labs and enhance access to soil information in MS. Over the course of 2023 and 2024 engagement sessions are being organised in MS to raise awareness and support the creation of living labs. The establishment of the first wave of living labs supported by the Mission is foreseen for 2024, as part of the current 'introduction and pilot phase' running until 2025. This will be followed by the 'expansion and innovation phase' (2025-2030) and the 'scaling up and mainstreaming phase' (2027-2030).

The study analysis indicates that **the Mission is progressing in line with its implementation plan**. Particularly notable is the high percentage of respondents strongly agreeing with the statement that the Mission is creating or is likely to create added value compared to existing initiatives or instruments. Stakeholders consulted through the external study consistently praised the **strong coherence between the implementation plan with its associated actions and the Mission board's views on what the Mission needs**. The four building blocks ('operational objectives') have the potential to reinforce each other, since living labs (partially drawing on citizen engagement) can for instance benefit from harmonised monitoring while they can also bring forward new practices that can be used for improving soil health elsewhere. The four operational objectives entail actions that cover all eight specific objectives that are important for completing the Mission. In addition to actions belonging to those operational objectives, a large number of extra actions is being undertaken to mobilize and align complementary policies. The policy impact that the Mission is beginning to create can notably be found in the contributions to the at least 12 Green Deal strategies and to the CAP as a major financial EU instrument under shared management.

The below table shows per operational objective which main steps (out of a much longer range of initiated actions) have been taken, and what challenges – according to the analysis carried out by the external consultants - still lie ahead. While the foundation of the Mission appears to be solid, careful attention should be devoted to the next steps (towards aligning non-R&I policies).

Table 9: Overview of implementation steps taken and challenges ahead

Mission Building Blocks	Implementation steps taken	Challenges ahead
To build capacities and the knowledge base for soil stewardship	HE work programmes have been developed, and associated calls have been launched (2021-2023), to fund research on soil health management topics, business models, soil advisors, soil education, etc. A Mission Implementation Platform has been established.	Ensuring that not just the calls cover different disciplines, but that also individual projects are truly multi- or trans-disciplinary. The projects should be holistic and focus on putting techniques to practice. Ensuring that potential applicants have sufficient time to develop new proposals. And ensuring coherency in the portfolio of awarded projects, e.g. by connecting them.
To co-create and upscale place-based innovations	HE WP calls on LLs and support structures. Through the NATIOONS project organisation of engagement sessions for LLs in all Member States and associated countries Set up of a support structure for LLs Labs (through a framework partnership and specific grant agreement)	Getting the SL accepted and implemented could massively drive the upscaling (uptake) of place-based solutions. This mainly requires more familiarity of Member States with progress in harmonised indicator infrastructure.
To develop an integrated EU monitoring system	HE WP calls on soil health indicators development and validation. Administrative agreement with the Joint Research Centre to oversee Mission activities on the monitoring of soil. Launch of EUSO Dashboard.	Development of method that uses the indicators for agreeing on reference values for policies (SL, CAP). A robust set of definitions, indicators, reference values and monitoring practices would then need to be matched with policy designs / adaptations that demand and reward soil health improvements.
To engage with the soil user community and society at large	Identification of 'soil needs' in regions. Engagement with regions, potential LL applicants students and citizens Training of specialised soil advisors Diverse set of co-creation and engagement events, social media campaigns, partnership exchanges. Preparation of EIB study on investment needs and of Territorial Management Agreements. Comprehensive communication, outreach and engagement activities have been carried out	Clarifying how citizens and other societal stakeholders can play a role in LLs and lighthouses, especially the ones not focused on agriculture and food.

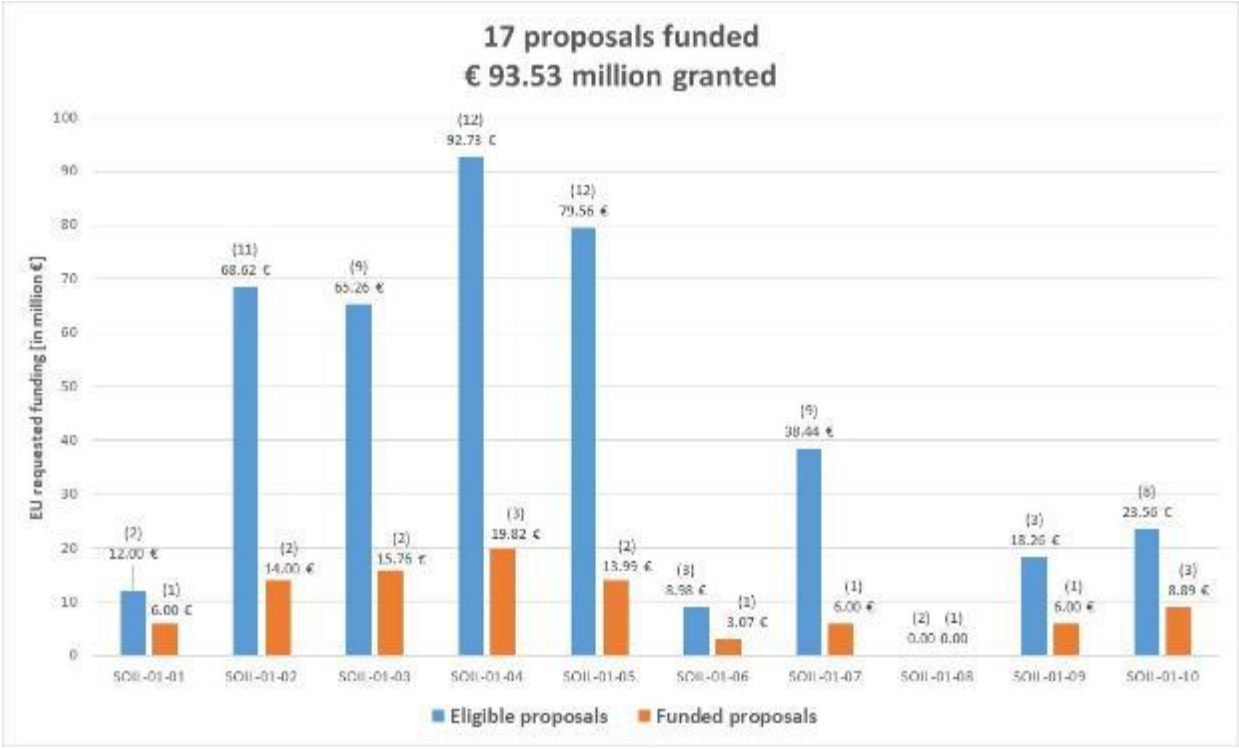
In sum, progress in terms of Mission implementation is broadly to plan. However, a point that is emphasised throughout all interactions undertaken as part of this study is that actual *Mission success* will now depend on other EU policies (notably the CAP and the SL) and on how national policymakers will implement those. The added value of the Mission is

often linked to the various ways the Mission can leverage or support those other policies, which by design look promising. There seems to be a need, however, to further engage with national and regional policymakers to better explain the accessibility and relevance of Mission outputs.

6.5 Budget and funding leveraged

The main funding source for the Mission's implementation is the Horizon Europe Mission budget. The first three Mission calls under Horizon Europe were launched as planned. The Horizon Europe actions provide opportunities for research and innovation, in line with the priorities highlighted in the Mission implementation plan. **The Mission Soil calls are mobilising and connecting communities working on soil protection (researchers, land managers, industries, etc.)**. The calls have targeted all four operational objectives of the Mission. The number of eligible proposals for the WP 2022 calls generally exceeds the capacity of what could be funded rather well. This holds for the calls on food processing residues (02); soil biodiversity (03); decontamination and reuse of land (04); monitoring, verification, reporting of soil carbon (05); soil education (07); and – with 8 relatively small proposals - innovation from biowaste (10). There were less applications for the calls on building the knowledge repository (01) and the network of carbon farming (06), perhaps because only a few networks in the soil science community were well-positioned to compete here. Topic 08 concerns the support structure for living labs, which is a special grant agreement instead of an open call.

Figure 13: Overview of eligible and funded proposals for WP 2022 calls.

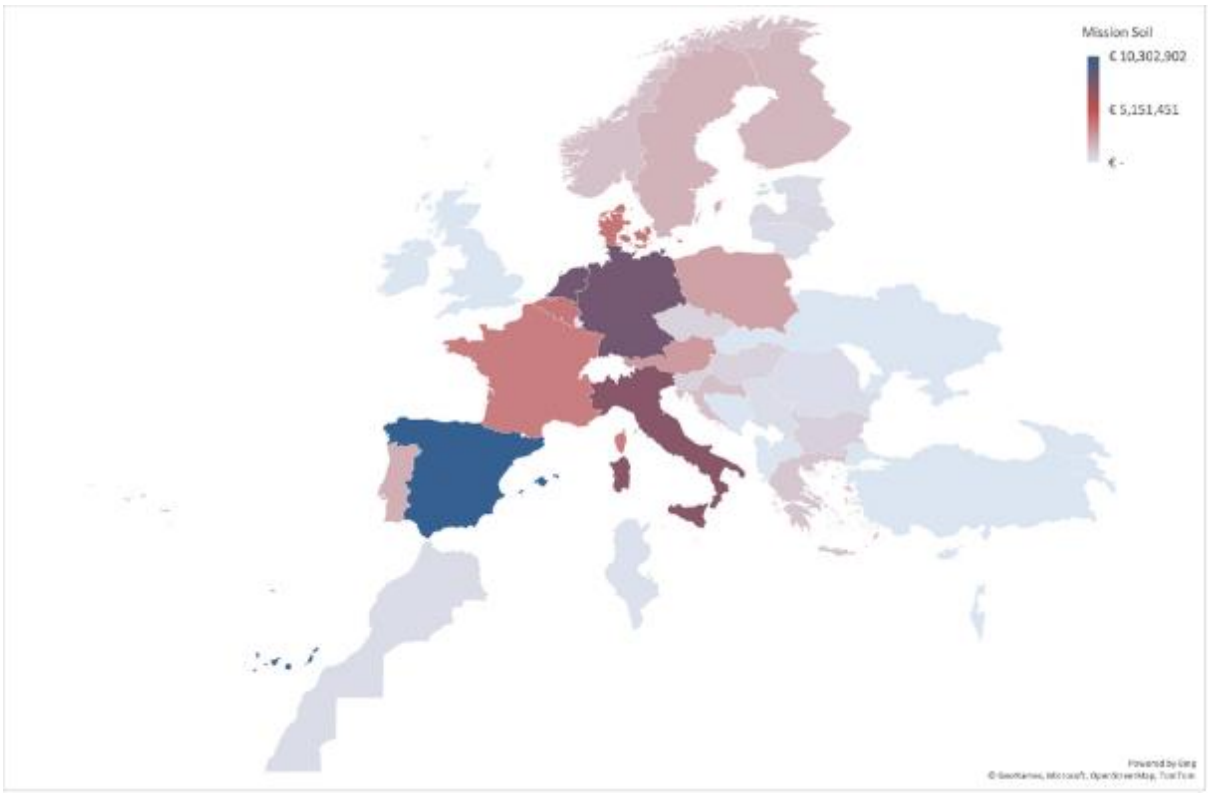


Source: Horizon europe Mission Dashboard

The below figure shows the EU MS where applicants received funding from the calls for the Mission Soil by end 2022. Overall, most of the funding so far has been landing in

central and south-west Europe. What stands out is the large amount of funding allocated to activities in Spain, a country with advanced soil health expertise to face the challenge of half of the land area being deemed highly susceptible to degradation and desertification. [156] Beneficiaries in Eastern Europe and northern Europe have been less involved in the first HE calls, which might be explained by factors like less expertise required for winning the calls or by less familiarity with the calls. It should be noted that this first image is probably not reflective of how the total HE budget will be spent, since later calls seek different types of expertise and actions (notably the establishment of the living labs and lighthouses throughout Europe).

Figure 14: Geographic distribution of funding from the HE calls for the Mission Soil



Source: Data extracted by the external study team on 21 March 2023 from the Horizon Europe dashboard.

Apart from the EU level, funding is also being mobilised at the national level. This involves, for instance, Member States' contributions to EU programmes like EJP SOIL and PRIMA or private sector contributions such as by the Joint Undertaking Circular Bioeconomy Europe. Additionally, MS also have their own policies and programmes. One prominent example is the German R&I soil programme BONARES ("Soil as a sustainable resource for the bioeconomy"), with a budget of €108m for the period 2015-2025. [157] This example shows that relevant funding schemes would not only include new programmes,

[156] JRC (2016). Soil threats in Europe: status, methods, drivers and effects on ecosystem services. A review report. (Editors) Jannes Stolte, Mehreteab Tesfai, Lillian Øygarden, Sigrun Kværnø, Jacob Keizer, Frank Verheijen, Panos Panagos.

[157] https://www.bonares.de/home-de

possibly influenced by the EU Mission, but also existing programmes that can be used for contributing to the activities and goals of the Mission Soil.

A major asset of the Mission is its unique formal and operational link to the Common Agricultural Policy (CAP) and to its EU CAP Network. The initial estimation of CAP 2023-2027 commitments favourable to soil management to improve soil quality and biota (CAP Result Indicator RI19) is EUR 50.6 billion. A more targeted analysis will be conducted in the future, focusing only on some specific practices which affect directly soil protection and management. In addition, it has been estimated that around 1,000 CAP Network Operational Groups (EUR 350 million funding) will directly contribute to the Soil Mission objectives. The figures already point to a major mobilisation of CAP funds for the implementation of the Mission objectives and for dissemination and take up of Mission outputs and results for the 2024-2027 period.

Overall, the external study analysis concludes (on the basis of the insights from desk research and the consultation of stakeholders) that the amount of funding available for the Mission Soil has been appropriate in this first phase during 2021-2023: it allowed for undertaking a broad range of actions that all have their natural place in driving change. However**, the Mission will only succeed if sufficient funding is secured over the next years (2024 – 2027), in particular to set up the expected number of living labs and scale up exemplary solutions through lighthouses**. One could wonder whether other EU funds could be mobilised in more systematic ways for funding living labs and dissemination activities, once they have shown their potential. This underlines the recurring observation that at the EU level the basis for Mission implementation is solid, but more attention is needed for bringing on board the sub-EU levels where experimentation and policy adaptations still needs to start.

6.6 Key conclusions from the external assessment

The overall assessment of the design and early implementation of the Mission Soil is positive. The analysis conducted through the external study identifies the formulation of the vision and goals, as well as the directions this gives to policy intervention, as particularly successful. While for many years there has been insufficient progress in this field, soil health is now increasingly being recognised as an urgent and transversal topic, interlinking vital soil functions like food production, water storage/purification/regulation, preserving biodiversity, nutrient cycling, contamination reduction, climate regulation (e.g. via carbon capturing), and cultural services. **The ambitious Mission is both a needed and suitable start for initiating, mobilising and aligning EU and national/regional policy efforts for counteracting soil degradation**.

Particularly promising is that **the design of the Mission goes beyond merely programming R&I in a more impact-oriented way**: improving soil health across Europe is genuinely leading, and all policy actions have a logical place in the strategy for achieving that goal. This also implies that while some actions are knowledge-oriented and support R&I on soil management practices, most attention goes to improving the conditions that make stakeholders receptive to adopting such practices (both old and new). The study concludes that the **sensitivity to place-specific variation in soils, economic structures and especially institutional landscapes is a clear strength of how the Mission is**

designed. Another added value is emerging from the Mission's **traction vis-à-vis the private sector and international partners**.

As for the governance structure, while challenging, **solid mechanisms have been put in place to connect various actors** across the Commission, Member States and sectors as well as to link R&I with many other policy and funding initiatives. The arrangements that have been put in place are functional for achieving coordination amongst a broad range of policy actors, both horizontal (across different EC DGs and networks) as well as vertical (across EU and national/regional policy actors). This coordination is necessary to create synergies between relevant policies and funding and the Mission Soil. **Promotion of the Mission is ongoing as well**, and an increasing amount of EU and national policies make reference to it. At the same time, **awareness about the Mission in Member States is still low**. This holds especially for policy officials outside the domain of R&I policy. With the recent launch of the Mission Soil manifesto and engagement sessions being carried out in all Member States and associated countries, some important additional steps are being taken. Overall, **improving commitment from the national/regional level** is regarded as an important mechanism for leveraging the well-targeted outputs of the Mission's "core" policy actions (as supported via HE Work Programmes).

Finally, **progress towards Mission goals is proceeding as planned or has been even accelerated**. At this stage this implies that the implementation of actions is on schedule. The interest for the calls is high, and the amount of available funding allows for broadening the community of researchers involved in soil science. Safeguarding multi- and trans-disciplinarity is essential, at least for action lines like the creation and management of the living labs and lighthouses in which researchers, landowners, land managers and other stakeholders will participate in practice-oriented research activities.

6.7 Self-assessment of the Mission 'A Soil Deal for Europe'

Soils are a vital, albeit fragile and non-renewable resource. One centimetre of topsoil can take hundreds of years to form but can be lost in just a single rainstorm or an industrial incident. Moreover, **soils are threatened all over Europe and globally** because of a range of human activities (e.g. through the competition for land, intensive land use, production, consumption patterns, and urbanisation) that are acerbated by climate change. Most land degradation processes occur largely unnoticed, but their effects are profound: By 2050, 500 - 700 million people worldwide are likely to be forced to migrate due to a combination of climate change and land degradation [(158)].

Recent floods and droughts in Europe have reminded us about the importance of healthy soils that can absorb and release water. As put by Vice-President Timmermans: "How will [farmers] remain heroes when the soil is dead, and crops fail due to drought? Isn't it time

[(158)] IPBES (2018): The assessment report on land degradation and restoration.

to help farmers regenerate their soil and protect crops from drought and high temperatures?" [159]

In Europe, over **60% of soils are considered unhealthy** [160] thereby losing their capacity to produce food, to regulate water and nutrient cycles and to mitigate climate change (soils hold three times more carbon than the atmosphere [161]).

Fortunately, **soils are increasingly getting the attention of policy makers and society**. The IPCC's report on "Climate Change and Land" shows how the sustainable management of land can help address climate change and improve agricultural productivity while conserving and restoring ecosystems and biodiversity[162]. At the Global Forum for Food and Agriculture 2022 in Berlin, Agricultural Ministers from all over the world endorsed the final *communiqué* "Sustainable Land Use: Food Security Starts with the Soil"[163].

Less than two years into its start, the Mission Soil has already positioned itself as an effective mechanism for mobilising actors across society and **accelerating Europe's green transition towards sustainable land and soil management**.

6.7.1 An ambitious yet realistic Mission goal

The Mission goal is to establish **100 living labs (LLs) and lighthouses (LHs) to lead the transition towards healthy soils by 2030**. This is an important milestone in Europe's trajectory towards having all soils in a healthy condition by 2050, as stipulated in the Soil Strategy and the future Soil Law. Against this background, the Mission's goal remains highly relevant, as also demonstrated by the increasing number of global initiatives (public and private) in favour of healthier soils [164]. **The future Soil Law, the EU Climate Law as well as the further development and implementation of the ambitious EU's Land Use, Land-Use Change and Forestry target for 2030 and the proposed carbon removal certification scheme call for greater, cross-sectoral efforts which are supported by the Mission Soil**.

As one Living Lab consists of several local testing sites, the target of 100 LLs will result in a comprehensive network of more than 1000 testing sites all over Europe that will experiment and scale up solutions for soil health. This is quite **an ambitious goal**, the more

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[159] Speech of Frans Timmermans at the Sustainability Conference of the German Ministry for Nutrition and Agriculture, 4 May 2023: https://ec.europa.eu/commission/presscorner/detail/en/speech_23_2615

[160] EU Soil Observatory (EUSO) Dashboard (http://esdac.jrc.ec.europa.eu/esdacviewer/euso-dashboard/)

[161] Bossio, D.A., Cook-Patton, S.C., Ellis, P.W. et al. The role of soil carbon in natural climate solutions. Nat Sustain 3, 391–398 (2020). https://doi.org/10.1038/s41893-020-0491-z

[162] IPCC (2019).

[163] Final Communique Global Forum for Food and Agriculture 2022: gffa-2022-kommunique-en.pdf (bmel.de)

[164] For example, PepsiCo announced on 21 March 2023 a $216 Million investment in long-term partnerships to support soil health through regenerative agriculture.

as the network of LLs and LHs will need to be balanced in terms of coverage of regions and land uses. As a result of the first call for Living Labs in Work Programme 2023, 25-30 living labs (these resulting in about 200 local testing sites) will be set up in 2024. A similar number of Living Labs will be funded by four subsequent calls 2024 – 2027 so that **the goal of 100 Living Labs is realistic and even likely to be exceeded**.

As the concept and approach of LLs gets more widespread and applied, it is expected that **additional funding will be mobilized to sustain existing and finance additional LLs**. This includes options to finance LLs through the future Common Agricultural Policy (CAP). It is also expected that LLs and LHs will surge from activities funded outside Mission Work Programmes, such as the Horizon Europe Partnership on Agroecology [165]. In this regard, the Mission is having a catalytic effect.

The Mission's goal is further substantiated with eight specific objectives and corresponding baselines, targets and indicators to address 1) soil degradation, 2) soil sealing, 3) pollution and erosion,(4) the protection and restoration of soil ecosystems, 5) soil biodiversity, 6) soil carbon sequestration and protection as well as 7) the global soil footprint.and 8) soil literacy. An analysis of evidence submitted by the scientific community confirmed that **the Mission's goal, objectives and targets are grounded on realistic assumptions, recognising that rapid change and combined efforts at a large scale are needed for the 2030 timeline to be met** [166].

6.7.2 The Mission's added value

The Mission gives **visibility to soils as a crucial, yet widely 'unrecognised' resource and proposes an integrated, systems approach to soil health**: While traditionally, R&I, soil monitoring and policies have largely focused on agricultural soils, the Mission promotes cooperation across disciplines and sectors to address all land uses (e.g. agriculture, forestry, urban areas, protected areas).

By reaching out to other instruments and establishing a structured dialogue with Member States, **the Mission has a main role in coordinating activities, leveraging funds from other programmes** (see sections 6.7.5 and 6.7.8) **and exploiting synergies between activities carried out at EU, national and regional levels**.

The Mission comes at the right time: **Healthy soils are necessary to meet the ambitions of Green Deal policies** notably in the areas of on sustainable food systems, biodiversity, climate and zero pollution. The Mission supports their implementation with data, scientific knowledge, harmonised soil health monitoring and innovations on the ground. The Mission together with the Soil Strategy, the future Soil Law and the European Soil Observatory (EUSO) forms **a single and more robust framework to address soil and land**

[165] Partnership on agroecology (europa.eu)

[166] See section 8.C of Mission Soil Implementation Plan.

stewardship at the necessary scale and pace. This represents a unique opportunity to address soil health at in Europe at all levels.

Developing an integrated EU soil monitoring system is highly relevant, not only for policy but also for industries, as shown by the open letter [(167)] signed by the Soil Health Coalition and more than 250 signatories calling for a **comprehensive, harmonized and legally anchored soil health monitoring and reporting system** (March 2023).The Mission is highly **relevant to the twin green and digital transition** by enhancing capacities in digital skills and unleashing the potential of **digital technologies**, such us artificial intelligence, and **earth observation**, making them work and accessible for land managers, citizens and businesses

The Mission adds value to the Common Agricultural Policy: An evaluation of the impact of the CAP 2014 – 2020 [(168)] concluded that "the lack of technical knowledge and support appeared to be a key factor hindering the implementation of management practices addressing soil quality". The Mission has a clear role in closing this knowledge-practice divide, also by testing and upscaling solutions that can be widely upscaled with CAP funding.

By implementing a novel approach to R&I, the Mission goes beyond what could be achieved within single parts of the Horizon Europe Programme. Local testing and demonstration grounds (LL&LH), together with open science and interactive, participatory innovation, will lead to a **quicker and easier deployment of solutions to maintain and restore soil health**.

The Mission contributes to the implementation of the **EU international commitments** towards Biodiversity, Climate Change, Nutrition, Hunger and Poverty Eradication including the Sustainable Development Goals. It The Mission has become a major flagship for international cooperation with the FAO Global Soil Partnership [(169)] or the Aim for Climate initiative [(170)].

The **Mission Soil is key for the successful implementation of the other four Missions**: Healthy soils underpin: the resilience to extreme weather (Mission Adaptation to Climate Change); food quality and safety, thereby helping to prevent cancer and other diseases (Cancer Mission); water quality (Ocean Mission) and green infrastructures in built up communities (Cities Mission).

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(167) https://eeb.org/wp-content/uploads/2023/03/Open-Letter-to-the-European-Commission-on-the-Soil-Health-Law-1.pdf

(168) https://ec.europa.eu/info/news/commission-publishes-study-caps-impact-soil2021-feb-04_en

(169) http://www.fao.org/global-soil-partnership/en/

(170) http://www.aimforclimate.org/

6.7.3 The Mission's R&I content

"*We know more about the movement of celestial bodies than about soil underfoot". This famous quote of Leonardo da Vinci reminds us of the importance of R&I to better understand and manage highly complex "soil systems*".

The Mission's R&I programme addresses knowledge gaps as identified in the implementation plan with a **transdisciplinary, multisectoral and portfolio-based approach**. It is regularly updated in broad consultation with Commission services (through the Mission Owners Group), Member States and stakeholders. This includes structured dialogues and coordination with major initiatives such as the European Joint Programme EJP Soil.

Through the first three work programmes (2021 to 2023) EUR 291 million have been allocated to R&I projects addressing topics of relevance for the Mission's specific and operational objectives. Twenty-seven projects were selected following 2021 and 2022 calls and 19 are expected to be selected under the 2023 call including two **topics in collaboration with Missions Adaptation to Climate Change and Mission Ocean & Waters.**

Table 10: Work Programme budgets, topics and projects for the Mission

Work Programme year	Indicative budget (€)	Number of topics	Number of projects
2021	57,000,000	8	11
2022	95,000,000	10	16
2023	139,000,000	9	19

Funded projects from the first two Work Programmes (2021- 2022) are giving rise to **a dynamic Mission community involving 400 participants/entities** from almost all Member States and Associated Countries, out of which **25% are private for-profit companies**.

By building thematic clusters (e.g. on soil indicators and monitoring, outreach and citizen engagement), projects are encouraged to exchange data and methods and exploit synergies.

As a novelty, funded projects interact from the start with the Joint Research Centre to establish the mechanisms and requirements for the transfer of data and information to the European Soil Observatory (EUSO). The EUSO will become the Mission's long-term repository for data and results.

The Horizon Europe calls have set the ground for

- Creating support structures for Mission implementation including the deployment of the living labs and lighthouses
- Addressing major knowledge and innovation gaps, in particular in the "hotspots" identified in the implementation plan: 1) carbon farming, 2) soil pollution and restoration, 3) soil biodiversity, and 4) circular economy solutions.
- Enhancing capacities for soil monitoring.

- Engaging with a range of stakeholder including regions, businesses and potential applicants for living labs.
- Improving education and skills.

Projects are applying transdisciplinary **and multisectoral approaches** including social sciences, to improve the uptake of new soil management practices by farmers and other land managers.

6.7.4 Ensuring implementation is feasible, measurable, and time-bound

The Implementation Plan establishes the intervention logic of the Mission Soil including its goal and eight specific objectives that contribute to the achievement of existing EU soil related targets [171]. Each specific objective is backed by a baseline and one or more measurable indicators. The intervention logic was developed based on a scientific analysis of soil threats and the review of existing data on soil regeneration by the Mission Board Soil Health and Food and the EU's Joint Research Centre. **Evidence obtained through a call to the scientific community confirmed that the Mission's goal and objectives are feasible**.

The implementation plan also provides a blueprint for action over the Mission's lifetime 2023 – 2030, structured around the four operational Mission objectives (also referred to as so-called "Building Blocks"). Proposed activities are continuously refined through a consultative process and through regular interactions with Member States to establish complementarities between Mission activities carried out at EU and national levels.

Mission projects are closely monitored based on a set of output, outcome and impact indicators which will be complemented as necessary through KPIs developed by Mission projects, such as SOLO [172] and BENCHMARKS ([173]).

As Living Labs (LLs) and Lighthouses (LHs) are at the heart of the Mission Soil, their gradual roll-out has been carefully planned and is promoted through engagement sessions. The coordination of this network will be ensured through a dedicated support structure for the Living Labs that will be operational early 2024. The first wave of 25-30 LLs will be selected in 2023. As similar numbers will follow through subsequent calls, **the target of 100 Living Labs is realistic and likely to be exceeded.**

The emerging portfolio of Living Labs will be closely monitored and steered to ensure a balanced coverage of countries and regions (administrative and biogeographical), Mission specific objectives and land-use types (urban, farm, forest, industrial etc.) across the projects. This will require to apply a mix of bottom-up and targeted LLs calls.

[171] Implementation Plans for the EU Missions (europa.eu)

[172] https://soils4europe.eu/

[173] https://soilhealthbenchmarks.eu/

The Joint Research Centre (JRC) is in charge of coordinating the work on soil monitoring to ensure complementarity with the European Soil Data Centre (ESDAC) and with the Land Use/Land Cover Area Frame Survey (LUCAS).

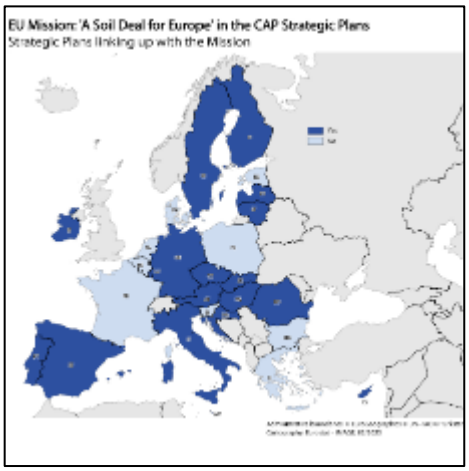
The Mission Soil Platform will become the main source of information on Mission related activities and events to an external audience. **Through its Dashboard, the platform will display the progress achieved towards the Mission's main goal and objectives**.

6.7.5 Securing buy-in

The Green Deal and other policies recognise soil health as an essential element for addressing major societal challenges. It comes therefore as no surprise that the Mission has succeeded in generating extensive political buy-in and leveraged resources at the level of the EU and Member States.

In its Resolution on soil protection (April 2021) [174], the **Parliament** highlights the urgency to act on soils and specifically supports a Mission on soils under Horizon Europe.

The Mission is embedded in more than a dozen **Green Deal strategies.** Under each strategy or communication, the Mission is identified as an operational tool to pursue the EU's main policy objectives and targets. The **Farm to Fork Strategy** relies on R&I as one of the main pillars to enabling the transition to sustainable, healthy and inclusive food systems.



Strong synergies have been created between the Soil Mission and the **Common Agricultural Policy (CAP)**. As a result, **18 out of 28 national CAP Strategic Plans link up with the Soil Mission** and propose concrete measures and mechanisms for support, thereby leveraging substantial funds from one of the major EU policies to benefit soil and land management. Regular exchanges with Managing Authorities serve to discuss at operational level synergies between the Mission and the CAP. Particularly close cooperation exists with the European Innovation Partnership EIP AGRI [175], the CAP's major instrument for innovation and in-built links to EU R&I programmes.

The EU Soil Strategy and the Mission were developed in tandem. Having 2030 as a timeline, the Mission is a clear milestone in Europe's longer-term trajectory to achieving a healthy status of all soils by 2050, as implied by the Green Deal objectives. **With the upcoming Soil Law (SL), the role of the Mission Soil becomes even more pronounced.** It is clear that the success of the SL will rely to a large extent on the data and knowledge acquired as well as the actions undertaken under the Mission (e.g. soil monitoring and the testing and upscaling of sustainable practices for soil management)

[174] European Parliament resolution of 28 April 2021 on soil protection (2021/2548(RSP)) (europa.eu)

[175] Home | EIP-AGRI (europa.eu)

The **EU Biodiversity Strategy** refers to the Mission to "develop solutions for restoring soil health and functions". The Mission is referred under the **EU Strategy on Adaptation to Climate Change** to, e.g., propose nature-based solutions (NBS) for carbon removals or MRV in carbon farming. The **EU Forest Strategy for 2030** refers to the Mission as to support "sound and site-adapted forest and soils restoration" and "the evidence-based design and implementation of forest restoration strategies". The **EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil'** refers to the Mission as to promote the wide-spread uptake of sustainable practices to ensuring 75% of healthy soils by 2030. The **Action plan for the development of organic production in the EU** includes the Soil Mission contributing to a pilot network of climate positive organic holdings through the deployment of LL&LH.

The Communication on '**A long-term Vision for the EU's Rural Areas**' identifies the Mission as a flagship initiative to "tackle soil challenges in rural areas, but also in urban settings, building connections between rural and urban practices.". The **Communication on sustainable carbon cycles** refers to the Mission as to "create living labs that test and demonstrate practices for carbon farming across various locations in Europe". **Communication on Safeguarding food security and reinforcing the resilience of food systems** mentions the Mission as an instrument to safeguard soil fertility, as well as the **Communication on Ensuring the availability and affordability of fertilisers**. The Mission is, finally, recognized in the **European Year of Skills 2023** as an important element in the development of skills of land managers in relation to improving soil healthIn addition to mobilising CAP funds, MS have reported in the Horizon Europe Strategic Programme Committee **more than 200 national/regional actions contributing to the soil Mission with mirror groups, activities and additional funding**.

EU programmes **LIFE,** the partnerships **Circular Bioeconomy Europe, PRIMA** as well as the **EIC** have allocated resources to support the Mission.

As regards buy-in from within the private sector, discussions with philanthropic institutions are at an advanced stage as regards the co-design and coordination of activities and funding. In addition, the EIB is developing a pipeline for large scale soil investments in connection with InvestEU.

6.7.6 Citizens and stakeholder engagement

Citizens and stakeholder engagement is a major element of the Mission as it is key to achieving the Mission's goal and anchoring care for soils in society.

In the initial phase of the Mission, a **survey on citizens' perceptions** about soil related challenges received more than 2,500 replies with **80% respondents considering that soil health matters for the quality of their lives**. Further views of citizens on the Mission were gathered through dedicated engagement events across Europe. A business round table served to bring-in the view of the private sector as regards Mission priorities and R&I needs. Private sector dialogue is further pursued through the presentation of Mission Soil at events of businesses and networks such as the Soil Health Law Coalition and the Global Coalition for Soil Health.

As Mission implementation progresses, national info days are becoming a main vehicle to inform about opportunities to engage in Mission activities and obtain feedback from

stakeholders. Engagement with Member States is organised systematically including through the TRAMI project, the Soil Mission's national Mirror Groups and meetings with the Soil Mission Working Group of the HE Strategic Programme Committee.

Through the NATI00Ns project, the Mission is holding engagement sessions at national and regional levels in all Member States and Associated Countries to inform about the concept of LLs and enhance stakeholders' skills on how to set up a LL and ensure high quality proposals. Together with regional stakeholders, the project PREPSOIL [176] has identified "soil needs" in about 30 European regions as a basis for prioritising action under LLs.

The Mission is further engaging with **municipalities, regions, and related networks**, to mobilise a critical mass of land managers and other relevant actors. This includes regular exchanges with the Committee of the Regions, the European Regions Research Network and the Network of European Regions for Innovation in Agriculture, Food and Forestry. Furthermore, Mission project HUMUS [177] is co-creating with citizens and stakeholders **Territorial Management Agreements** in 33 regions to tackle soil challenges.

The recently launched Mission Soil Manifesto [178] has proven to be a highly effective tool for outreach and for mobilising individuals and institutions to support the Mission and its objectives.

6.7.7 Progress, achievements, and milestones

The implementation of the various building blocks of the Mission Soil is well on track, in line with the key milestones set out in the Mission Implementation Plan for the period 2021-2023.

The creation of a comprehensive portfolio of R&I actions amounting to a total funding of EUR 291 million is described in section 6.7.3 (The Mission's R&I content).

Activities have resulted in creating capacities for the Mission's implementation, notably through the set-up of the **Mission Soil Platform.** The Platform will host the Mission's website including the project hub and Mission dashboard. It is designed to become a one-stop shop for information on Mission activities, events and progress and will support the networking of Mission communities.

The JRC has been tasked to coordinate the Mission's activities on soil monitoring. The first version of the **EUSO dashboard went live in March 2023** and the validated indicators framework available through EUSO is expected by Q4/2024, together with the operational data flows from Mission projects and Members States towards EUSO.

A cluster of Mission projects is contributing to the **development of robust harmonised, reliable, cost-efficient soil health monitoring,** making use of artificial intelligence, remote sensing and Internet of Things and laying the ground for a **digital twin of soils as**

[176] https://prepsoil.eu/

[177] https://cordis.europa.eu/project/id/101091050

[178] The EU Mission Soil launches its Manifesto (europa.eu)

part of Destination Earth. Funded projects are also developing business models for soil health and methods for the **monitoring, reporting and verification of soil carbon removals.** These activities help generating **novel opportunities for diversification of farmers' income** (e.g. through carbon farming) and support industries in the creation of **soil friendly and climate neutral value chains**.

The delivery of **strategies and solutions for soil decontamination in urban and rural areas** is another important outcome of funded projects with significant potential for follow-up investments. This complements **work undertaken by the European Investment Bank to promote large-scale soil investments** (see section 6.7.8 'Current estimation of the budget').

As regards soil literacy and education, Mission projects are strengthening the **skills of soil advisors and promoting citizen science as well as soil education on soils** in schools and universities as a contribution to the **Education for Climate Coalition**.

The **first call for Living Labs has been launched** and will **kick-start 25-30 living labs in 2024**. A Specific Grant Agreement published in WP 2023 will give rise to a 'Living Lab Support Structure' that will be operational by 2024 to assist the growing network of LLs&LHs. The **Mission's Manifesto was launched on 18 April 2023** in Brussels at the premises of European Regions Research and Innovation Network (ERRIN). This was followed up by an event with the Committee of the Regions in Finland on 20 April 2023, and a campaign to mobilise signatories and supporters (such as private organisations, NGOs, schools, universities, as well as individuals). Only one week after its launch, the Manifesto had attracted about **600 signatories** out of which 100 are organisations (legal entities including regional authorities) and 500 individuals including Members of the European Parliament.

There has been a remarkable growth in soil health related communication and outreach. Since September 2019, the Mission has been presented and discussed in interactive formats at more than **300 events across Europe** and beyond at the initiative of the Commission, Mission Board members, Member States or stakeholders. For example, the Mission has been celebrating the World Soil Day with events and communication activities (e.g., videos, launch of publications, social media) and was presented e.g. at the Salon International de l'Agriculture (Paris) [(179)], the International Green Week Berlin [(180)], COP 27 [(181)] or BIOEAST [(182)]. The Mission has featured prominently in the EU Soil Observatory (EUSO) Stakeholder Forums of 2021 and 2022.

From 2023 onwards, an **annual European Soil Mission Fair** will be held to bring together the wider Soil Mission community. The first one will take place in November 2023 and will be hosted by the Spanish presidency.

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(179) http://www.salon-agriculture.com/

(180) http://gruenewoche.de/en/

(181) http://unfccc.int/cop27

(182) http://bioeast.eu

The **wide take up of the Mission in Member States** is a major success. **More than 200 initiatives** implementing the Mission goals have been reported by **22 Member States**. Nine Member States have created governance structures, i.e., structures which proactively address the coordination and implementation of the Mission objectives at national level. These 'mirror groups' put special emphasis on cross-cutting work, for example, involving different ministries.

At **global level**, the Mission is promoting international R&I cooperation (e.g. with Japan, US, Canada) and has become a flagship contribution of the EU to major initiatives including the Global Soil Partnership, the Global Coalition for Soil Health and the Aim for Climate initiative. At this year's Aim for Climate summit (8-10 May in Washington), the Mission Soil was highly visible thanks to a dedicated breakout session. Ministers and Vice-Ministers from Denmark, Ireland and the Netherlands actively participated in the session and highlighted the important role of the Mission for soil protection in the EU.

6.7.8 Current estimation of the budget

The Mission has a budget of **EUR 301 million for the period 2021-2023** coming from the overall Horizon Europe budget.

In addition, other parts of **Horizon Europe** contribute to the Mission goals and have been explicitly mentioned or crossed referenced in the respective annual work programmes. This includes the Partnership for Research and Innovation in the Mediterranean Area (**PRIMA**), the Circular Bio-based Europe Joint Undertaking (**CBE JU**) and the European Innovation Council (**EIC**), with a specific Accelerator Challenge than links up with the Mission in 2023. **EJP SOIL** is a European Joint Programme on agricultural soil management addressing key societal challenges including climate change and future food supply.

Other EU programmes and initiatives contribute to the Mission as well. The **LIFE** Programme, as the EU's funding instrument for the environment and climate action, finances projects that support soil ecosystem services, carbon farming and prepare soils for extreme weather events and combat desertification, thus contributing to the eight Mission objectives. Applicants are encouraged to develop synergies with the projects financed under the Horizon Europe programme, including the Mission "A Soil Deal for Europe".

There are strong **synergies between the Soil Mission and the CAP.** Under the current CAP (2023 – 2027 period), actions to improve soil health are expected to cover nearly 47,4% of EU's utilised agricultural area (UAA). A specific result indicator (R19 'UAA under supported commitments favourable to soil management to improve soil quality and biota') is used to measure CAP contribution to the improvement and protection of soils.

Through the integration of the Mission Soil in national CAP Strategic Plans, clear synergies are being established between the CAP funding and the Mission goals. In the CAP Strategic Plans [183], it is planned to set up around 6,500 **Operational Groups** under

[183] https://agriculture.ec.europa.eu/cap-my-country/cap-strategic-plans_en

the EU CAP Network, out of which at least **1,000 are expected to address soil management**, directly contributing to the Soil Mission and its objectives.

Table 11: Mapping of the instruments contributing to the Mission Soil objectives

Instrument	EU contribution (EUR million)
CAP 2023-2027 ([184])	50,574.9
CAP 2023-2027 - Operational Groups ([185])	350.0
Mission 'A Soil Deal for Europe' budget	301.0
Partnership for Research and Innovation in the Mediterranean Area (PRIMA) Work Programmes 2021-2023 [186]	153.4
Circular Bio-based Europe Joint Undertaking (CBE JU) Work Programmes 2022-2023 [187]	89.0
European Innovation Council (EIC) Work Programme 2023 [188]	65.0
European Joint Programme EJP SOIL Work Programmes 2020–2025 [189]	40.0
LIFE Programme 2021 ([190])	70.0
Horizon Europe Partnership on Agroecology and Research Infrastructures	
Digital Europe Programme: complementary funding to Soil Mission activities in relation to Destination Earth (planned for 2024 and/or 2025 depending on outputs of Mission projects)	30.0

[184] Initial estimation of CAP 2023-2027 contribution to Result Indicator RI19. A more targeted analysis will be conducted, focusing only on some practices which affect directly soil protection and management.

[185] https://ec.europa.eu/eip/agriculture/en/eip-agri-projects/projects/operational-groups.html

[186] PRIMA annual work plan for 2022 (https://prima-med.org/wp-content/uploads/2022/01/AWP22.pdf) and for 2023

[187] https://www.cbe.europa.eu/system/files/2023-03/CBE-JU-Annual-Work-Programme-Budget-2023.pdf

[188] https://eic.ec.europa.eu/system/files/2022-12/EIC%20Work%20Programme%202023_F%26T.pdf

[189] https://ejpsoil.eu/about-ejp-soil/news-events/item/artikel/horizon-europe-funding

[190] Estimated EU contribution to projects reporting on quantitative improvements in soil quality selected under LIFE 2021 calls. This amount does not include other projects that could address soil issues without having chosen to report on them. These amounts will be confirmed in 2024. Future estimates cannot be done due to the bottom-up approach of the programme.

Instrument	EU contribution (EUR million)
EAC/EACEA international actions (Erasmus Mundus Joint Masters [191], Capacity Building in Higher Education ([192]) and Jean Monnet actions) [193] (2020 – present)	63.0

Source: EFIS study

When it comes to **private sources**, the European Investment Bank (**EIB**) is carrying out a study to assess the demand and supply sides for private-sector investment in relation to soil health. The study (EUR 400,000) shall identify key market players addressing the problems of soil health and quantifying their investment needs. It shall also develop an actionable pipeline of 30 projects for potential investments in connection with InvestEU, of which 5-10 projects shall be immediately investable. The estimated amount of EIB financing that could be mobilised for the 5-10 actionable investment opportunities is EUR 35-75 million (total investment mobilised of EUR 70-150 million) spread over several years, assuming the EIB finances half the total project costs and based on a minimum EIB contribution per project of EUR 7.5 million.

The study will also assess what types of instruments (new or existing) can be deployed to bridge the funding gap in each of the relevant land-use types.

The Mission is establishing mechanisms of cooperation with **philanthropic organisations** to support healthy soils, some of which have announced complementary funding to the Mission.

(191) https://erasmus-plus.ec.europa.eu/opportunities/individuals/students/erasmus-mundus-joint-masters-scholarships

(192) https://erasmus-plus.ec.europa.eu/opportunities/organisations/cooperation-among-organisations-and-institutions/capacity-building-higher-education

(193) https://erasmus-plus.ec.europa.eu/opportunities/organisations/jean-monnet-actions-stimulating-teaching-and-research-on-the-european-union

II. Review of Mission Areas

1 OVERALL AIM OF THE REVIEW

As formulated in the Horizon Europe legal base (Article 11 of the Horizon Europe Regulation): "By 31 December 2023, the Commission shall carry out a **review of Annex VI** to this Regulation as part of the overall monitoring of the Programme, including Missions and institutionalised European partnerships established pursuant to Article 185 or 187 TFEU and present a report on the main findings to the European Parliament and to the Council".

The areas of possible Missions included in Annex VI of the Horizon Europe Regulation are as follows:

- Area 1: Adaptation to Climate Change, including Societal Transformation.
- Area 2: Cancer.
- Area 3: Health Oceans, Seas, Coastal and Inland Waters.
- Area 4: Climate-Neutral and Smart Cities.
- Area 5: Soil Health and Food.

The overall aim of the review of Mission Areas is to verify **whether the Mission Areas still address some of the major challenges faced by the EU** and, therefore, **to what extent each Mission Area is still relevant** given the developments in the research, innovation, environmental, economic and social landscapes.

The external study underpinning the review of Mission Areas

The five Mission Areas were analysed taking into account the current and future broad research and innovation (R&I), economic, social and environmental trends and factors. **An external contractor carried out a study** (EFIS; RTD/2022/SC/022)[194] **to provide evidence to help the Commission review the 5 five Mission Areas**.

The analysis of Mission Areas was based in particular on a literature review of academic journals, desk research covering technical (e.g., foresight, research and innovation analysis) studies, policy reports and grey literature as well as data analysis. In addition, views and opinions on the continuing relevance of the Mission Areas and trends impacting the Mission Areas were gathered through targeted interviews, an online survey and policy workshops. The publication of this study is foreseen for the summer 2023.
A detailed description of the methodology used for reviewing the Mission Areas is provided in Annex B.

[194] Study supporting the assessment of EU Missions, the review of Mission Areas and the analysis of EU Missions' portfolio of instruments and actions – RTD/2022/SC/022. Specific Contract under the Multiple Framework Contract N° 2018/RTD/A2/OP/PP-07001-2018.

2 MISSION AREA: ADAPTATION TO CLIMATE CHANGE, INCLUDING SOCIETAL TRANSFORMATION

2.1 Scope and definition of the Mission Area

"*Despite progress, adaptation gaps exist between current levels of adaptation and levels needed to respond to impacts and reduce climate risks. Most observed adaptation is fragmented, small in scale, incremental, sector-specific, designed to respond to current impacts or near-term risks, and focused more on planning rather than implementation*" (IPCC, 2022).

One of the five Mission Areas defined by the European co-legislators (see introduction) was defined as follows: 'Adaptation to climate change, including societal transformation'. In the Mission board proposal in 2020, the term 'societal transformation' was not retained. When the Mission was launched in September 2021, 'Adaptation to climate change' was chosen as official title of the Mission and recognised as more easily understandable and fit for communication purposes for its brevity and focus.

The Mission Area is anchored in a set of overarching EU policies:

- The need for adaptation is enshrined in the Paris Agreement, to which the EU is committed. Article 2.1 of the agreement sets the goal of increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and article 7 of sets a global goal of "enhancing adaptive capacity, strengthening resilience and reducing vulnerabilities to climate change" (UNFCCC, 2015).
- The Mission Area is in line with and legitimised by the second EU Adaptation Strategy (EC, 2021c) [(195)], updating the previous 2013 strategy, which is the EU strategy to which the Mission is most directly linked, with the European Green Deal as an overarching strategic umbrella (EC, 2019).
- Article 5 of the 2021 European Climate Law [(196)] foresees that "the relevant Union institutions and the Member States shall ensure continuous progress in enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in accordance with Article 7 of the Paris Agreement" and "Member States shall adopt and implement national adaptation strategies and plans, taking into consideration the Union strategy on adaptation to climate change and based on robust climate change and vulnerability analyses, progress assessments and indicators, and guided by the best available and most recent scientific evidence."

By focusing on a challenge that is highly timely and urgent for achieving the green transition of Europe, the Mission Area fits with the overall expectations set for EU Missions to "*support Europe's transformation into a greener, healthier, more inclusive*

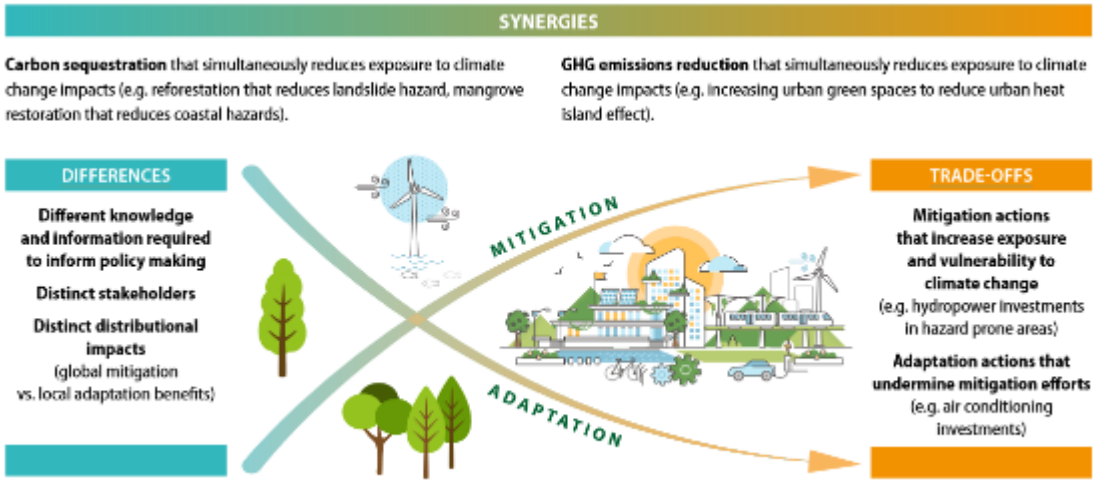
[(195)] Except for its component of international action.

[(196)] REGULATION (EU) 2021/1119 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999.

and resilient continent" by providing "*a new way to bring concrete solutions to some of our greatest challenges*" and "*bring tangible benefits to people in Europe and engage Europeans in their design, implementation and monitoring*" (EC, 2021c).

Adapting to the unavoidable impacts of climate change adaptation is needed at the same time as mitigating climate change. Both efforts are complementary and mutually reinforcing, as stated by all interviewees without exception, and as also clearly acknowledged by the IPCC (2022) and the above-mentioned EU strategies. **Adaptation and mitigation both contribute to addressing climate change challenges**, and even more so when synergies are built between the two, avoiding maladaptation (OECD, 2021)

Figure 15: Synergies between mitigation and adaptation to climate change



Source: OECD, 2021

Climate change adaptation and mitigation policies have been to a large extent separately addressed in the past: mitigation is chiefly about developing solutions to decarbonise all our activities, from transport to energy, while adaptation aims at finding solutions to maintain essential services and activities despite severe impacts of climate change on ecosystems, infrastructure and people. The type of R&I needs also differ. Under mitigation, the target is the development of technologies or new organisational models for the circular economy, the production of energy from green sources, etc. In contrast, under adaptation research efforts target e.g. the development of nature-based solutions to address coastal erosion or the development of new financial models for adaptation finance. Limiting climate change through mitigation action has global public good benefits with overall reductions of GHG at planetary level translating into a stabilising climate, while benefits from adaptation actions are mostly accrued locally, reducing loss and damages from floods or wildfires (Swart and Raes, 2007). This creates different needs and levels of coordinating action. The type of knowledge needed to inform adaptation and mitigation policies is also different. While mitigation policy is grounded in information on the source, type and amount of GHG generated by different economic activities, adaptation measures are determined by the estimated scale of local climate change impacts.

Yet, **there are synergies between adaptation and mitigation efforts that can help to achieve climate resilience more effectively**. Forest or mangrove restorations, for example, create an opportunity to increase carbon storage capacity, while also contributing

to reduce weather-related risks, such as landslides or coastal storm surges. Identifying these opportunities can lead to better understanding and avoiding trade-offs and to developing policy measures that are mutually reinforcing (OECD, 2021).

Building closer linkages between mitigation and adaptation efforts is advocated both by IPCC and OECD:

Defining the Mission scope

Working on the mandate given by EU authorities, the Mission board proposed a Mission with the following title: "a Climate Resilient Europe: Prepare Europe for climate disruptions and accelerate the transformation to a climate resilient and just Europe by 2030" (EC, 2020).

The Mission board based its work on a multiplicity of sources of evidence, notably from IPCC and EEA. A foresight report was prepared for this Mission Area and involved interactions with the Mission board and other experts, scenario building exercises and an analysis of relevant projects relevant for the topic of adaptation to climate change (EC, 2021b). The foresight exercise addressed the areas of risk management, financial risk protection, social infrastructure, health, water, food/agriculture, and ecosystems. In addition, the Mission board members met with a variety of stakeholders in 2019 and 2020, which nurtured the Mission board proposal.

Three key orientations, which are in line with findings of recent research, were considered in the proposal of the Mission board:

1. Adapting to climate change is a complex and pervasive challenge requiring a systemic approach;
2. A territorial cohesion dimension needs to be at the forefront of adapting to climate change;
3. Attention and efforts towards climate change adaptation need to be stepped up drastically emphasising the costs of non-action.

The Mission board proposal proposed that the "*Mission employs an **integrated and systemic approach to risk management and resilience building**, moving away from piecemeal sectorial and linear cause-effect-solution focus*" (EC, 2020).

In consequence **the Mission scope definition rightly emphasises the interlinkages between systems for which 'transformative pathways' will need to be developed**.

This scope is put in perspective with the systems identified for climate change adaptation by other global studies.

Table 12: Comparison of the systems identified by the EU Mission board (2020) and other international frameworks

EU Mission Board for Adaptation to Climate Change, including Societal Transformation (EC, 2020)	Regions Adapt initiative ([197])	Intergovernmental Panel on Climate Change (IPCC, 2022)	Global Commission on Adaptation (GCA, 2019)	OECD work on climate change adaptation (OECD, 2022)
Regenerating community and social infrastructure	Infrastructure (including transport and energy) and territorial planning; economic impacts and opportunities; social adaptation and impacts	Cities, settlements and key infrastructure	Cities and urban areas; infrastructure; finance	Infrastructure
Protecting human health and wellbeing	Resilience and disaster risk reduction	Health, wellbeing and the changing structure of communities; poverty, livelihoods and sustainable development	Disaster risk management	Development co-operation; losses and damages from climate change
Restoring nature, biodiversity and ecosystems services	Forestry, protected areas and biodiversity	Terrestrial and freshwater ecosystems and their services; oceans and coastal ecosystems and their services	Natural environment	Biodiversity; nature-based solutions for climate resilience
Rethinking water management	Water resources and management	Water	Water	Water - sea level rise and coastal climate risks
Reviving landscapes and sustainable food systems	Agriculture and zootechnics	Food, fibre and other ecosystem products	Food security	Agriculture

Source: external study team based on cited references

A comparison between the enabling conditions of the EU Mission and those identified by the IPCC (IPCC, 2022) underlines that the EU Mission places an emphasis on the same enabling conditions as the IPCC, but also identifies the need to: strengthen education, communication and have a better understanding of behavioural change; strengthen sustainable and circular local economies.

The Mission board's proposal places an emphasis on the **diversity in level of vulnerability, type of climate risks, response capacity and level of preparedness across territories** in Europe. The overall Mission board approach is to **support a balanced improvement in resilience 'leaving no territory behind', thus incorporating the 'just' dimension in the overall vision** for the Mission. The proposal includes the idea of "*a twinning mechanism bringing together innovation leaders and more modest performers"* (EC, 2020). The understanding that climate change impacts are crossing

[197] https://regions4.org

borders also justifies an inclusive approach, i.e. one that is not limited to the creation of a few 'islands of excellence on adaptation' in Europe.

In addition, social justice is also included in the Mission's scope. This is consistent with findings about the state-of-the-art in adaptation policies in Europe: "*the social justice aspects of adaptation are not yet integrated in the reporting of all countries. However, these increasingly important aspects aim to address the uneven distribution of climate risks, which affect vulnerable groups the most. More positively vulnerable groups have a role in developing national and regional adaptation policies in several countries and are involved in the prioritising of adaptation measures*" (EEA, 2022).

The Mission proposal starts from the premise that **long-term benefits will outweigh the immediate costs of investments in climate change adaptation**, and that adaptation strategies and solutions have not received the attention they deserve until recently. The role of R&I in addressing the challenges faced by regions and local communities

Regions and local communities face multiple challenges to address adaptation to climate change: understanding the current status and projections of the impacts of climate change for their territories; identifying what is required to become resilient; identifying transformative solutions; overcoming the barriers for long-term adaptation pathways and assessing achievements. Research and innovation can contribute to address all these challenges.

Scientific and research efforts are needed to produce new robust evidence as well as solutions and approaches tailored to the needs of regional and local authorities. "*data that are specific to local context, scenario modelling, decision making tools (for instance evaluating which option is the best approach) and robust datasets spanning longer time periods. The importance of local data for local authorities is a key theme with many noting that data is often not specific to the region and downscaling national data is not easy or even possible*" (Gancheva *et al.,* 2020).

To date, scientific research efforts have mainly adopted sector-specific or region-specific approaches. The literature analysis shows great emphasis on the adoption of a technology-based approach not just to addressing climate change mitigation but also to help communities in adapting to climate change and adjust to rapidly changing climatic conditions (IPCC, 2018). However, the limit of existing studies on adaptation to climate change is that they predominantly focus on specific regions or sectors or climate risks (e.g. draughts) (Ferreira *et al*., 2020), paying insufficient attention to heterogeneity across Europe. There is insufficient understanding of the indirect and spill-over effects of climate change across different sectors (Gancheva *et al.,* 2020).

As important as new knowledge on current and future climate change, risks and impacts, is the **knowledge about costs and benefits from investing in climate change adaptation measures.** On both fronts - measuring costs and measuring benefits - a lot of methodological issues remain unsolved, e.g. the identification of 'adaptation-relevant' investments and the distinction between nature- and man-driven climate hazards, and these are compounded by the high level of uncertainty on evolutions in climate change and intensity and effectiveness of mitigation efforts.

Current methods for monitoring and evaluating climate change adaptation use a variety of indicators ranging from climate parameters, the impacts of climate change, vulnerability

to climate change, progress made in implementing actions and, more rarely, estimations of the capacity to respond to a given impact. To date, **no standardised approach to describe climate resilience** has emerged. This leads to difficulties in communicating simply about the impact of climate change adaptation policies and the progress they have been able to bring.

The external study underpinning the review of the Mission Areas concludes that the identification of climate change adaptation as a Mission Area is timely and responds to a huge gap in knowledge necessary to respond to the societal challenge it addresses at regional and local levels.

2.2 Developments influencing the Mission Area

Analysis shows that the Mission Area is broad enough to cover needs and adjust to new/emerging or previously unforeseen/identified factors or trends that are or are likely to impact this Mission Area.

Table 13: Identified main factors or trends influencing the Mission Area

Type of factor/trend	Short summary of the expected impact of the factor/trend
Frequency and severity of occurrence of extreme climatic events **Occurrence of new hazards due to combination and cascading effects of multiple risks**	"*Widespread, pervasive impacts to ecosystems, people, settlements, and infrastructure have resulted from observed increases in the frequency and intensity of climate and weather extremes, including hot extremes on land and in the ocean, heavy precipitation events, drought and fire weather (high confidence). Increasingly since AR5, these observed impacts have been attributed to human-induced climate change particularly through increased frequency and severity of extreme events*." (IPCC, 2022) "*Climate change impacts and risks are becoming increasingly complex and more difficult to manage. Multiple climate hazards will occur simultaneously, and multiple climatic and non-climatic risks will interact, resulting in compounding overall risk and risks cascading across sectors and regions. Some responses to climate change result in new impacts and risks*." (IPCC, 2022)
Extent and effectiveness of climate mitigation efforts and impacts	If mitigation efforts are insufficient, systems and territories will have reached hard limits, i.e. points where adaptation efforts are not effective anymore. "*Soft limits to some human adaptation have been reached, but can be overcome by addressing a range of constraints, primarily financial, governance, institutional and policy constraints (high confidence). Hard limits to adaptation have been reached in some ecosystems (high confidence). With increasing global warming, losses and damages will increase and additional human and natural systems will reach adaptation limits (high confidence)*." (IPCC, 2022)
Regulations covering mainstreaming adaptation in sectoral policies	Strengthening regulations to incorporate adaptation in infrastructure planning, disaster emergency management procedures, health system configurations, etc. can reveal new needs in terms of research and innovation and support faster and deeper Mission delivery.

Source: external study team

2.3 Key conclusions from the external review of the Mission Area

There is a large convergence of views, both from the stakeholders consulted as part of the external study and from literature review, to indicate that **the Mission Area is fit for purpose and likely to stand the test of time.** This is due, in particular, to the Mission Area's broad and flexible coverage of key community systems and enabling conditions for resilience. Climate change adaptation is a relatively newer subject than climate change mitigation. This makes the Mission Area, as such, timely and welcome: it should help push adaptation to the top of policy agendas, in particular of sub-national authorities.

The definition of the Mission Area is fit for purpose and likely to stand the test of time due to its broad and flexible coverage of key community systems and enabling conditions for resilience. The subject of climate change adaptation being a relatively newer subject than climate change mitigation makes the Mission Area relevant and timely.

The Mission Area requires the creation and diffusion of a lot of new knowledge, highlighting **a clear role for R&I to support transformational adaptation, key for the Mission's success**. Strong R&I efforts are needed to produce, for instance: better evidence on territorial climate risk profiles and vulnerabilities, impacts of climate-induced hazards, including complex and cascaded impacts; new knowledge and methods on measuring resilience as a positive feature (beyond measuring vulnerability only); research and innovation activities on new adaptation solutions and models within and across various ecosystems; research and development of suitable models and mechanisms for adaptation finance; inputs from social and political science on effective and inclusive governance models for adaptation opening room for wide participation including citizens, etc. These research and innovation efforts require transdisciplinary approaches.

Processes such as regenerative sustainability and regenerative design could be further explored to bring new insights on how adaptation and mitigation strategies and interventions can give back to nature more than they take from it, enhance rather than deplete biodiversity, incentivise the restoration and expansion of nature. This also requires considering how contexts and environments influence worldviews, paradigms, and behaviours, hence looking at the scale of an ecosystem. The success and the speed of climate adaptation efforts depends on a combination of aspects which go beyond the environmental sustainability and functionality of the R&I solutions proposed. Social acceptance (including aesthetics) and affordability are also key for innovations to be taken up by society at all levels.

3 MISSION AREA: CANCER

Cancer is a growing challenge for Europe for several reasons [198]. Cancer is the second leading cause of death in Europe after cardiovascular diseases and the first cause of death

[198] https://cancer-code-europe.iarc.fr/index.php/en/about-cancer/what-causes-cancer and https://gco.iarc.fr

by disease in children older than one year. With less than 10% of the world's population, Europe nevertheless has roughly a quarter of all cancer cases (Bray et al, 2018).

In 2020, there were almost 4 million new cases in Europe and 2 million deaths (A *Lancet* Oncology Commission, 2022). For 2022, the World Health Organisation estimated the number of new cases in Europe to be about 4.4 million (or 22.8% of the global number of cancer cases) and the number of deaths at about 2 million (or roughly 20% of the global deaths from cancer) ([199]). On an annual level in the EU-27 1.2 million people die of cancer, almost 2.6 million people are diagnosed with cancer and the number of cancer cases will increase by 25% by 2035 if things stay unchanged in this area (EC, DG RTD 2020). Although there is a slight reduction in mortality due to screening campaigns and improved diagnostics and treatment, the number of diagnosed cases is still increasing.

3.1 Scope and definition of the Mission Area

The last century has seen Europeans living longer and healthier lives, thanks also to big advances in medical treatment. However, Europeans are disproportionately affected by cancer, [200] which apart from wrecking lives and families, places a major pressure on national health systems. As a term 'cancer' covers more than 200 diseases linked to the uncontrolled growth and spread of abnormal body cells that divide uncontrollably and have the ability to infiltrate and destroy normal body tissue.

The discussions around cancer as a potential focus area in the EU started already during Carlos Moedas' term as Commissioner for Research, Innovation and Science (2014-2019). In 2019, as part of the election campaign the Chairman of the EPP group [201], Manfred Weber, proposed a "European Masterplan to join our forces to fight against cancer". As a response to this call, the European Commission President Ursula von der Leyen announced a "European Plan to fight cancer to support Member States in improving cancer control and care" as a key component of her political guidelines 2019-2024. At the World Health Summit 2020 Ursula von der Leyen called for a stronger European Health Union. [202] This was different to what the previous presidents of the European Commission talked about referring to health as a national topic. The COVID-19 pandemic showed that collaboration in addressing a major health problem is essential. In parallel Ursula von der Leyen tasked Stella Kyriakides, the Health and Food Safety Commissioner, to develop an ambitious plan for cancer. Recognising the increasing number of cancer cases in Europe and the importance of care, the EU developed the Europe's Beating Cancer Plan and the EU

[199] WHO, International Agency for Research on Cancer. The global cancer observatory.

[200] See: https://joint-research-centre.ec.europa.eu/jrc-news/cancer-europe-5-things-data-tells-us-2022-01-13_en

[201] The EPP Group is the largest group in the European Parliament.

[202] https://ec.europa.eu/commission/presscorner/detail/en/speech_20_1983

Cancer Mission . The Mission Area itself as defined in the regulation of Horizon Europe (2021) [203] was called 'cancer'.

Although no information is publicly available about how the Mission Area was scoped prior to its inclusion in the Horizon Europe Regulation and what evidence and methods were used to define the Mission Area, the choice of cancer as a Mission Area seems relatively logical. **Cancer is a growing challenge for Europe** (EC, DG RTD 2020) due to various causes. ([204]) **Cancer is the second leading cause of death in Europe** after cardiovascular diseases and the first cause of death by disease in children older than one year. Moreover, **cancer is the leading cause of male deaths in an increasing number of Member States**.

3.2 The role of R&I in addressing the challenges

As stated in the recent Science, research and innovation performance (SRIP) report: "*R&I have the potential to produce novel solutions in areas like health, …*" (EC, DG RTD 2022). Research and innovation (R&I) play a fundamental role in addressing the challenges linked to cancer and along the whole cancer control pathway, from prevention to end-of-life care or survivorship, and for improving cancer outcomes.

Within the topic of **understanding cancer**, Europe (i.e. larger than just the EU27) is a global leader in cancer discovery science with strength lying in molecular, cellular and structural cancer biology; modelling; diagnostic and early detection; new medical technologies and personalised treatments; precision oncology; vaccines, immunotherapies, and drug- antibody conjugates; and paradigmatic shifts in neoadjuvant therapy, especially for immunotherapy (The *Lancet* Oncology Commission, 2022). This strength can be used further to investigate certain types of cancer (e.g. lung cancer) which are researched less compared to other types and relative to its disease burden. In the topic of **prevention**, it is well known that many cases of cancer and of particular type of cancer can be prevented, yet cancer prevention research did not have sufficient research funding given its potential role in cancer control (Toumazis et al. 2021). When it comes to **treatment**, survivorship is still far higher in northern and western countries. Even within countries access to care is not equal and a 'postcode lottery' to accessing the best care is present (The *Lancet* Oncology Commission, 2022). Moreover, the ability to convert research discovery into therapeutic innovation is struggling within the constraints of regulatory, implementation and scale-up challenges (Aggarwal et al., 2022). Finally, on the **access to cancer control and care**, research can / does play and important role too. There are geographical disparities across and within the European countries in access to and delivery of optimal cancer control.

[203] 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

[204] See: https://cancer-code-europe.iarc.fr/index.php/en/about-cancer/what-causes-cancer and https://gco.iarc.fr

The EU has long prioritised investments in cancer research in order to improve quality of life. Yet, **observations from the literature** analysed in the context of the external study (underpinning the review of Mission Areas and the assessment of EU Missions) **suggest that a Mission in the area of cancer is very much needed**. European programmes supporting R&I, such as Horizon Europe, are rooted in the approach of building a critical mass of research 'champions' in given fields (e.g. medicine or pharmaceuticals) to increase the potential outcomes of research efforts and the returns of public efforts. Yet, for some time, and more recently in the specific case of cancer research (Rekers & Hansen, 2015, Smye and Gatenby, 2022, Rezaei, 2023), the research community has emphasised the need for more interdisciplinarity in research intensive fields, such as cancer, and for greater emphasis on the geographical dimension of collaborations.

In this respect, it is a shared opinion in recent literature that inequity of R&D activity differs across R&D stages and between rare and non-rare cancers, with a disproportionate focus on low-need non-rare cancers (Barrenho et al., 2022). Disparities in cancer research areas and care are found also across different ethnic groups and income levels (Brown et al., 2014; Lor, 2018; Rubino et al., 2022; Kalarivayil and Desai, 2020).

Another relevant issue in the literature concerns the **need to increase health policy research**. Cancer and in general all non-communicable diseases (NCDs) represent the major cause of death in Europe. It, thus, increasingly becomes connected to and affects many other aspects of human life and, therefore, calls for changes in health policy (Wepner & Giesecke, 2018). R&I funding priorities can have a drastic impact on extending human life. However, contrasting cancer and other NCDs will require intervention in other societal fields, with different timelines and what could work today (e.g. nutrition and cancer) might require further intervention in the future. In this respect, some researchers underline the fundamental necessity to match technoscientific aspects to socio-economic and cultural changes to achieve these goals. In addition, the '**Data Governance Act**', creates a trustworthy framework, in which data can be safely shared ("donated"), accessed, used and reused for altruistic purposes such as scientific research.

Screening and prevention remain important challenges in controlling cancer in Europe (Reihani et al., 2021). The need for better communication extends far beyond R&I on cancer, demanding better information on – as well as research – into the effects of environmental regulations (e.g. on the impact of chemicals on health) and a better involvement of research institutions in scientific communication (Kourany & Fernández Pinto, 2018).

Finally, striving to reduce the burden of cancer and increase opportunities in its successful prevention, treatment and care, requires well-functioning and resilient health care systems in different countries. Recent events (COVID-19, the Russian invasion of Ukraine) provide example of the fragility of health care systems that can come under pressure from external or unexpected events. R&I can be of assistance here too investigating effects of the catastrophic events on the health care systems, changes needed to be introduced in the system not only in terms of care but also prevention and looking into innovative approaches.

Table 14 below sums up some expected contributions of R&I to addressing the Mission Area challenges.

Table 14: Expected contribution of R&I to addressing the Mission Area challenges

Specific challenges	Expected contribution of R&I
Prevention, e.g. implementation of the screening regulations	e.g. understanding human behaviour when it comes to prevention
Need or emergence of new treatment protocols and methods	e.g. academic-led clinical trials, translation of research into clinical practice, new therapeutics
Guaranteeing good quality of life for cancer survivors	e.g. understanding and addressing physical, psychosocial, financial needs of cancer survivors
Geographical disparities across and within the European countries in access to and delivery of optimal cancer control	e.g. cancer research strength at the moment are not evenly distributed across the countries and do not always align with the cancer priorities of individual countries.
Catastrophic events affecting the resilience of the health system	e.g. understand the effects of the catastrophic events, finding solution to be able to prepare for them

Source: external study team

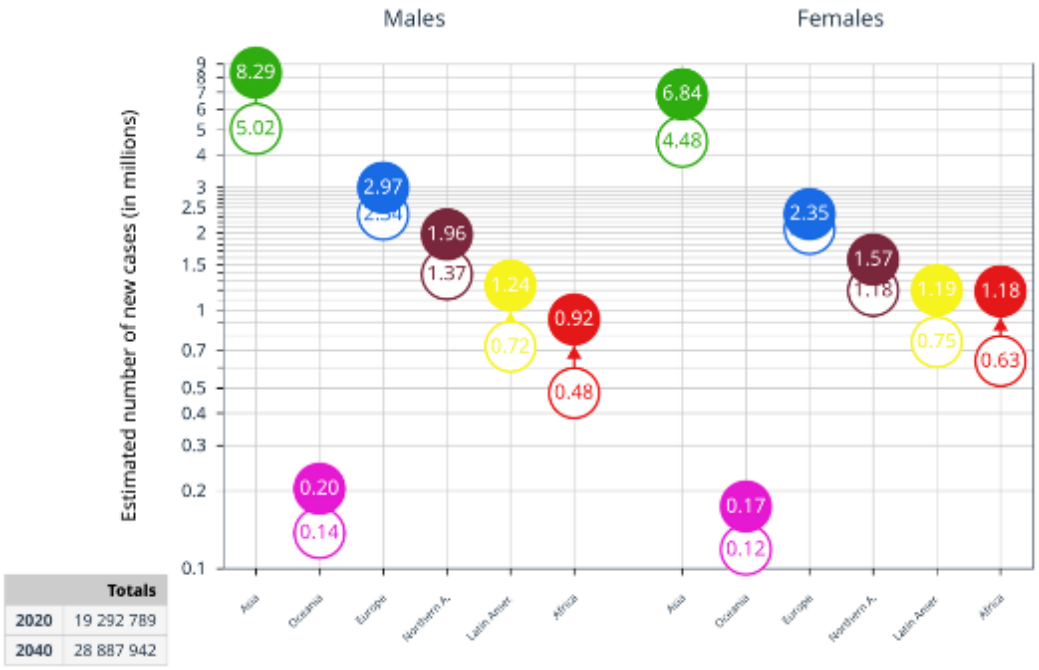
3.3 Developments influencing the Mission Area

While it has only been a few years since the Mission Area was defined, **the importance of cancer as a Mission Area is unlikely to change**. The way to assess this is by looking at the changes and forecasts for statistics around cancer as well as at developments in the societal challenges the Mission Area relates to. For the former the WHO data is solid foundation; for the latter the EUROSTAT dashboard that monitors progress towards the SDG targets the EU has set can be used as a proxy.

While it has only been a few years since the Mission Area was defined in 2018, the importance of cancer as a Mission Area is unlikely to change. One way to assess this is by looking at the changes and forecasts for statistics around cancer as well as at developments in the societal challenges the Mission Area relates to. For the former the WHO data is a solid foundation; for the latter the EUROSTAT dashboard that monitors progress towards the SDG targets the EU has set can be used as a proxy.

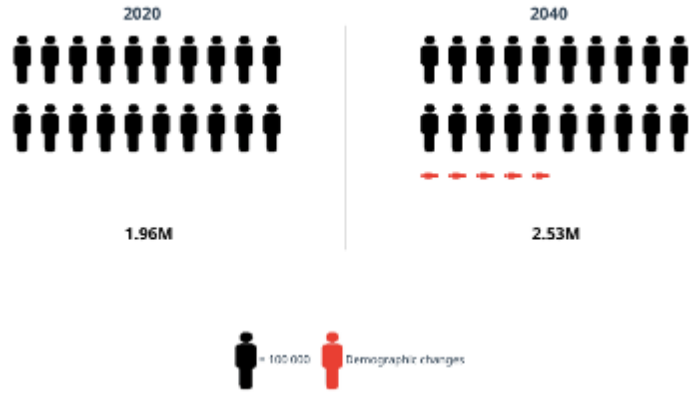
Cases of cancer are predicted to still increase in Europe. WHO predicts that the number of new cancer cases will be 5.32 million by 2040 (or 21% increase compared to the 2020 position) and the number of deaths will increase by 0.6 million to 2.53 million deaths.

Figure 16: Estimated number of new cases from 2020 to 2040, Males and Females, age [0-85+]



Source: Cancer Tomorrow |IARC, data version: 2020

Figure 17: Estimated number of deaths in Europe from 2020 to 2040, both sexes, age [0-85+]



Source: Cancer Tomorrow |IARC, data version: 2020

The major causes of cancer are not yet fully overcome. Although smoking in Europe is being dealt with quite successfully, another major cause of cancer, such as obesity, is still likely to be as critical as today. According to the EU progress towards the Sustainable Development Goals (SDGs) and Goal 3" To ensure healthy lives and promote well-being for all at all ages" the EU is moving away from the target on obesity rate. Obesity is both an NCD and a fundamental driver of many other diseases (e.g., type 2 diabetes and cancer).

Progress towards other SDGs is also important for Cancer Mission, SDG 6 "Ensure availability and sustainable management of water and sanitation for all", SDG 13 "Take urgent action to combat climate change and its impacts".

There are also **several other concerning developments** – unforeseen but rather catastrophic – **contribute to the sustained relevance of the cancer Mission Area**. For example, the **COVID-19** (SARS-COV-2) pandemic put significant pressure on the national health systems and further crystalised the cancer situation. According to the

collected evidence, during the pandemic, about 1 million cancer diagnoses might have been missed (Lawler & Crul, 2022).

Table 15: Identified factors or possible trends influencing the Mission Area

Type of factor/trend	Short summary of the expected impact of the factor/trend
Economic: workforce crises, need for competence development	If insufficient workforce available in prevention, health care, and nursing, this will create bottlenecks in cancer treatment and care and could potentially increase cancer cases
Geopolitical: refugees crises due to wars and climate change	Increasing pressure on the healthcare systems of the countries accepting refugees. Equality of access to care and treatment will become higher on the health agenda.
Policy: the need to share data and opportunities offered by the European Health Data Space (EHDS)	Potential positive effect on cancer research and treatment. Individual having control over their health data could support them in seeking faster cancer treatment across the border.
Policy: the possibility to share data for altruistic purposes in the Data Governance Act	Positive effect on cancer research and treatments thank to altruistic data sharing for purposes of general interest
Policy: new directive from EMA regulating clinical trials, new directive on medical devices	Potential to influence the speed of introduction of medical innovation to market / healthcare system. This in its turn will improve cancer diagnostics and treatment
Scientific: cancer becoming more and more a chronic disease	Reforms in the health and care system might be needed to cope with the long-term nature of the disease. Quality of Life will become higher on the agenda.
Social: major needs for quality of life and survivorship (e.g. tertiary prevention)	Reforms in the care system might be needed.
Technological: use of AI/machine learning cancer diagnostics, radiology, new technologies for screening	Cancer cases identified faster, thus increasing the likelihood of survivorship. AI-driven imaging help improve consistency and reduce workload. Screening in itself could contribute to changing people's attitudes towards cancer and becoming more active in prevention.

Source: external study team

3.4 Key conclusions from the external review of the Mission Area

Pressures to deal with cancer are not going away, as almost all the identifies factors point in this direction. Some factors, of course, will affect positively the cancer area, such as, for example, technological development around application of AI for cancer diagnostics. Generally, it is regarded **as unlikely that scientific and technological breakthroughs will, in the near future, make the Mission Area less relevant**. This has to do with two fundamental aspects.

When discussing 'cancer' as a focus area for a Mission it is first important to keep in mind that the key discoveries in the 1980s brought the breakthrough in understanding cancerous process as occurring at the molecular level. This transition means that cancer is not viewed

any longer as one organ-based disease, one diagnostic procedure and one treatment all in the same hospital but a combination of diagnostic approaches, medical interventions and with several therapeutic modalities. This also means that participations of experts from more than one hospital or healthcare services is needed. As more types of cancer are being identified this calls for new research into the understanding of cancer and finding suitable diagnostics and treatment methods.

Second, what is critical is the cancer care pathway – from prevention to care – which regardless of the disease has the same elements. **It is crucial to tackle cancer systematically from prevention to survivorship and quality of life, which implies activities should span much wider and beyond just R&I**. Emerging technologies might bring solutions to different elements of the cancer care pathway, but they will not solve them all. This will then need further decisions and solutions on what to do with these cases and how the treatment and/or care parts of the pathway need to be adjusted. Translation research might lead to new and more powerful treatment options. This could influence the recovery and survivorship, which in their turn might need to be adjusted. To take new scientific and technological solutions as well as new care protocols into practice require specialists, not only cancer diagnostics and treatment specialists but also, for example, psychologists, care workers etc. This requires education, training and career development and **can be achieved by addressing the topic through a Mission-oriented approach.**

This multiplicity of meaning behind one word 'cancer' does show that **there is sufficient flexibility built into the Mission Area definition**. The Mission Area is defined in a focused manner but yet wide enough (i.e. cancer is not one disease but a multiple disease, the pathway of the disease has multiple elements). Scoping as well as development in the disease make it unlikely that the Mission Area will become irrelevant.

4 MISSION AREA: HEALTHY OCEANS, SEAS, COASTAL AND INLAND WATERS

Oceans cover 71% of the surface of the globe. They produce over 50% of the oxygen in the air we breathe and absorb approximately 30% of the CO2 and 93% of the excess heat generated by human activity. Oceans are a major global climate regulator, dominating the planetary carbon, water and heat budgets: oceans and waters influence climate and weather patterns, provide us with food and lay the foundations for an important part of the world's economy – being of vital importance for the whole living world.

The hydrosphere is, however, seriously endangered. The state of the marine ecosystem and the quality of its services are heavily dependent on the environmental, physical and biogeochemical condition of seawater. These are in turn highly affected by the multiple stressors, both water-based and land-based, of anthropogenic origin. As a result of unsustainable GHGs emissions, emission of pollutants of various sources in the water sphere and the overexploitation of biological resources and natural ecosystems, the hydrosphere has warmed, become more acidic, less oxygenated, poorer in biological resources and less able to provide services to the human populations, in terms of food availability, of resilience to extreme weather conditions and even of tourism, ultimately affecting human well-being.

After a process of policy debates at European and national level, inspired by the work of Mariana Mazzucato (European Commission, 2018), the European Commission proposed

five broad Mission Areas in autumn 2018, aligned with the principles of a Mission-oriented policy that calls for a novel systemic intervention. including 'healthy oceans, seas, coastal and inland waters'.

4.1 Scope and definition of the Mission Area

After a process of policy debates at European and national level, inspired by the work of Mariana Mazzucato (European Commission, 2018), in 2019, the European Council and European Parliament proposed five broad Mission Areas, including '***healthy oceans, seas, coastal and inland waters***', aligned with the principles of a Mission-oriented policy that calls for a novel systemic intervention.

The EU Mission Area of "healthy oceans, seas, coastal and inland waters" provides a frame for **a Mission that focuses on defining the challenges and scoping actions to achieve cleaner, healthier, and more resilient aquatic environments**, related to the marine and freshwater ecosystems within the European Union, ensuring their sustainable use and protection. **The Mission Area is also aligned with the broader goals of the European Green Deal and the EU Biodiversity Strategy for 2030**. The aim is to contribute to the conservation and sustainable use of aquatic resources, promote ecosystem health and resilience, and ensure the long-term well-being of European aquatic environments and the communities that depend on them.

4.2 The role of R&I in addressing the challenges

The Mission Area of healthy oceans, seas, coastal and inland waters is a multidimensional space influenced by very varied external factors, such as environmental conditions, ecological stressors, societal approaches, political governance, and management. The area of ocean, seas, and coastal and inland waters requires urgent and continuous policy attention, including in the context of R&I actions.

Table 16: Specific challenges addressed by the Mission Area

Specific challenges addressed	Evidence for the specific challenge
Changes in the physical conditions of ocean and seas	• The ocean has warmed unabated since 1970 and has taken up more than 90% of the excess heat in the climate system • Since 1993, the rate of ocean warming has more than doubled • Sea surface temperature yearly warming trends for the European regional seas range from 0.03 to 0.07°C (uncertainty range is less than 10%) • The warming trends, between 1993 and 2017, are evident both in the upper oceanic layer (0-700 m) and middle layer (700-2000 m), and projected to continue to warm in the long-term (by 2100), increasing at a rate of 0.9 ±0.1 Wm-2 in the upper (0-700m) and of 1.2 ±0.1 Wm-2 integrating depth to 2000 m • Sea level continues to rise at a rate of 3.2 ± 0.4 mm year−1. As the ocean warms, its volume expands (thermosteric effect), which is a major cause of global mean sea level rise. The upper ocean (0–700 m) thermosteric sea level has been rising since 1993 at a rate of 1.4 ± 0.1 mm per year

Specific challenges addressed	Evidence for the specific challenge
	• Since 1993, the ocean is losing a sea ice extent of nearly 770,000 km2 per decade, in the northern hemisphere, while the sea ice extent in the southern hemisphere is increasing by 80,000 km2 per decade • Marine heat-waves have doubled in frequency, since 1982, and are increasing in intensity
Changes in the biogeochemical conditions of ocean and seas	• The ocean has taken up between 20-30% of total anthropogenic carbon since the 1980s, a major cause of ocean de-alkalinisation (i.e.: acidification). Open ocean surface pH has declined by a range of 0.017 to 0.027 pH units per decade since the late 1980s • Over the past 30 years, 26% increase in ocean acidity from pre-industrial times is registered, threatening marine life and hampering the ocean's role in moderating climate change • The Ocean is losing oxygen, overall, with a loss between 0.5-3.3%, between 1970 and 2010, from the surface to 1000m with an expansion of the oxygen minimum zones by 3-8%. Primarily this is due to changing ocean stratification, ventilation and biogeochemistry, which reinforce the smaller contribution due to warming-induced reduced solubility of oxygen in seawater • Chlorophyll-a, the main photosynthetic pigment contained in all phytoplankton, has shown increasing and decreasing trends over the past 19 years (1998-2017). At global scale, chlorophyll-a has been increasing by 0.6± 0.01% per year. The increase of phytoplankton biomass is related both to direct physiological alterations and indirect changing water column stratification and resource availability, mainly nutrients and light. Variability of this phenomenon exists, with regions where this trend has an opposite sign, i.e. Chl-a concentration is decreasing • The extent of marine protected areas has doubled since 2010 • The proportion of marine fish stocks that are within biologically sustainable levels declined from 90% in 1974 to 67% in 2015
Changes in freshwater systems	• Changes in landscapes, growth in food and energy production and the movement of people into urban areas alter the quantity and quality of our freshwater resources. • Hydro-morphological pressures, diffuse pollution and water abstraction have impaired freshwater ecosystems and are reducing the amount of runoff water that reaches the world's oceans. • New infrastructure disrupts the natural flow of rivers and the condition of lakes, while in many places, the level of groundwater is falling and lakes are drying up. • Today, 65% of global rivers are considered as being under moderate-to- high threat in terms of human water security and biodiversity. Since the beginning of the twentieth century, more than 800.000 dams have been built to facilitate increased withdrawals, and currently 75% of the main rivers are fragmented. Some large river basins have seen their flow reduced by almost 75% over 30 years due to increasing water extraction. • The flows of many rivers are not sufficient to sustain the deltas, the consequences are losses in fish biomass and biodiversity, as well as coastal erosion due to a great decrease of sediment load.
Changes in the socio-economic conditions	• In 2017, atmospheric CO2 concentrations reached 405.5 PPM, representing 146% of pre-industrial levels. To limit global warming to 1.5°C means that global carbon

Specific challenges addressed	Evidence for the specific challenge
	emissions need to fall by a 45% by 2030 from 2010 levels and achieve net zero emissions by 2050. ● From 1998 to 2017, climate-related disasters around the world accounted for 77% of the nearly $3 trillion in direct economic losses from disasters, claiming an estimated 1.3 million lives. The biggest challenges are investment in disaster-risk reduction for resilience and promoting policy coherence between the SDGs and climate change. ● From 2013–2014 to 2015–2016 a 17% increase in global climate finance is observed, still relatively small in relation to the scale of the problem. Moreover, investments in climate activities are still surpassed by those related to fossil fuels ($781 billion in 2016). ● More countries are making plans to boost their resilience and capacity to adapt to climate change, raising the number of parties that ratified or acceded to the Paris Agreement, from the initial 114 in 2016 to 186 in 2019, and to 194 states and the EU (as of February 2023), representing over 98% of global greenhouse gas emissions, including China and the United States, the countries with the 1st and 2nd largest CO2 emissions among UNFCCC members.
Ethics	**Unethical behaviour has led an unsustainable human footprint in the use of our water resources and water-related ecosystem services.**
Economy	● Losses in the order of €3-20 trillion per year in ecosystem services and of €5.5-10.5 trillion per year due to land degradation. ● Almost half a billion people depend at least partially on small-scale fisheries, which account for 90 per cent of employment in fisheries worldwide. ● Poor water quality and sanitation, food scarcity, poverty, hunger, unemployment, warfare.
Biodiversity loss	● Nature across most of the globe has now been significantly altered by multiple human drivers, with the great majority of indicators of ecosystems and biodiversity showing rapid decline ● Human actions threaten more species with global extinction now than ever before

Sources: IPCC, 2019, United Nations, 2022, Copernicus Marine Service, 2021, NASA Earth Observatory data, Data from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), OECD, 2016

Understanding the complexity of the interconnections between the water system's health, the climate, biodiversity and food provision, is fundamental to develop the required flexible capacity to manage challenges simultaneously, in a systemic perspective.

4.3 Developments influencing the Mission Area

A number of specific factors and trends need to be considered as they can influence the Mission Area 'healthy oceans, coastal and inland waters'. The below table provides an overview of some of the factors and trends which are likely to impact the ocean and water system.

Table 17: Identified main factors or trends influencing the Mission Area

Type of factor/trend	Description	Short summary of the expected impact of the factor/trend
Environmental	• In 2021, more than 17 million metric tons of plastic entered the world's ocean, making up 85% of marine litter. The volume of plastic pollution entering the ocean each year is expected to double or triple by 2040. • The global nitrogen cycle results altered by land-based, human-activity-related emissions, mainly due to agriculture practices of crop fertilization (Battye, 2017), leading to the question whether Nitrogen is the new Carbon and describing it as a major challenge for the new century (Mellilo, 2021). • More than a third (35.4%) of global fish stocks were overfished in 2019, up from 34.2 per cent in 2017 and 10% in 1974. However, the rate of decline has recently slowed. • Continuing ocean acidification and rising ocean temperatures are threatening marine species natural habitats, and negatively affecting marine ecosystem services. Between 2009 and 2018, the world lost about 14% of coral reefs. • The global coverage of marine protected areas stood at 8% of global coastal waters and oceans in 2021. • In the coming decade, a crucial challenge will be water security. In addition to the effects of global warming, water availability is directly affected by increasing demand for water from industry, agriculture, urbanization and tourism. This escalates global demand for renewable energy, which is strongly water- dependent, saline intrusions and the pollution of surface- and groundwater.	• Reduction of both water- and land-based ecosystem services
Technological	• Digitalisation, Artificial Intelligence (AI), European Open Science Cloud and EU data spaces including, digital twins • Research and technology infrastructures • Sea defence solutions against marine litter at source (on rivers) or at sea. • Blue carbon • Carbon Farming • Biotechnology • Improved modelling of environmental processes • Improved environmental monitoring sensors and systems	• Contributing to digital marketing and EU data spaces • Pollution remediation and prevention, ecosystem restoration • Technological and nature-based solutions supporting planet's health management and restoration • Modelling and forecasting capacity, considering the stressors' continuum and predicting their impact over the relevant hydrosphere nexuses (with climate, food and water security, human and animal health), integrated over space and time.
Geopolitical/ governance	• UNCLOS High Seas Treaty (2023): Kunming-Montreal Global Biodiversity Framework, Montreal December 2022: countries pledged to protect at least 30% of terrestrial and marine	• Improved governance • Targeted policy

Type of factor/trend	Description	Short summary of the expected impact of the factor/trend
	areas, while also recognizing Indigenous and traditional territories. ● Paris Agreement (2016): More countries are making plans to boost their resilience and capacity to adapt to climate change, raising the number of parties that ratified or acceded to the Paris Agreement, from the initial 114 in 2016 to 186 in 2019, and to 194 states and the EU (as of February 2023), representing over 98% of global greenhouse gas emissions, including China and the United States, the countries with the 1st and 2nd largest CO2 emissions among UNFCCC members. ● EC new agenda on international ocean governance (2022) (European Commission, 2022a)	● Achieving SDGs objectives, e.g.: for the Climate action, Life below water, Clean water and sanitation, Zero hunger. ● Halt and reverse the loss of marine biodiversity, fight climate change and marine pollution for a healthy ocean, protect the seabed from harmful practices, ensure a sustainable blue economy and build up ocean knowledge, ensure security and safety at sea and a compliance with international rules and standards ● Protecting biodiversity in waters beyond national jurisdiction ● integrated planning of maritime space
Ethical	● UNESCO UN decade of ocean science for Sustainable development (2022): 45 programmes, 200 projects self-contributing; 45 national decade committees, seeds of interdisciplinary ocean management structures; includes ethics. ● The High-Level Panel for a Sustainable Ocean Economy	● Ocean empathy; empowered women; ocean professionals ● Sustainable hydrosphere governance conscience ● Sustained hydrosphere management and planning capacity
Economic	● Losses in the order of €3-20 trillion per year in ecosystem services and of €5.5-10.5 trillion per year due to land degradation. ● Almost half a billion people depend at least partially on small-scale fisheries, which account for 90 per cent of employment in fisheries worldwide.	● Poor water quality and sanitation, food scarcity, poverty, hunger, unemployment, warfare.

Source: external study consultants

The evidence suggests that **there will be no alleviation of global warming, demographic pressure, use of resources and man-made pollution**. In addition, measures to reduce the impact of human activity on planetary natural ecosystems will continue to be a priority to avoid mass extinction(s) (ESPAS, 2019). The latest SDG Report (United Nations, 2022) indicates that:

- Continuing ocean acidification and rising ocean temperatures are threatening marine species and negatively affecting marine ecosystem services. Between 2009 and 2018, the world lost about 14% of coral reefs;
- In 2021, more than 17 million metric tons of plastic entered the world's ocean, making up 85% of marine litter. The volume of plastic pollution entering the ocean each year is expected to double or triple by 2040;
- The global coverage of marine protected areas stood at only 8% of global coastal waters and oceans in 2021;

- More than a third (35.4%) of global fish stocks were overfished in 2019, up from 34.2 per cent in 2017 and 10% in 1974. However, the rate of decline has recently slowed;
- Almost half a billion people depend at least partially on small-scale fisheries, which account for 90% of employment in fisheries worldwide.

According to the Eurostat barometer (2022) [(205)], the EU has made good progress towards the SDG 'Life below water' (SDG14): while the trends for the various indicators of the status of this goal show a varied pace of progress, the overall progress is generally significantly positive. On the other hand, this goal needs to be considered also through its relationship with other SDGs and related indicators, considering that the biggest sources of pollution to the oceans are land-based (hence a clear linkage with the Mission Area on soil health). The status in clean water and sanitation (SDG6) and zero hunger (SDG2) is less reassuring, showing that the concentration of nitrates and phosphates in rivers and ground water systems is moving away from the target value. While only moderate progress is achieved for the climate action (SDG 13).

In 2021, the EC second annual Strategic Foresight Report 'The EU's capacity and freedom to act' (European Commission, 2021c) presents climate change and other environmental challenges as a main stressor on the EU's capacity and freedom to act in the coming decades. The report highlights a particularly alarming situation regarding biodiversity loss and change in the nitrogen cycle, mainly induced by mass agricultural and breeding practices, with a scale of change far superior to the modification of the carbon cycle, affecting freshwater, coastal areas and human health. Economic consequences estimate losses for €3.5-18.5 trillion per year in ecosystem services from 1997 to 2011 and an estimated loss of EUR 5.5-10.5 trillion per year due to land degradation. Ultimately, public health, food crops and animal health will be endangered.

Finally, the EU Green Deal Barometer (IEEP, 2022) indicates that the commitment of the MS to the EU Green deal implementation is at risk, given the unforeseen challenges faced by the EU, including the recent pandemic, the war in Ukraine and the related energy crisis. The experts consistently identified the lack of commitment by Member States as the biggest obstacle to the implementation of the Green Deal agenda. Similar concerns of derailing policy implementation in the context of the emerging crisis have also been expressed in the report on science, research and innovation performance of the EU ('SRIP report', European Commission, 2022g). Also interviews flagged that indeed due to the pandemic and war in Ukraine the political attention to biodiversity in general is waning, while commitment to ocean matters do hold strong.

Given the evidence presented above, it is evident that the **recent developments reinforce the relevance of the Mission Area for the challenges that Europe is facing** and, in fact, for saving the planet from the negative impacts caused by human activity.

[(205)] https://ec.europa.eu/eurostat/cache/website/sdg/sdg_key/sdg_key_2022/index.html?lang=en

4.4 Key conclusions from the external review of the Mission Area

Considering that this Mission Area addresses challenges that threaten life as we know it on this planet, it is evident that the Mission Area remains fully relevant for Europe and that a system-approach is required to address the complexity and multitude of the factors influencing this area, such as interdependent environmental conditions, ecological stressors, societal approaches, political governance and management. However, a risk is that the current 'transversal crisis' will derail the political commitment to the highly ambitious EU policy objectives and jeopardise the necessary support to R&I actions and the establishment of the required collaborative frameworks.

R&I is at the core of the provision of knowledge and solutions (both technology- and nature-based) to accompany the achievement of goals set in the EU strategies, such as the European Green Deal and the European Digital Strategy - Digital Agenda for Europe (DAE); as well as contribute to global initiatives such as the implementation of the UN Agenda 2030 for Sustainable Development and the UN Ocean Decade of Ocean Science for Sustainable Development (2021-2030). In particular: **investigating the interdependencies among the elements of the water-climate nexus, and how this impacts life on Earth** is at the core of a fuller understanding of the dynamics of this area. It also enables the provision of opportunities for intervention, mitigation and adaptation strategies. An observation and recommendation is that the novel dimension of ocean ethics must be better highlighted so as to produce a cultural shift and behavioural change at the individual scale, regarding the impact of human activity on the hydrosphere. **A holistic approach that combines sustainability concerns with aspects influencing social acceptance** –e.g., participation, ownership, inclusion, affordability, quality of experience and beauty- **can facilitate a faster adoption of solutions and behaviours**. The use of digital technologies for representing and managing the water continuum are also a rather novel element for possible R&I action, which would support a modern ocean governance and management system.

The external review study suggests that while several countries around the world have implemented initiatives and policies to address the health and conservation of their marine and freshwater ecosystems, **a policy Mission-area definition as encompassing as the EU approach appears to be unique**. This provides an opportunity for EU global leadership on this critical 'grand challenge' for all on Earth.

5 MISSION AREA: CLIMATE-NEUTRAL AND SMART CITIES

5.1 Scope and definition of the Mission Area

In focusing on cities, the selection of the Mission Area 'climate-neutral and smart cities' responds to the recommendation of the Lamy Report to define Missions that "are open to all actors in the research and innovation cycle, in particular new actors of innovation and change such as cities and regions, which could act as 'innovation laboratories of change'

in piloting new ideas and concepts". [206] Even closer to the Mission Area, Professor Mazzucato proposed that '100 climate-neutral cities by 2030' would meet all criteria of a promising Mission. [207]

The idea was also taken up by the High-Level Panel of the European Decarbonisation Pathways Initiative, which proposed a Mission to be formulated in the area of "climate-neutral, 'circular' and liveable cities" alongside a Mission on soil as carbon sinks and a Mission for the full integration and decarbonisation of the energy system. [208] In its interim recommendations, the panel considered further Mission Areas for decarbonisation: a Mission on smart storage and transmission, a Mission on renewable and sustainable plastics, and a Mission on zero-carbon and sustainable construction materials. [209]

The Mission Area 'climate-neutral and smart cities' is tightly linked to the aim of achieving a climate-neutral economy in Europe by 2050 [210] and EC's growth model of a green and digital 'twin transition'. [211] It also connects to previous cross-national city initiatives for climate action (e.g. Carbon Neutral Cities Alliance, C40 Cities, Climate Alliance, Energy Cities, Global Covenant of Mayors for Climate and Energy) and smart cities (e.g. 100 intelligent cities challenge, smart cities marketplace, United for Smart Sustainable Cities).

The broad thematic scope of the Mission Area calls for holistic and cross-sectoral solutions to urban challenges. According to the latest climate mitigation report of the Intergovernmental Panel on Climate Change (IPCC), cities "can only achieve net-zero GHG emissions through deep decarbonisation and systemic transformation (*very high confidence*)". [212] Furthermore, the scope of the Mission Area makes it well placed to deliver significant contributions to SDGs 11 (sustainable cities and communities) and 13 (climate action). [213] When the Mission Area was defined, SDG 13 was among the goals where the EU had been making the least progress. Regarding SDG 11, the EU had made moderate progress overall but was experiencing reversed trends in the climate-relevant domains of per capita settlement areas and share of public transport. [214] The Mission Area

[206] EC (2017, p. 15 emphasis on 'are open to all actors' omitted).

[207] Mazzucato (2018).

[208] EC (2018b, p. 165).

[209] EC (2018c, p. 251) .

[210] EC (2018a).

[211] EC (2022); Furthermore, the Mission Area corresponds to a wide range of EU policy objectives (Di Girolamo et al., 2022, p. 329).

[212] IPCC (2022, p. 864).

[213] The Mission board proposed that the Mission may also deliver major contributions to SDGs 3, 7, 8, 9, 12, 14, 15, 17 and moderate contributions to SDGs 5 and 10 (Gronkiewicz-Waltz et al., 2020, pp. 8–9).

[214] EU (2019).

is thus linked to some of the key sustainable development issues Europe was facing at the time of its selection.

Due to its broad scope, **the Mission Area addresses many significant societal challenges in domains such as mobility and transport, urban greening, energy provisioning, and buildings**. [215] Tackling GHG emissions of cities has a high potential to deliver rapid and large-scale contributions to decarbonisation while creating co-benefits with respect to air quality, heat stress, as well as mental and physical health. [216] With respect to climate mitigation, the Mission Area does not provide an indication of the relative priority to be given to different strategies of GHG emissions reduction and removal, a matter that remained unresolved in the implementation of the Mission. [217] At the same time, **by including the notion of 'smart', the Mission Area is the only one that gives some direction in terms of the means to be implemented to address a societal challenge**.

5.2 The role of R&I in addressing the challenges

Mission-oriented innovation policy addresses societal challenges that require the development of novel and potentially radically different solutions. [218] The continued relevance of the Mission Area is thus conditional upon its ability to speak to persistent challenges in both, Europe and R&I.

Table 18 compiles some key contributions that R&I is expected to deliver in response to urban challenges, drawing on three reports that were prepared by expert groups in support of the Mission (Area) selection process.

Table 18: Expected contribution of R&I to addressing the Mission Area challenges.

Domains of urban challenges	Expected contributions of R&I (illustrative)
Mobility and transport	Shared, autonomous, multi-modal mobility and mobility-as-a-service for fewer cars; electrified vehicles reducing demand for fossil fuels; mobility system optimisation for reductions of passenger-kilometres; 3D printing reduces need for freight transport; remote maintenance and smart products reduce; faster public transport (e.g. hyperloop) connect cities and curb urban sprawl; data analytics and technologies improve traffic management and avoid congestions
Energy systems	Internet of Things solutions for remote control of street lighting; better understanding of the role of cities in producing electricity and heat locally
Built environment	Durable, mixed-use buildings for less material demand; modular designs for reuse of building components; sustainable building materials and advanced construction techniques; new financing schemes to overcome high upfront costs of building retrofitting
Governance and planning	Estimating costs of making a city climate-neutral in a smart way; methodologies to calculate monetary co-benefits of low-carbon solutions; systematic screening of windows of opportunity for applying smart, climate-neutral solutions; understanding stability and vulnerability of climate-neutral and smart

[215] Dinges et al. (2021).

[216] Floater et al. (2016), IPCC (2022), Material Economics (2020).

[217] Shabb et al. (2022).

[218] Mazzucato (2018).

Domains of urban challenges	Expected contributions of R&I (illustrative)
	infrastructures to mitigate risks; guidelines to help local administrations of how to induce behavioural change; understanding motivations for companies to make more sustainable choices; knowledge of how to balance public and private interests of technical and ICT operators; knowledge how governance can enable decarbonisation in cities
Everyday life	Knowledge of evolving needs; understanding conditions for better quality of life; nudges for sustainable behaviour change; understanding requirements to protect security of individual data amidst development of advanced digital technologies; understanding the social acceptance of climate-neutral cities; social innovations for stronger citizen engagement
Urban system	Design of integrated and zero-carbon systems to reduce energy demand and improve energy efficiency; better understanding of the co-benefits of climate action in cities; knowledge on pathways to climate-neutrality depending on local conditions of cities

Source: external study based on Dinges et al. (2021), European Commission (2018b), Peiffer-Smadja et al. (2022), Ricci et al. (2017)

5.3 Developments influencing the Mission Area

Five years after its formulation, the Mission Area remains highly relevant. The foresight study prepared in support of the Mission selection process identified a series of **key trends affecting pathways to climate-neutral and smart cities, such as urbanisation, an ageing population, digitalisation, climate change, and migration inflows**. [(219)] Most of these trends have continued since then and even intensified. Table 19 provides an overview of important trends affecting the Mission Area.

While the situation for cities has become more difficult lately, cities are facing enormous challenges with respect to climate mitigation. To achieve climate-neutrality by 2050, the EU stepped up its goal of reducing GHG emissions to at least 55% (instead of 40%) below 1990 levels by 2030. [(220)] Projections of future GHG emission trends suggest that existing and additional measures the EU and its Member States plan to launch in the coming years will not be sufficient to reach this target. To meet short- and long-term targets, the pace at which **improvements in energy efficiency and the share of renewable energy have been achieved to date need to be accelerated significantly throughout the coming decades**. Whereas significant progress has been made in reducing GHG emissions in energy supply and industrial processes, much more effort is required in transport, agriculture, and the buildings sectors. [(221)] In the past five years, Europe moved even away from the trajectories needed to comply with its climate targets in critical domains linked to urban development, in particular with regards to opposing trends in the share of public passenger transport, average CO_2 emissions from new passenger cars, and spread of settlement areas. [(222)]

[(219)] Dinges et al. (2021).

[(220)] European Parliament & Council of the European Union (2021).

[(221)] European Environment Agency (2022).

[(222)] Eurostat (2022).

Climate mitigation is far from the only challenge cities are facing today. Many of the trends listed below put high environmental and social pressures on cities, which tend to have spatially and socially unequal effects and are not explicitly addressed by the Mission Area.

Table 19: Identified factors or possible trends influencing the Mission Area

Type of factor/trend	Short summary of the expected impact of the factor/trend
Environmental • Climate change exacerbates the impacts of natural disasters, energy poverty, water scarcity, and extreme weather conditions • Growing urban greenspaces • Declining share of public passenger transport • Increasing CO2 emissions from new passenger cars • Reduction of CO2 emissions in energy supply and industrial processes	In light of the slow progress made in climate mitigation, implementing a Mission in the area of climate-neutrality raises the political ambition to meet a major and still unresolved societal challenge. As global warming continues, climate change adaptation may become a more important concern for citizens and policymakers.
Social • Urbanisation • Ageing population • Increasing urban sprawl • Growing migration inflows	Urbanisation and the growing population make cities increasingly critical sites of climate action.
Geopolitical • Declining dependency from Russian energy imports • Disruptions of global supply chains, especially in automobile and electronics sectors • EU financial and trade sanctions against Russia • Industrial policy initiatives like the U.S. Inflation Reduction Act may reduce the competitiveness of European industries	Shortages of energy and electronics could have strong negative effects on decarbonisation and digitalisation efforts. Cities increasingly rely on national governments to secure supply chains, build energy infrastructures, and support industries for green products and services.
Policy • Cities are moving towards integrated planning and new forms of governance • Growing environmental awareness and rising citizen participation • Climate-neutrality and digitalisation have been gaining priority in EU and its Member States, but the COVID-19 pandemic, war in Ukraine, and increasing geopolitical tensions have recently directed attention away from these goals.	Repeated global and supranational crises could threaten EU's and national governments political support for climate action and digitalisation at the city level. If deep crises can be averted, the political environment is favorable for Missions on climate-neutral and smart cities.
Technological • Accelerating digitalisation • Growth of digital-enabled services	While transitions to 'smart' cities are under way, the effects of digitalisation on carbon-neutrality are mixed.
Economic • Stagnating tax revenues of city governments • Decreasing affordable housing • High inflation rates, especially for energy • Shortage of skilled workers • Rising economic inequality and urban segregation	Intensifying financial pressures at the local level, especially in city governments and among most vulnerable social groups, call for increased support at the regional, national, and EU level. The shortage of skilled workers may significantly slow down decarbonisation.

Source: EFIS report based on Dinges et al. (2021), European Committee of the Regions (2022), Vandecasteele et al. (2019)

5.4 Key conclusions from the external review of the Mission Area

Compared to previous, mostly sectoral initiatives, **a Mission-oriented innovation policy approach has the potential to ignite more impact- and goal-oriented actions in cities that cross R&I and other action fields**. The Mission Area also represents an exemplary effort of connecting Mission-oriented innovation policy with place-based approaches to innovation and the principle of subsidiarity. [223]

The Mission Area allows to address some of Europe's main challenges in achieving climate-neutrality that would lie beyond the scope of most Missions launched in non-EU countries, notably with respect to critical domains where less progress has been achieved to date such as urban transport, buildings, and land-take as well as cross-cutting challenges relating to non-technological issues and lock-ins resulting from the interplay of urban subsystems. This opens possibilities for truly transformative changes at the city level that can generate cascading effects across all sectors. **Being high on the global agenda,** [224] **the unique focus among Mission-oriented innovation policies on climate-neutral cities could put the EU in a leadership position in the provision of systemic and cross-sectoral solutions**.

Building on previous initiatives at the city level and in transnational city networks, **the Mission Area was very much instrumental in mobilising stakeholders across governmental bodies and civil society organisations**. The Mission Area attracted considerable interest among cities and inspired several Member States to introduce new policies and city administrations to reorganise their departments. Insofar, the Mission Area was likely an effective 'boundary object' [225] for mobilising many important, if not all, actors needed to realise a climate-neutrality in cities.

The changes that cities need to undergo in their climate-neutrality path are close to citizens as they have a great impact on their daily life. While the R&I agenda is progressively becoming more human-centric, cultural aspects of human experience also need to be embedded in R&I policies and efforts. New technologies and market-based solutions alone are not sufficient: sustainable solutions are often not affordable, affordable solutions are often not the most attractive to citizens nor sustainable. Addressing the current imbalance between the values of sustainability, inclusiveness and beauty at the city scale helps to engage citizens in the green transformation, generate social acceptance for green policies (specifically the Green Deal), promote social ownership of green solutions, and promote changes in behaviour needed to meet sustainability targets. Furthermore, rural areas should not be left behind in this exercise, even when cities lead the way.

[223] Wanzenböck & Frenzen (2020), Schwaag Serger et al. (2023).

[224] See Seto et al. (2021).

[225] Janssen et al. (2023).

6 MISSION AREA: SOIL HEALTH AND FOOD

6.1 Scope and definition of the Mission Area

After a process of intense interaction between the European Commission and the Member States over the selection of Mission Areas, in 2018 'soil health and food' was identified as one of the five selected Mission Areas. Other options on the shortlist of about 20-30 options also covered options of a more technological nature, like quantum and hydrogen. ([226]) The choice of soil health and food as a Mission Area fits the imperatives that Missions form an opportunity to go beyond R&I and technology development to help tackling current societal challenges (see below). [(227)]

More specifically, the soil health and food Mission Area was supposed to provide building blocks (like a monitoring infrastructure) for Green Deal strategies and concrete policies like the Soil Strategy and Soil Law that were already in early stages of development. [(228)] As also stated in the recent Science, research and innovation performance report: "*R&I is essential for adapting our territories, food, water systems, infrastructure, and our ways of producing and consuming*" (SRIP, 2022, p149), for instance when it comes to providing accurate information that allows for monitoring the evolution of soil (health). [(229)] A particular motivation for taking soil health and food as a topic requiring a Mission approach is that **while there were current and forthcoming policies (at the EU and national level) dealing with soil health, much of these efforts were fragmented and only considered a subset of soil health indicators** (e.g. only land degradation or erosion, but not biodiversity). The Mission approach allows to align what would otherwise remain separate policies to accelerate their visibility and uptake. [(230)]

A Mission board consisting of 15 experts was set up in August 2019. The Mission board for soil health and food was asked to analyse the Mission Area and, subsequently, propose a concrete Mission (for more on the Mission itself see the Mission assessment report for

[(226)] Source: interviews with various EC officials conducted in the context of the external study on the review of Mission Areas and the assessment of EU Missions.

[(227)] European Commission, DG RTD, Mazzucato, M., (2018). Mission-oriented research & innovation in the European Union: a problem-solving approach to fuel innovation-led growth, EC Publications Office.

[(228)] Mission board for soil health and food (2020). Caring for soil is caring for life: Ensure 75% of soils are healthy by 2030 for healthy food, people, nature and climate: interim report of the Mission board for soil health and food.

[(229)] European Commission, Directorate-General for Research and Innovation, Science, research and innovation performance of the EU 2022 : building a sustainable future in uncertain times, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2777/78826.

[(230)] Bouma, J. (2022). Transforming living labs into lighthouses: a promising policy to achieve land-related sustainable development. Soil, 8(2), 751-759.

soil health). This led to the publication of the 'Caring for soil is caring for life' report in September 2020. [231]

Together with the Joint Research Centre (JRC) the Mission board conducted a review of the latest literature on soil health and food. The main conclusion was that "*current management practices result in, approximately, 60-70% of EU soils being unhealthy, with a further, as yet uncertain percentage of soils unhealthy due to poorly quantified pollution issues. A 75% goal of healthy or improving soil by 2030 through a radical change in current land management practices is both feasible and necessary. Soils will also benefit from improvement to indirect drivers of change such as reductions in air pollution and carbon emissions*" (Mission board, 2020, p.34). More specifically, the review points at several specific challenges. These are listed in the table below.

Table 20: Evidence base for the Mission Area – soil health and food

Specific challenges	Evidence for the specific challenge (illustrative excerpts)
Nitrate	"The Gross Nutrient Balance Indicator (EUROSTAT 2020) shows that there is currently an excess of fertiliser applications in the EU" "SOER 2020 (EEA) reports that for 65-75% of agricultural soils, nitrogen values exceed critical values beyond which eutrophication can be expected"
Organic carbon	"LUCAS Soil data, covering surface soil, show that cultivated and permanent crops have the lowest SOC concentrations of all major land cover classes"
Peat	"Peats cover 8% of EU land area, of which 50% of peatlands are estimated to be drained which will result in the oxidising of the peat and loss carbon to the atmosphere (JRC 2016)."
Water erosion	"Pangos et al. (2015) reports that 24% of land has unsustainable soil water erosion rates (>2. t /ha)." "a new report by JRC (Panagos et al. 2020) shows erosion by water on arable land is 10% greater than the mean for the EU"
Compaction	"The best available estimates suggests that 23% of land assessed had critically high densities (JRC 2016)."
Pollution including risks to food	"In terms of local soil pollution, JRC (Paya Perezet al. 2018) reported 2.8 million potentially contaminated sites in EEA-39"
Soil sealing and net land take	"Artificial areas cover 4.2% of the EU (EUROSTAT 2017) of which about 50% is sealed" "The rate of net land take was estimated to be around 539 km² per year during the period 2012-2018 (EEA 2019)"
Salinisation	"In 2016, 10.2 million hectares was actually irrigated (5.9 % of EU). 25% of this area is at risk of secondary salinization i.e. 1.5% of EU"
Desertification	"The most recent estimate of sensitivity to desertification in Southern, Central and Eastern Europe in 2017 suggested 25% (411.000 out of 1.7 million km2) was at High or Very High Risk"
Soil biodiversity	"It is likely that all of the above drivers are probably singly or in combination resulting in a decline in biodiversity but there are no actual EU data demonstrating soil biodiversity change"

Source: EFIS study based on the Mission board work (2020) 'Caring for soil is caring for life'. The sources of the abovementioned quotes can be found in Annex to this Staff Working Document.

[231] Mission board for soil health and food (2020). Caring for soil is caring for life: Ensure 75% of soils are healthy by 2030 for healthy food, people, nature and climate: interim report of the Mission board for soil health and food.

By defining soil health as "continued capacity of soils to support ecosystem services", the Mission board for soil health and food report (2020) stresses that improving soil health is crucial for safeguarding at least the following ecosystem services:

- Producing adequate quantities of nutritious and safe food, feed, fibre and other biomass for industries;
- Storing and purifying water, regulating flows, recharging aquifers, and reducing the impact of droughts and floods thereby helping adaptation to climate change;
- Capturing carbon from the atmosphere and reducing emission of greenhouse gases from soils, thereby contributing to climate mitigation;
- Nutrient cycling supporting crop productivity and reducing contamination;
- Preserving and protecting biodiversity by preserving habitats both above and within the soil;
- Supporting the quality of our landscapes and greening of our towns and cities.

Finally, **the Mission board also stressed the potential of a Mission in this Mission Area to contribute to several United Nations Sustainable Development Goals (SDGs)**. The SDGs most directly affected by soil degradation, and thus requiring soil action, are SDG 2 (zero hunger), SDG 6 (clean water and sanitisation), SDG 13 (climate action) and SDG 15 (life on land). ([232]) These are aligned, to a large extent, with the SDGs targeted by the European Green Deal that was introduced around the same time as the Mission board was preparing its report.

6.2 The role of R&I in addressing the challenges

One basis for reviewing the Mission Area is determining whether it really allows for R&I to make a meaningful contribution to solving the societal challenge(s) the area comprises. Of particular interests are **solutions that are not stand-alone products, services, etc. for which there are markets, but solutions that for their diffusion require the transformation of entire production-consumption systems**. [(233)] Such transformations often rely on a range of complementary investments and efforts by different actors (including users), targeted at e.g. knowledge development as well as infrastructure, legislation, awareness raising, and any other factor that determines the possibility for new solutions to be adopted. If more of such factors need to change simultaneously to create the synergies that allow for system transformation, it becomes essential to bundle and

[(232)] The Mission board noted that the topic of soils was hardly mentioned in targets for the SDGs. To highlight that soil health is a transversal concept, the board proposed a set of soil indicators for 11 SDGs.

[(233)] Hekkert, M. P., Janssen, M. J., Wesseling, J. H., & Negro, S. O. (2020). Mission-oriented innovation systems. *Environmental innovation and societal transitions*, *34*, 76-79.

coordinate packages of R&I (and non-R&I) policies. This is where Missions, as coordination devices, hold an important promise. [234]

Food innovations are a priority in continuously evolving food systems and the research community agrees that **innovations improving soil health rank high among specific food innovations likely to be available to consumers within 5 years** (Zickafoose et al., 2022). R&I activity on soil is thriving, with several new trends emerging, such as precision agriculture and the implementation of Agriculture 4.0 and Industry 4.0 technologies in farming (Aubert et al., 2012). However, R&I in agriculture has many peculiarities and policymakers need to account for farmers' entrepreneurship and the need to create an entrepreneurial environment as an indirect way to support the adoption of new technologies and practices.

Innovation adoption is a concern in the literature dealing with soil health. However, innovation is primarily developed 'outside' the agriculture sector and farmers tend to be innovation adopters of technologies developed by the chemical, mechanical, ICT industry. Therefore, **innovation adoption is a key aspect of R&I policy in soil health.** The role of intermediary stakeholders, especially from the private sector (e.g., crop advisers), will be fundamental in spreading information among farmers about conservation practices, promoting innovation adoption (Eanes et al., 2019).

The below table has been developed in the context of the external study supporting the review of Mission Areas and the assessment of EU Missions. It sums up some expected contributions of R&I to addressing the Mission Area challenges.

Table 21: Expected contribution of R&I to addressing the Mission Area challenges

Specific challenges	Expected contribution of R&I
Practices for enhancing soil health cannot readily be applied, as they have to be tuned to place-specific circumstances	Co-creation and demonstration of knowledge and innovation in living labs and lighthouses, in which different types of stakeholders work together and learn from each other
Practices for enhancing soil health are not adopted when policy makers try to impose them	
Different countries use different (or no) indicators for monitoring soil health aspects	Development, validation, harmonization and integration of indicators, as well as methodologies for measuring them
Experiments with (innovative) soil management practices lack robust methodologies for assessing effectiveness, and/or indicators cover only some dimensions of soil health	
For some soil health problems (like biodiversity decline) or solutions (like biowaste innovation), there is a shortage of applicable insights and techniques	Development of 'technical' knowledge on soil health issues
Practices for enhancing soil health remain underutilized as they are or seem not economically feasible	Development of knowledge on socio-economic factors like business models

[234] Janssen, M. J., Torrens, J., Wesseling, J. H., & Wanzenböck, I. (2021). The promises and premises of Mission-oriented innovation policy—A reflection and ways forward. Science and public policy, 48(3), 438-444.

Practices for enhancing soil health remain underutilized as potential users are not familiar with them	Development of capacities (advisors, education) that support the absorption and application of relevant knowledge

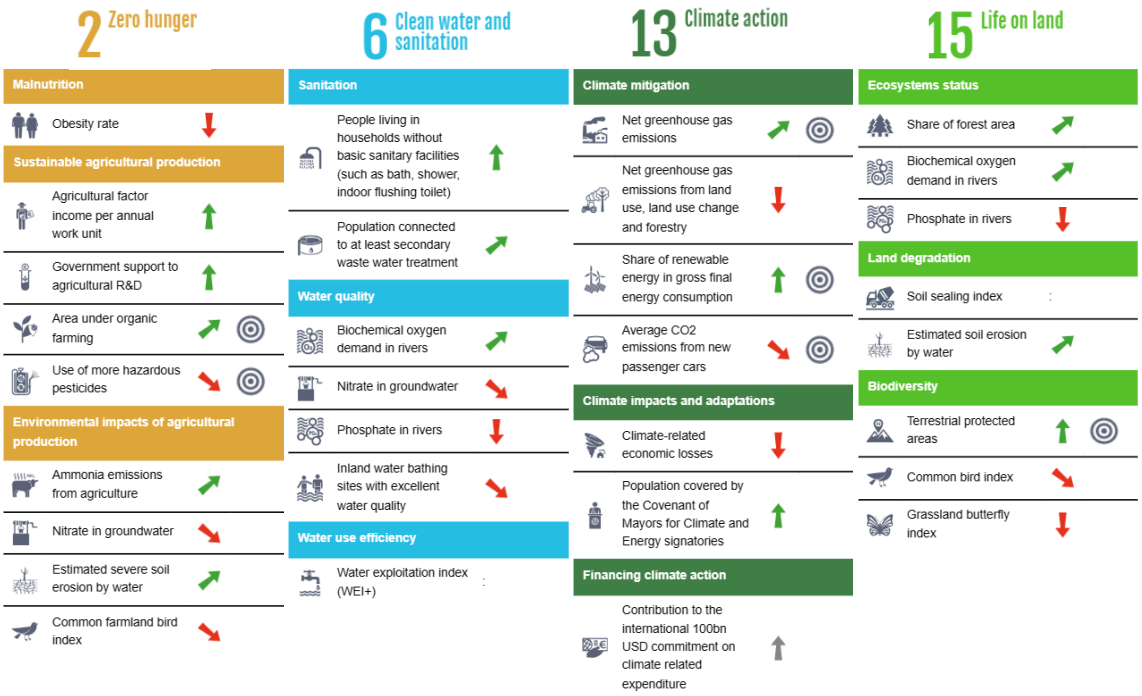
Source: EFIS study on the basis of the Mission board for soil health and food report (2020) 'Caring for soil is caring for life'

In conclusion, given the diagnosis that the lacking diffusion of innovative soil management practices is more salient than the development of those practices, **there is an interest for promoting soil health by applying living labs as a policy instrument. This makes the area of 'soil health' particularly fit to be addressed through the Mission approach as defined in the Horizon Europe regulation.** This means the identification of soil health as a Mission Area is timely and responds to gaps in our knowledge vis-a-vis soil related societal challenges**.**

6.3 Developments influencing the Mission Area

Analysis shows that **the Mission Area is broad enough to cover needs and adjust to new/emerging factors or trends that are likely to impact the Mission Area**. One way to assess this is by looking at developments in the societal challenges the Mission Area relates to. A useful proxy here is the Eurostat dashboard that monitors progress towards the SDG targets the EU has set.

Figure 18: EU progress towards the SDGs over the past 5 years, 2022



Source: EUROSTAT – Sustainable Development ([235])

The overview gives a mixed picture. In the context of agricultural soils, notable positive developments concern the rise in areas under organic farming as well as the reduction of agriculture-based ammonia emissions and severe soil erosion by water. Other highlights

([235]) https://ec.europa.eu/eurostat/web/sdi/overview

are the increases in the share of forest areas and, even more significantly, in terrestrial protected areas. The progress on those indicators suggests that at least in a number of respects, soil health seems to be gradually improving already. Worrying trends are observed for, for instance, the use of hazardous pesticides; nitrate in groundwater; phosphate in rivers; common farmland birds and birds and butterfly biodiversity in general; and greenhouse emissions from land use, land use change and forestry. These trends suggest that **there are many reasons to keep investing in a soil health and food Mission Area.**

An additional way of assessing the relevance of the Mission Area is by considering the range of factors that could influence the need of policies for soil health and food. One example of such a factor, supported by evidence discussed in the 2022 Science, research and innovation performance (SRIP) report, is the geopolitically driven demand for food security and food system resilience, increasing the pressure on food production on European soils. [236]

Table 22: Identified factors or possible trends influencing the Mission Area, in order of descending likelihood.

Type of factor/trend	Short summary of the expected impact of the factor/trend
Environmental: Worsening of biodiversity decline, soil organic carbon decline, global warming (leading to drought and other extreme weather conditions), etc.	Urgency to improve the health of soils increases
Social: Increasing preferences for locally produced healthy food	More local food production puts more pressures on soils, underlining the demand for policy intervention
Geopolitical: The EU seeks to be less dependent on other countries, including when it comes to food production	
Policy: CAP might be further? adapted after the current period (2021-2027) ends, in a way that it better rewards ecosystem services	More rewards for ecosystem services would probably result in healthier agricultural soils, thus reducing the urgency for the Mission Area
Technological: Rise of synthetic food production, replacing traditional food production	Societies would rely less on agricultural use of soils, potentially decreasing pressure on arable soils
Economic: Globalising food chains, supported by highly industrialised forms of agriculture	Negative impacts for environmental and food quality (and thus human and animal health) and more risk of infectious diseases spreading easily, both aggravating the need for policy intervention

[236] European Commission, Directorate-General for Research and Innovation, Science, research and innovation performance of the EU 2022 : building a sustainable future in uncertain times, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2777/78826; European Food Banks Federation (September 2021), COVID-19: a unique opportunity for a real change. FEBA Report 01, FEBA_Report_ Survey_COVID_Sept2021.pdf (eurofoodbank.org).

Source: EFIS study based on interviews with selected stakeholders and on the 'Caring for soil is caring for life' Mission board report (2020).

The conclusion is that **the urgency to address soil health and food is becoming more pressing**, as almost all the identified factors point in this direction. Generally, it is regarded as unlikely that scientific and technological breakthroughs will, in the near future, make the Mission Area less relevant. This has to do with two fundamental aspects of the Mission Area:

- Many suitable innovative and non-innovative practices for improving soil health are already available but simply under-used (due to potential users not being familiar with the potential benefits of those practices and with ways to apply them); and
- Soils differ in many ways across territories and are used in various different ways, therefore requiring rather place- and use-specific practices.

Both aspects reduce the likelihood of a new technology emerging (outside the Horizon Europe actions supported by the Mission) that radically simplifies the possibilities for transitioning to healthy soils.

6.4 Key conclusions from the external review of the Mission Area

The Mission Area is defined and scoped in a way that is flexible when it comes to responding to technological, societal, economic and policy developments. The **'soil health'** part of the Mission Area's scope is on the one hand specific and recognizable, while on the other hand it is a transversal concept cutting across many societal challenges. **'Food'**, which is the second part of the Mission Area's scope, is just one particular domain and already relates to different societal needs, e.g. those pertaining to food safety and food security. Beyond that, soil health also covers challenges related to, amongst others, the health of people living on and eating food grown in soils, the capacity of soil to purify and retain water, the possibility of soils to be used for carbon sequestration (important for mitigating climate change) and cycling nutrients, and the role of soils in preventing and mitigating extreme climatic events (in particular droughts and floods). Another example is related to the green transition of industrial ecosystems (e.g. construction), which reduce the impact on the soil quality and can benefit from a holistic approach to increase the viability of solutions from a societal point of view.

In sum, there are no finding in the external study that suggest to further adjust the Mission Area. Nevertheless, the external study analysis identifies a potential risk focusing on a broad notion like soil health: while it does allow for addressing many challenges, it may be difficult to tackle each of them equally at the same time. A potential consequence is that the soil health label as such is not regarded as an important topic by those who are not familiar with what it entails.

Overall, the broad scope of the Mission Area implies that the Mission Area will likely remain relevant in the future, as perhaps emerging technologies and policies might (partially) tackle some challenges but not all. Thanks to its broad scope the Mission Area is likely to remain relevant and shows sufficient flexibility to cater for changing needs. **The strength of the Mission Area scope lies in recognising that the various challenges are interrelated**, and that there is no use of only targeting e.g. problems related

to water or contamination issues if that intensifies other problems. Instead, **the integrative scoping of the Mission Area encourages experimentation with policies and solutions that address multiple challenges at once**.

III. Review of areas for institutionalised partnerships based on Articles 185 and 187 TFEU

The full effects of the research and innovation efforts undertaken today will unfold only well into the 2030s and the ensuing economic and societal impact will take some time to materialise. These long gestation periods require careful consideration when setting the priorities for the Research and Innovation Framework Programme to respond to long-term challenges.

To provide the flexibility to cater for unexpected needs, **Article 11 of the Horizon Europe Regulation requires the Commission to carry out by 31 December 2023 a review of the areas for** Missions and **institutionalised partnerships established pursuant to Article 185 or 187 of the Treaty on the Functioning of the European Union (TFEU)** listed in its Annex VI of the Regulation.

Horizon Europe introduces a more strategic, coherent and impact-driven approach to European Partnerships, and orients them towards the delivery of the EU priorities. In addition to strengthening the evidence-base, the strategic coordinating process aims to improve the intelligence on starting new R&I programmes, including which topics can be better addressed by a partnership approach. This year 2023 is a particularly relevant milestone in that regard, considering the review of the areas for the institutionalised European Partnerships based on Articles 185 and 187 TFEU, as well as the second strategic planning phase of Horizon Europe for 2025-2027.

1 ARTICLE 185 AND ARTICLE 187 PARTNERSHIP AREAS

Institutionalised European Partnerships are partnerships in the field of research and innovation between the Union, EU member states and/or industry. They require legislative proposals from the Commission and are based on a Council Regulation (Joint Undertakings, Article 187 TFEU) or a Decision by the European Parliament and Council (Public-Public Partnerships, Article 185 TFEU). They are implemented by dedicated structures created for that purpose. Institutionalised partnerships must be set up within the areas listed in Annex VI of the Horizon Europe regulation and will only be implemented where other parts of the Horizon Europe programme, including other types of partnership, would not achieve the desired objectives or expected impacts. Indeed, the Horizon Europe Regulation foresees that the least complex form of implementation should always be preferred, which introduces some bias against institutionalised European Partnerships that take the longest to set up. To ensure the latter, they are subject to an ex-ante impact assessment. EIT Knowledge and Innovation Communities (KICs) are also institutionalised partnerships relying on the EIT's separate legal base and are therefore not part of this review exercise.

Based on the legal framework, the list below includes the criteria for setting up Institutionalised Partnerships:

1. Necessity for action at EU level

2. Aims/goals or impacts needed to address the challenges are not expected to be fully met by other types of Partnerships
3. Need for a long-term perspective in addressing the defined challenges
4. Building on a higher degree of integration in the organisation of research in the area
5. Prospect for aligning R&I agendas, improving skills and increasing absorption capacity of European businesses.
6. Need for systematic engagement of stakeholders and end-users, including standardization bodies and international partners to achieve uptake of solutions.
7. Addressing a set of systemic, market and transformational failures, which is a pre-condition for accelerating the development and diffusion of innovations.
8. Addressing the Union's economic capacities and its scientific and technological sovereignty.

The first two criteria can be regarded as 'exclusion' criteria, the first one for setting up a partnership of any kind and the second one for setting up an institutionalised partnership. The following ones that can be considered as 'enabling' criteria or factors for an institutionalised partnerships to exploit its full potential.

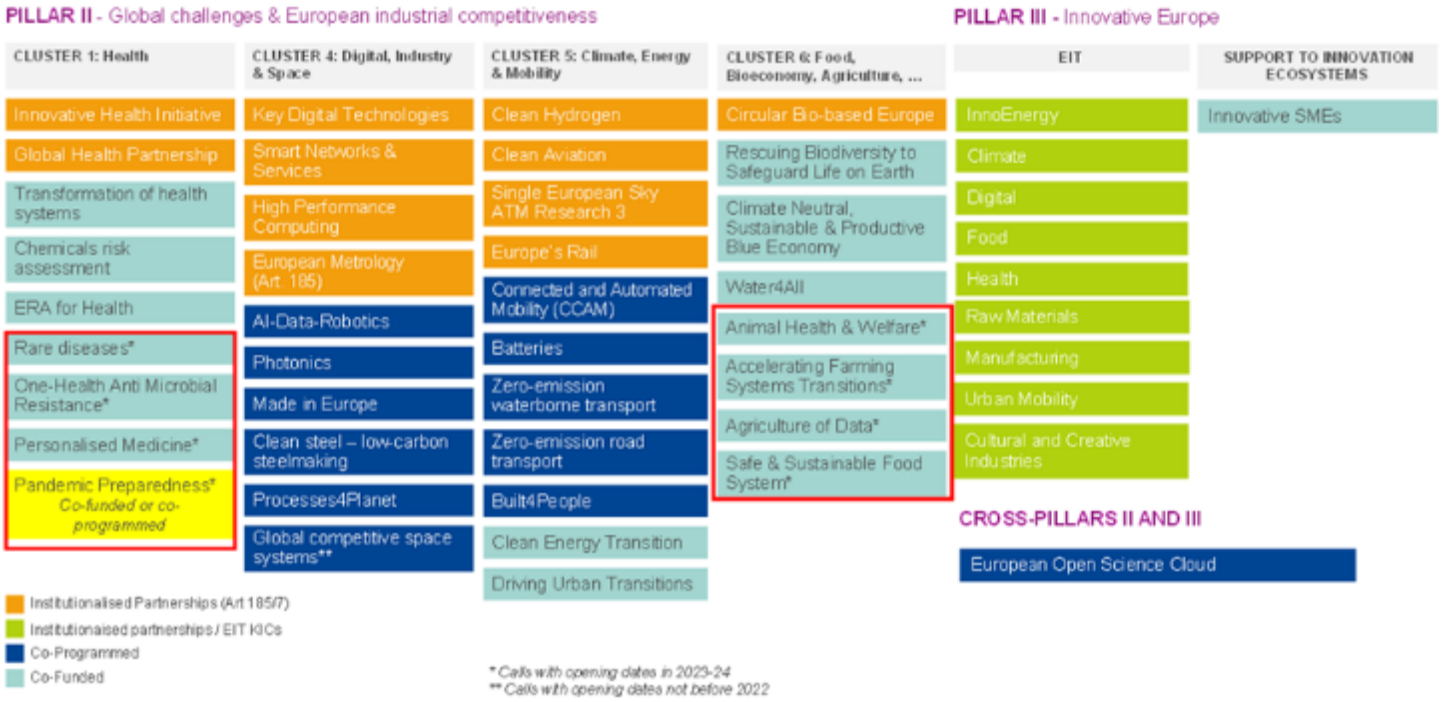
According to Annex VI of the Horizon Europe Regulation, the areas for possible Institutionalised European Partnerships on the basis of Article 185 or 187 TFEU are:

- Partnership Area 1: Faster development and safer use of health innovations for European patients, and global health.
- Partnership Area 2: Advancing key digital and enabling technologies and their use, including but not limited to novel technologies such as artificial intelligence, photonics and quantum technologies.
- Partnership Area 3: European leadership in Metrology including an integrated Metrology system.
- Partnership Area 4: Accelerate competitiveness, safety and environmental performance of Union air traffic, aviation and rail.
- Partnership Area 5: Sustainable, inclusive and circular bio-based solutions.
- Partnership Area 6: Hydrogen and sustainable energy storage technologies with lower environmental footprint and less energy-intensive production.
- Partnership Area 7: Clean, connected, cooperative, autonomous and automated solutions for future mobility demands of people and goods.
- Partnership Area 8: Innovative and R&D intensive SMEs.

Withing these areas, 11 Art 185/7 institutionalised partnerships were set up: Innovative Health Initiative, Global Health Partnership, Key Digital Technologies, Smart Networks and Services, High Performance Computing, European Metrology, Clean hydrogen, Clean Aviation, Single European Sky ATM Research 3, Europe's Rail and Circular Bio-based Europe. Institutionalised European Partnerships take up the biggest share of the Horizon Europe partnership budget (59%) with €14.704 billion. Of the institutionalised

partnerships, the largest share of the budget is dedicated to the 10 Joint Undertakings (JUs) (based on Article 187 of the TFEU).

Figure 19: Overview of 49 European Partnerships



Approach taken for the review of art. 185 and art. 187 partnership areas

Since the agreements on the areas listed in Annex VI of the Horizon Europe Regulation, two important studies were completed, contributing to underpinning the reform and rationalisation of the partnership landscape.

An Impact Assessment Study [237] conducted between July 2019 and January 2020 by Technopolis supported and provided input to the impact assessments of the first set of European Institutionalised Partnerships based on Articles 185 and 187 of the TFEU to be funded under Horizon Europe. The Commission conducted a coordinated impact assessment analysing alternative implementation modes to Article 185/187 (the so-called 'necessity test') and includes a horizontal analysis on the coherence and efficiency in the current European Partnership landscape under Horizon Europe. This was a well thought-out approach and assessment methodology leading to a score-card analysis of the evaluation dimensions of effectiveness, coherence and efficiency across the three different types as well as regular Horizon Europe calls.

([237]) European Commission, Directorate-General for Research and Innovation, Impact assessment for institutionalised European partnerships under Horizon Europe, Publications Office, 2021, https://data.europa.eu/doi/10.2777/295096

The Biennial Monitoring Report (BMR) 2022 on Partnerships in Horizon Europe [238] provides a systematic overview of the overall European Partnership landscape by shedding light on:

- The effectiveness of the new policy approach for European Partnerships and the extent to which it leads to a better achievement of objectives and impacts compared to traditional calls under the Framework Programme.
- The progress of European Partnerships towards their objectives and targeted impacts – both individually and collectively, at the EU and national level.
- Early implementation barriers and drivers towards impacts – e.g. in terms of contributions, coherence, collaboration, openness or accessibility of partnerships.
- First results achieved, in view of their further demonstration, exploitation and valorisation, including for policymaking by Commission Services and national administrations.

Given the extensive insights provided by the Impact Assessment and the BMR, the review of the areas for institutionalised partnership consists in a complementary stock taking exercise, to assess whether the list of areas enshrined in Annex VI of the Horizon Europe Regulation remains coherent in the current landscape of priorities. The review is therefore two-fold: assessing the relevance and comprehensiveness of these areas.

Reviewing the areas for the institutionalised European Partnerships, the European Commission was assisted by the expert group on support of the coordinating strategic process for European Partnerships [239]. The expert group devised a methodology to develop and assess the portfolio of European Partnerships [240], taking into account emerging European R&I priorities, emerging national R&I priorities and programmes, but also common challenges and EU political priorities that require orchestrated large-scale investments [241]. This methodology (explained in Annex C) was used to assess the adequacy of the list of areas for institutionalised partnerships.

([238]) https://ec.europa.eu/research-and-innovation/en/knowledge-publications-tools-and-data/interactive-reports/performance-european-partnerships-2022

([239])https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&do=groupDetail.groupDetail&groupID=3738&news=1

([240]) DOI: 10.2777/62770
https://research-and-innovation.ec.europa.eu/system/files/2023-07/ec_rtd_assessing-ep-against-european-policy-priorities.pdf

[241] The approach used for the identification of relevant European and national policy priorities, global scientific, technology and socio-economic trends and other dimensions was a multi-step process, from a literature review to the identification, analysis and processing of forward-looking issue and technology areas, to a survey of all European Partnerships. 39 out of 49 partnerships answered to the survey, including 9 of the 11 institutionalised partnerships.

2 RESULTS

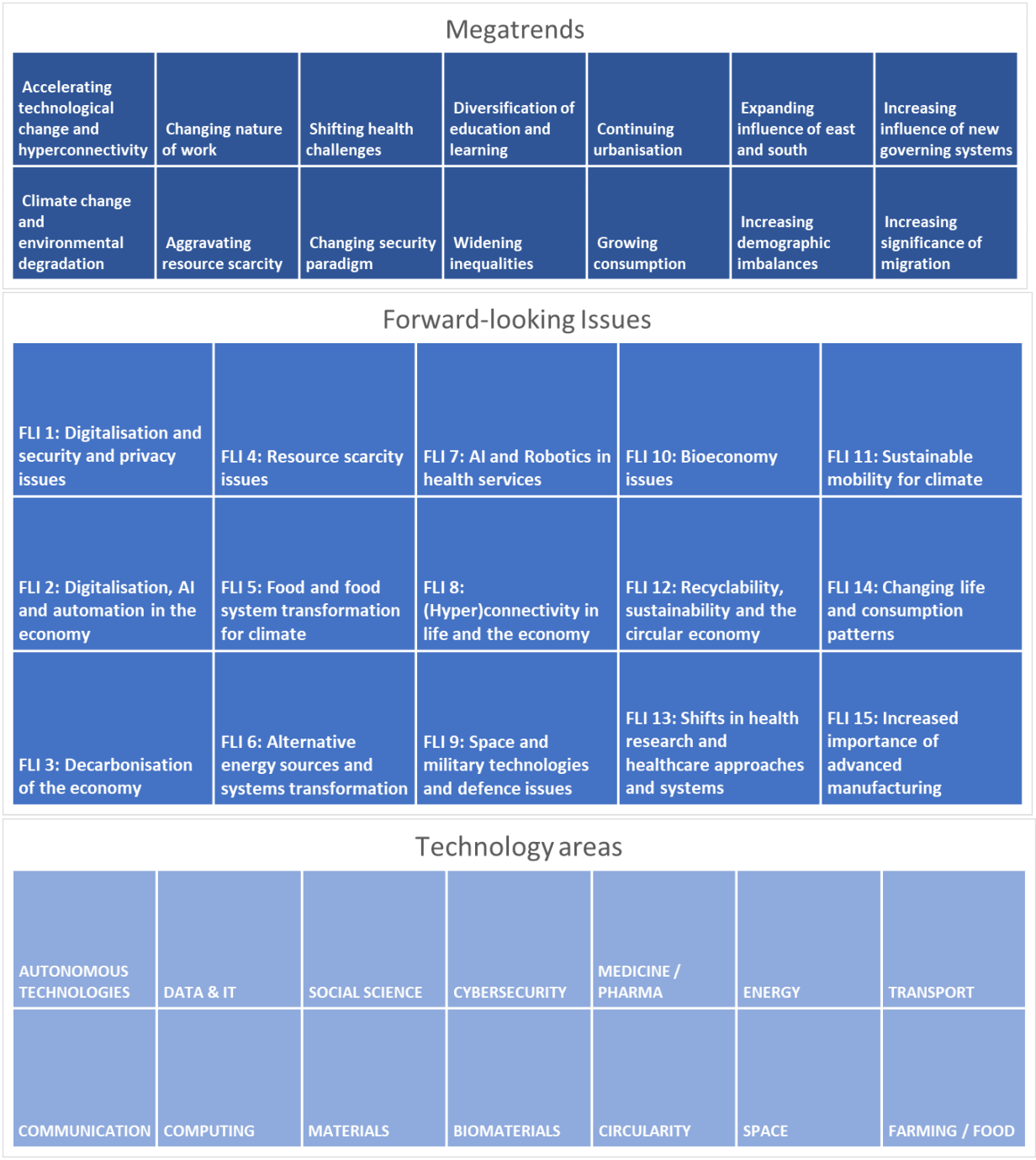
2.1 Relevance of the 8 areas for institutionalised partnerships

Assessing the relevance of the 8 areas for Institutionalised Partnerships listed in Annex VI requires considering them in the light of the current landscape of relevant European and national policy priorities, global scientific, technology and socio-economic trends. To this end, the independent expert group identified the factors shaping the landscape of current and future policy priorities. These factors were divided into three categories:

1. Megatrends: longer term drivers causing changes in the global socio-economic, environmental, and political context
2. Forward-looking issues (FLIs): emerging issues to be increasingly aware of and address
3. Technology areas

The analysis performed by the expert group resulted in the identification of 14 megatrends, 15 forward looking issues and 14 technology areas as potential current and future policy priorities. These dimensions were used to create a mapping of the landscape of priorities (the forward-looking issues), its drivers (the megatrends) and the means to address them (the technology areas) against which to assess the areas for institutionalised partnerships.

Figure 20: Overview of the megatrends, forward-looking issues and technology areas



Source: Expert Group on support of the coordinating strategic process for European Partnerships (2023)

Results from the study highlighted the influence of the megatrends on the partnership portfolio, thereby showing its dynamic nature and the need to assess its appropriateness regularly, in a changing global socio-economic, environmental, and political context. The mapping of the influence of megatrends on institutionalised partnerships notably showed that 'acceleration technological change and hyperconnectivity' and 'climate change and environmental degradation' are currently the most prominent drivers of the portfolio of institutionalised partnerships.

A good example of the dynamic nature of the partnership portfolio and the regular assessment of its appropriateness is the transformation of the Key Digital Technologies Joint Undertaking into the Chips Joint Undertaking to reinforce the Union's semiconductor

capacity by stimulating investment, strengthening the capabilities, adaptability and resilience of the Union's semiconductor supply chain.

The analysis of the list of areas for institutionalised partnerships against the 15 forward looking issues showed that each area for institutionalised partnerships relates to at least 5 of them, thereby demonstrating that they address current priorities and remain pertinent. The fulfilment of the set of criteria by these areas was already assessed by the above-mentioned impact assessment.

2.2 Comprehensiveness of the 8 areas for institutionalised partnerships

Assessing the comprehensiveness of the 8 areas for Institutionalised Partnerships listed in Annex VI requires considering whether new areas arisen requiring a response in the form of an institutionalised partnership.

The analysis of the list of areas for institutionalised partnerships against the 15 forward looking issues also brought to light that some identified challenges are not substantially addressed by the instrument, such as "Food and food systems transformation for climate". However, the gap analysis in the landscape of trends and priorities cannot be performed looking at institutionalised partnerships independently. Indeed, areas appearing as gaps may already be addressed via or more suitable for other instruments.

While acknowledging that the areas for institutionalised partnerships are broader in scope, the expert group analysed the coverage of priorities by the current institutionalised partnership themselves in order to reach a comparable level of granularity with other types of partnerships and EU Missions and extract additional trends.

Institutionalised partnerships address substantially about half of the identified Forward Looking Issues, including amongst the dominant ones 'Decarbonisation of the economy', 'Increased importance of advanced manufacturing' and 'Sustainable mobility for climate'. On the mapping of institutionalised partnerships only, a number of forward-looking issues appeared poorly addressed, such as 'Resource scarcity issues', 'Space and military technologies and defence issues' or 'Food and food system transformation for climate'. However, the mapping of the portfolio of all types of European partnerships against the same issues indicated that all were addressed to some extent by one of the three types of partnership. For instance, the 'Resource and scarcity issues' was identified as highly relevant by many non-institutionalised partnerships, such as the Agroecology partnership, Water4All or Processes4Planet. Similarly, the Photonics co-programmed partnerships indicated high relevance to 'Space and military technologies and defence issues', although this issue remains the least addressed of the 15. The comparison of the mapping of institutionalised partnerships with the portfolio of all partnership types therefore showed that the gap areas did not fulfil the second criterion for setting up Institutionalised Partnerships "Aims/goals or impacts needed to address the challenges are not expected to be fully met by other types of Partnerships".

Comparing the mapping of institutionalised and non-institutionalised partnerships allows to note that "Sustainable mobility for climate" and "increased importance of advanced manufacturing" seem to be significantly more addressed by institutionalised partnerships. Conversely, "Resource scarcity issues", "Food and food systems transformation for climate", "AI and Robotics in health services" and "Changing life and consumption

patterns" are significantly less addressed by institutionalised partnerships. This trend can in some cases be explained by the respective share (low or high) of institutionalised partnerships in a specific thematic (e.g. health, food, transport) compared to non-institutionalised. "Decarbonisation of the economy" is the most addressed issue in both cases, which is coherent with the EU Green Deal objectives.

The study showed that in terms of technology areas coverage, provides additional insight to analyse the above trends. Institutionalised partnerships appear to be most focused on enabling technologies, such as data and IT, computing and autonomous technologies, material and transport. These results echo findings from the BMR 2022, showing that horizontal partnerships - expected to develop methodologies and technologies for application in other priority areas - are typically proposed as institutionalised. It is most likely linked to the very nature of the instrument, whose criteria include the need for a long-term perspective in addressing the defined challenges (criterion 3), a higher degree of integration in the organisation of research in the area (criteria 4), and a systemic dimension (criteria 9 and 10).

2.3 Conclusions

The analysis of the areas for institutionalised partnerships demonstrated that the current list remains relevant in the current landscape of technological and social challenges, and that challenges not covered by these areas are addressed by other types of partnerships. The list of areas for institutionalised partnerships in Annex VI of the Horizon Europe regulation is considered suitable at this stage and will therefore be kept unchanged for the second half of the framework programme. Its suitability will be reassessed in the context of the next Framework Programme.

2.4 Forward-looking considerations

Taking a more strategic, coherent and impact-driven approach to R&I police requires taking a broader view than through the lens of a single type of instrument. It requires to analyse for a given issue and a broad toolbox of instruments, which one of them provides the best approach to address it.

Missions provide a structure to convene efforts and federate actions across programmes and actors towards a common objective. They notably aim to create a large-scale mobilisation of stakeholders and citizens, leading to a quicker and wider deployment of new solutions and technologies.

The partnership concept was developed with the objective of addressing the fragmentation and unnecessary duplication of research efforts and to increase public and private investment in research activities and enhance their impact. In Horizon Europe, partnerships are also expected to play a key role in achieving the EU's strategic objectives. By teaming up with both the public and private sectors, European Partnerships are expected to help speed up novel solutions and help achieve the green and digital transitions.

The review of Mission Areas and areas for institutionalised partnerships offers the opportunity to bring both the Mission and partnership instruments in the same picture, with

a view to analysing when should one approach be preferred to the other, how they complement and reinforce each other, and the potential synergies between them.

Missions and partnerships both share the same 3 most occupied forward-looking issues: decarbonisation of the economy, Changing life and consumption patterns and Bioeconomy issues, as well as their 2 least occupied forward-looking issues "Digitalisation and security and privacy issues" and "Space and military technologies and defence issues". These findings indicate that the topology of the sets of Missions and partnerships against the current landscape of priorities present significant similarities, showing that they operate under common objectives.

However, comparing their respective main technology areas revealed that partnerships develop primarily autonomous technologies, computing, and data, while Missions leverage biomaterials, social sciences and space. The dense IT dimension of partnerships seems to indicate that partnerships, more technology rich and horizontal in nature, are more prone to developing/exploiting a technology independently from the topic. The analysis of FLI and technology area coverage also reveals that Missions gravitate around matters 'closer to citizens', while partnerships rather focus on enabling technologies. These findings reflect the commonalities and complementarities of the Mission and partnership approaches.

The overlap of the forward-looking issues and complementarity of technology areas suggests that both instruments could be better coordinated to leverage their respective strengths (technology development versus framework conditions) to achieve what are ultimately common objectives. Missions should focus their efforts and resources on building and orchestrating the overarching framework in which these technological solutions come together with governance structures, individual/collective actions, and financial/economic measures to pave the way towards their objectives.

Table 23: Comparison of the mapping of EU Partnerships and EU Missions

	EU Partnerships			Missions		
Top 3 most occupied Megatrends	Climate change	Accelerating technology change	Shifting health change	Climate change	Aggravating resource scarcity	Continuing urbanisation
Top 3 most occupied FLIs	FLI 3: Decarbonisation of the economy	FLI 14: Changing life and consumption patterns	FLI 10: Bioeconomy issues	FLI 10: Bioeconomy issues	FLI 3: Decarbonisation of the economy	FLI 14: Changing life and consumption patterns
Top 3 most occupied technology areas	Autonomous	Computing	Data	Biomaterials	Social Science	Space
Bottom 3 least occupied Megatrends	Increasing demographic imbalance	Aggravating resource scarcity	significance of migration	Changing security paradigm	influence of east and south	significance of migration

Bottom 3 least occupied FLIs	FLI 6: Alternative energy sources and systems transformation	FLI 1: Digitalisation and security and privacy issues	FLI 9: Space and military technologies and defence issues	FLI 8: (Hyper)connectivity in life and the economy	FLI 1: Digitalisation and security and privacy issues	FLI 9: Space and military technologies and defence issues
Bottom 3 least occupied technology areas	Transport	Space	Farming	Medicine	Cyber-security	Communication

Source: Expert Group on support of the coordinating strategic process for European Partnerships (2023)

The comparison of the set of partnerships with the set of Missions in the landscape of policy priorities, global scientific, technology and socio-economic trends highlighted the complementarities and synergistic potential between the two instruments.

Missions and partnerships contribute to addressing common societal challenges and EU strategic objectives in a complementary way. On one hand, partnerships federate research efforts and resources to speed up the development of novel technical solutions, including solutions Missions need for the achievement of their targets. On the other hand, Missions provide a structure to convene efforts across programmes and actors, creating the enabling framework for the solutions developed by the partnerships to thrive and realise their impact.

Missions and partnerships sharing common objectives should therefore reinforce their cooperation to leverage the links between them and maximise impact. Coordinating their respective strategies to foster synergies in their efforts, bringing together public and private actors in R&I and beyond, building capacity of businesses and increasing their ability to absorb the knowledge and research results produced, Mission and Partnerships will join forces to drive societal transitions.

Annex A: Methodology for the assessment of EU Missions

The external study supporting the assessment of the EU Missions assessed the following key dimensions for each Mission:

- The Mission's goal and objectives;
- The selection process of each EU Mission;
- The Mission's governance structures and functioning arrangements;
- The progress towards the fulfilment of the Mission's objectives;
- The Mission' s budget and funding arrangements.

The assessment process was based on applying of set of primary and secondary research methods to address the five dimensions mentioned above.

Figure 21: Simplified overview of the methodological framework for the Mission assessment

Source: EFIS external study

In terms of secondary research, the study team has drawn on:

- Insights derived from a literature review of academic articles carried out for the five Missions. The full literature review is annexed to the final study report, which will be published during the summer of 2023;
- Evidence from desk research covering technical (e.g., economic, research and innovation, environmental) studies, policy reports and grey literature;
- Relevant data on funding (Horizon Europe, other EU level programmes, national or regional programmes, where available).

In terms of primary research, the following methods were applied to collect the views and opinions of a broad group of stakeholders: interviews, an online survey, Mission-specific policy workshops. The consultation of stakeholders targeted in particular:

- EC Commission services and Mission representatives (Mission secretariat, Mission managers, Mission owners' group);
- National and regional representatives of EU Missions' initiatives and networks in EU Member States;
- Mission Board representatives;
- Committee of the Regions;
- European Investment Bank;
- EU Member state representatives;
- Selected MEPs;
- National innovation agencies;
- National and pan-European research organisations and research networks;
- National and pan-European NGOs;
- Private sector representatives.

Interviews were conducted across all five Missions, including people involved in the design and management as well as stakeholders from European national and regional levels.

For the Climate Change Adaptation Mission:

- 13 Mission-specific interviews;
- 97 responses for the Adaptation to climate change Mission to the online survey;
- A policy workshop held on 12 April 2023 with 21 participants.

For the Cancer Mission:

- 13 Mission-specific interviews;
- interviews with stakeholders from European, national and regional levels;
- 107 responses for the Cancer Mission to the online survey;
- An online policy workshop held on 13 April 2023 with the participation of 28 stakeholders.

For the 'Oceans and Seas' Mission:

- 14 Mission-specific interviews;
- 73 responses for the Ocean and Waters Mission to the online survey;
- An online policy workshop held on 13 April 2023, attended by 21 participants.

For the Mission Climate neutral and smart cities:

- 14 Mission-specific interviews;
- 80 responses for the Cities Mission as part of the online survey;

- An online workshop held on 11 April 2023 which was attended by 24 participants.

For the Soil Mission:

- 13 Mission-specific interviews;
- 60 responses for the Mission Soil to the online survey;
- An online policy workshop held on 12 April 2023 with the participation of 24 stakeholders.

Annex B: Methodology for the review of Mission Areas

The Mission Areas were analysed taking account the current and future broad research and innovation (R&I), economic, social and environmental trends and factors. Five main research questions are addressed:

- How well does the definition of the five Mission Areas address the major challenges the EU faces?
- Is the key role of R&I in addressing the Mission Area challenges adequately explained?
- Has the relevance of the Mission Areas, as initially defined, changed over time given developments in the R&I, environmental, economic and social landscapes?
- Is there enough flexibility built into the Mission Area definition to adapt to such changes?

The research questions have been firstly informed by secondary research:

- Insights derived from a literature review of academic journal articles which was carried out across the five Mission Areas;
- Evidence from desk research covering technical (e.g. foresight, research and innovation analysis) studies, policy reports and grey literature;
- Review of relevant data on recent trends in socio-economic, environmental, health, etc. statistics.

In addition, the views and opinions on the continuing relevance of the Mission Areas and trends impacting the Mission Areas have been gathered from a broad group of stakeholders through:

- Selected interviews, including those carried out with selected experts with in-depth knowledge of specific topics or trends of the Mission Area (such as senior researchers from academic or research and technology organisations, experts from think tanks and specialist NGOs);
- The online survey, which included questions addressing the relevance and scope and opportunities for respondents to provide written comments;
- The views of the participants to five online policy workshops held during the week of 11 April 2023.

Annex C: Methodology for the review of areas for institutionalised partnerships

For the purpose of present study on identifying relevant European and national policy priorities, global scientific, technology and socio-economic trends for assessing the landscape of European Partnerships, the expert group adopted a mixed approach inspired by "technology landscape" and "horizon scanning" was developed and implemented.

The "technology landscape" approach is one of the most popular, besides "technology mapping", methodology to identify emerging future trends or emerging technologies as an element of foresight studies. The "technology landscape" approach is used to identify wider technology areas [(242)], which makes it more relevant for the present study.

Present approach has got inspiration from typical technology landscape maps, which connect technology drivers via specific dimension (e.g., Technology Readiness Level) with possible applications e.g. on the market. For the purpose of the study, this is translated into maps connecting global socio-economic trends, via technology areas in time-to-market space with technology / R&I areas occupied by existing or future European Partnerships. It creates a framework to capture the results of the collection and review of a number of foresight studies and other forecasts reports of future trends with data and information which could be collected on technology priorities of European Partnerships.

To complement the above approach and provide input for identification of emerging socio-economic trends and technologies, a "horizon scanning" methodology was deployed. It builds on the methodology and the material produced in the framework of an expert contract to support the Joint Research Centre (JRC) in mapping forward-looking elements that can affect the EU long-term objectives in 2020. The task assigned by the JRC to the experts was to scan available sources of information and mark the way(s) they affect/relate to the JRC megatrends and the EU policy areas (EU green deal, Economy that works for all, EU way of life, EU digital age, Strong EU in the world, EU democracy). During the scanning activity, a wide variety of documents were examined including e.g., academic papers, policy reports, posts in blogs or other sites, dedicated websites, etc.

Decoding how the issues addressed in the reports analysed, affected, or related to the megatrends and the current EU policies required an intelligent reading/scanning of the documents and other sources of information. Given the limitations of the scanning methods and the role of the human factor in creating, detecting, analysing, and interpreting emerging issues, the scanning results need to be treated with caution and cross-checked with other validating sources [(243)]. The outcome of the expert work under the JRC project, in a form

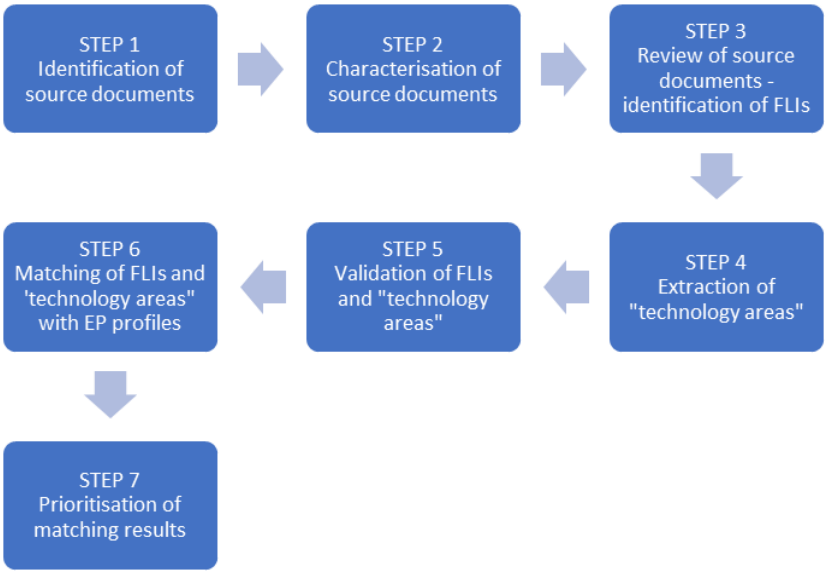
[(242)] Irene Spitsberg, Sudhir Brahmandam, Michael J. Verti & George W. Coulston (2013) Technology Landscape Mapping: At the Heart of Open Innovation, Research-Technology Management, 56:4, 27-35, https://www.tandfonline.com/doi/abs/10.5437/08956308X5604107

[(243)] Amanatidou, et a. 2012.

of the database collecting results of review of 60 forward looking reports, was a starting point and framework for the present study. In addition, the approach implemented for identification of relevant European and national policy priorities, global scientific, technology and socio-economic trends and other dimensions was organised as a multi-step process with several well-defined steps (see figure 22 below).

The detailed description of each step in the process is presented in Annex 1 of the expert group's report [(244)]. The summary of results in each step is presented below.

Figure 22: multi-step process for analysing European and national priorities, global scientific, technological, and socio-economic trends, and identifying relevant forward-looking issues (FLIs) and technology areas.



Source: Expert Group on support of the coordinating strategic process for European Partnerships (2023)

STEP 1 + 2

There were 76 relevant, trusted, and comprehensive documents reviewed - 60 originally reviewed under JRC projects and 16 identified under present studies - and characterised by several parameters (e.g., title, web link, source type, time horizon, publisher, relation to the EU policies etc.)

STEP 3

About 350 preliminary Forward Looking Issue (FLI) – policy, societal, economic, or technological topics – were identified and connected with the most relevant 14 Global

[(244)] DOI: 10.2777/62770
https://research-and-innovation.ec.europa.eu/system/files/2023-07/ec_rtd_assessing-ep-against-european-policy-priorities.pdf

Megatrends identified by the Megatrend Hub of the EC [245],and the most relate EU policy areas. Among them, there were 157 FLIs with technological relevance allowing to identify specific technology or technology area affected by the FLI. It implies a methodological bias, which results in underrepresentation of social and humanity issues among selected FLIs. In further steps it also implies underrepresentation of technologies and R&I topics related to mentioned areas.

STEP 4

There were 130 individual technology and R&I topics extracted from names and short descriptions of FLIs.

STEP 5

For the purpose of further analysis and graphical visualisation all FLIs and technology / R&I topics were reviewed to avoid duplication and connect similar issues. Final list of the 35 Forward-Looking Issues (grouped in 15 Thematic Groups) and 118 technology and R&I topics (grouped in 14 Technology areas) were defined.

STEP 6

The 14 Global Megatrends, 35 Forward-Looking Issues and 119 technologies and R&I topics (grouped in Technology areas) were matched through the Survey with the areas of interest of existing European Partnerships.

There were 34 European Partnerships (13 Co-funded, 8 Co-programmed, 9 Institutionalized, 3 EIT KICs) participating in the Survey, which provided a solid statistical base for further analysis.

To extend and validate the proposed methodology to other EU instruments the Missions were invited to participate in the Survey. All 5 Missions participated.

Participation of Missions in the Survey allows to check and analyse possible differences, which could be related to different nature of the instruments.

STEP 7

The Forward-Looking Issues, Thematic Groups of FLIs and Technology areas could be prioritised against different dimensions, e.g., relevance and/or impact on the EU policies, urgency of the EU needs, level of development/integration on the EU market, maturity of technology or distance to the market. The purpose of the prioritisation is to identify the top technological / challenge areas based on the dimensions described above, which is an important input for the decision-making process on the structure of the Partnership portfolio. It is particularly relevant in the context of identification of certain Groups of Areas as overpopulated or less addressed by the present European Partnership portfolio.

[245] The 14 Global Megatrends are listed and monitored under the Megatrend Hub run by the Knowledge4Policy (K4P), which is the EU Commission's platform for evidence-based policymaking. https://visitors-centre.jrc.ec.europa.eu/en/media/publications/megatrends-hub