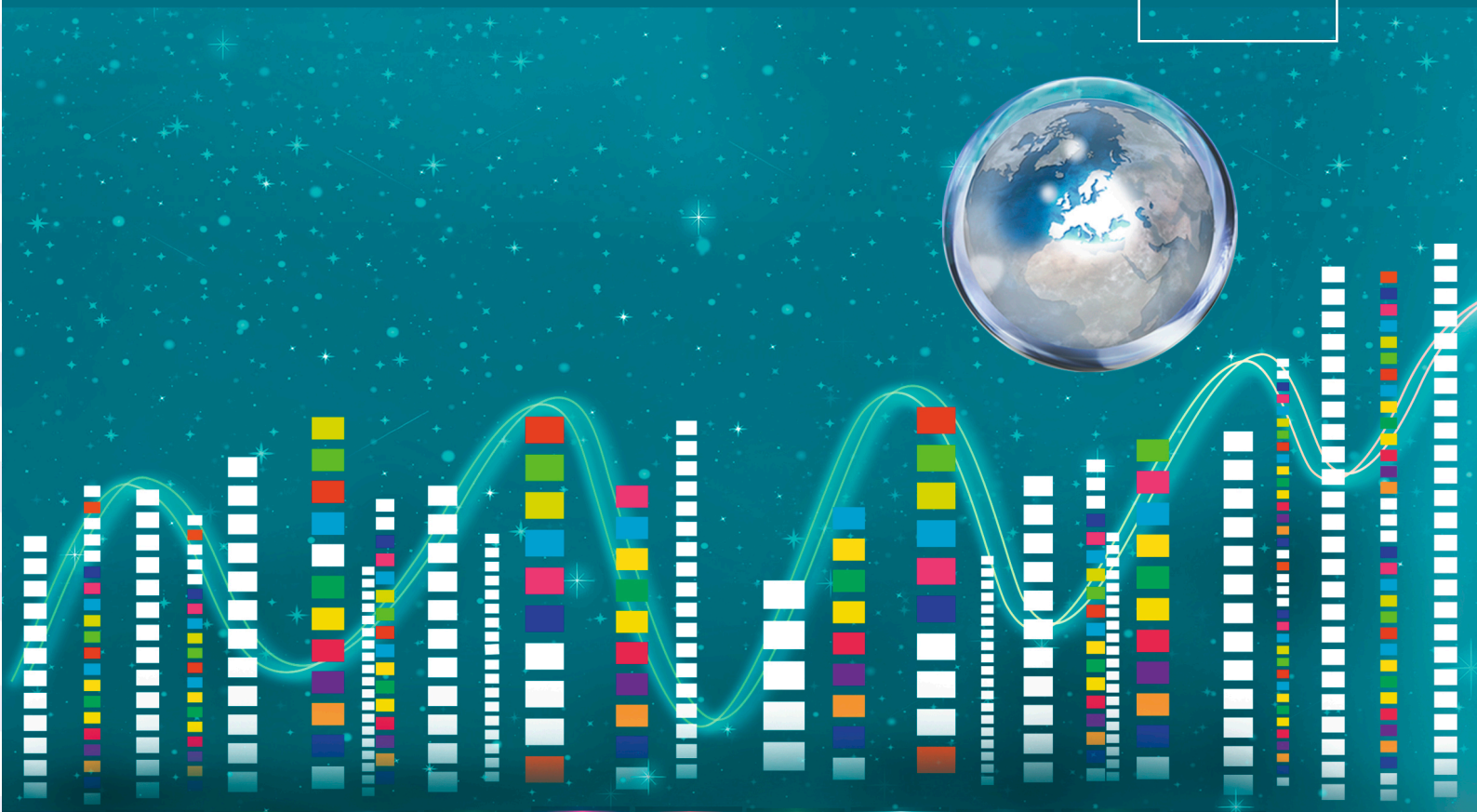
European Commission

Impact Assessment Study for Institutionalised European Partnerships under Horizon Europe

Independent
Expert
Report



Research and Innovation

Impact Assessment Study for Institutionalised European Partnerships under Horizon Europe

European Commission
Directorate-General for Research and Innovation
Directorate A — Policy & Programming Centre
Unit A.2 — Programme Analysis & Regulatory Reform
Contact Ann-Sofie Ronnlund
Email RTD-A2-SUPPORT@*ec.europa.eu*
Ann-Sofie.Ronnlund@*ec.europa.eu*
RTD-PUBLICATIONS@ec.europa.eu
European Commission
B-1049 Brussels

Manuscript completed in January 2020

Luxembourg: Publications Office of the European Union, 2020

PDF ISBN 978-92-76-17342-7 doi: 10.2777/295096 KI-01-20-182-EN-N

EUROPEAN COMMISSION

Impact Assessment Study for Institutionalised European Partnerships under Horizon Europe

In collaboration with

2020 Directorate-General for Research and Innovation EN

Table of Contents

Introduction

This Impact Assessment Study had the primary objective to support and provide input to the impact assessments of the first set of 13 European Institutionalised Partnerships based on Articles 185 and 187 of the Treaty on the Functioning of the EU (TFEU) that are envisaged to be funded under the new Framework Programme for Research and Innovation, Horizon Europe.

In addition, the Impact Assessment Study team contributed to future European policymaking on the overall European Partnership landscape by means of a horizontal analysis of the coherence and efficiency in the implementation of European partnerships. The purpose of this analysis was to draw the lessons learned from the implementation of the impact assessment methodology developed for this study and to formulate recommendations for the refinement and operational design of the criteria for the selection, implementation, monitoring, evaluation and phasing-out for the three types of European Partnerships. Finally, an impact modelling exercise was conducted in order to estimate the potential for longer-term future impacts of the candidate Institutionalised European partnerships in the economic and environmental sustainability spheres.

Technopolis Group was responsible for the overall coordination of the 13 specific impact assessment studies, the development of the common methodological framework, and the delivery of the horizontal analysis. It also conducted specific analyses that were common to all studies, acting as a 'horizontal' team, in collaboration with CEPS, IPM, Nomisma, and Optimat Ltd. For the implementation of the individual impact assessment studies, Technopolis Group collaborated with organisations that are key experts in specific fields covered by the candidate Institutionalised European Partnerships. These partner organisations were Aecom, Idate, Steer, Think, and Trinomics. Cambridge Econometrics took charge of the impact modelling exercise.

The Impact Assessment Study was conducted between July 2019 and January 2020. The 13 Impact Assessment Studies were conducted simultaneously, based upon a common methodological framework in order to maximise consistency and efficiency. The meta-framework reflected the Better Regulation Guidelines and operationalised the selection criteria for European Partnerships set out in the Horizon Europe Regulation. The 'Horizontal analysis of efficiency and coherence of implementation' was conducted in the same time period, building upon the information available on the 44 envisaged European Partnerships landscape as in May 2019, complemented with information on five envisaged European Partnerships as decided by the European Commission in October and November 2019.

This final report contains the reports of all individual impact assessment studies and the 'horizontal' analyses. It is structured in two parts, reflecting the two strands of analysis:

PART I. Impact Assessment Studies for the Candidate Institutionalised European Partnerships

1. Overarching context to the impact assessment studies

This report sets out the overall policy context and methodological framework underlying the impact assessment studies for the candidate Institutionalised European Partnerships. It describes the changes in approach to the public-private and public-public partnerships under Horizon Europe compared to the previous EU Framework Programmes. An example is the requirement that all envisaged European Partnerships be implemented as either co-programmed, co-funded or institutionalised. The impact assessment studies will consider these three scenarios as the different options to be assessed, in compliance with the Better Regulation guidelines and against the functionalities that the candidate partnerships are expected to fulfil. The report describes the common methodological framework to assess the envisaged initiatives accordingly. The report also presents the landscape of European Partnerships at the level of Horizon Europe Pillar 2 clusters, which lay the grounds for all

of the impact assessment studies except the candidate Institutionalised European Partnership for Innovative SMEs.

2. EU-Africa Global Health Candidate Institutionalised European Partnership

This initiative focuses on research and innovation in the area of infectious diseases, with a particular focus on sub-Saharan Africa. It will address the challenges of a sustained high burden of infectious diseases in Africa, as well as the (re)emergence of infectious diseases worldwide. Its objectives will thus be to contribute to a reduction of the burden of infectious diseases in sub-Saharan Africa and to the control of (re)emerging infectious diseases globally. It will do so through investments in relevant research and innovation actions, as well as by supporting the further development of essential research capacity in Africa. The study concluded that an Institutionalised Partnership under Art. 187 of the TFEU is the preferred option for the implementation of this initiative.

3. Candidate Institutionalised European Partnership on Innovative Health

This initiative focuses on supporting innovation for health and care within the EU. It will address the EU-wide challenges raised by inefficient translation of scientific knowledge for use in health and care, insufficient innovative products reaching health and care services and threats to the competitiveness of the health industry. Its main objectives are to create an EU-wide health R&I ecosystem that facilitates translation of scientific knowledge into innovations; foster the development of safe, effective, patient-centred and cost-effective innovations that respond to strategic unmet public health needs currently not served by industry; and drive cross-sectoral health innovation for a globally competitive European health industry. The study concluded that an Institutionalised Partnership based on Article 187 of the Treaty on the Functioning of the EU (TFEU) is the preferred option for the implementation of this initiative.

4. Candidate Institutionalised European Partnership in High Performance Computing

The initiative focuses on coordinating efforts and resources in order to deploy a European HPC infrastructure together with a competitive innovation ecosystem in terms of technologies, applications, and skills. It will address the challenges raised by underinvestment, the lack of coordination between the EU and MS, fragmentation of instruments, technological dependency on non-EU suppliers, unmet scientific demand, and weaknesses in the endogenous HPC supply chain. The initiative has as its main objectives to enhance EU research in terms of HPC and related applications, continued support for the competitiveness EU HPC industry, and fostering digital autonomy in order to ensure long-term support for the European HPC ecosystem as a whole. The study concluded that an Institutionalised Partnership is the preferred option for the implementation of this initiative as it maximises benefits in comparison to the other available policy options.

5. Candidate Institutionalised European Partnership in Key Digital Technologies

This initiative focusses on enhancing the research, innovation and business value creation of European electronics value chains in key strategic market segments in a sustainable manner to achieve technological sovereignty and ultimately make European businesses and citizens best equipped for the digital age. It will address the risks of Europe losing the lead in critical industries and services and emerging KDTs. It will also tackle Europe's limited control over digital technologies that are critical for EU industry and citizens. It has as main objectives to strengthen KDTs which are critical for the competitive position of key European industries in the global markets, to establish European leadership in emerging technologies with high socioeconomic potential and to secure Europe's technological sovereignty to maintain a strong and globally competitive presence in KDTs. The study concluded that the Institutionalised Partnership is the preferred option for the implementation of this initiative.

6. Candidate Institutionalised European Partnership in Smart Networks and Services

This initiative focuses on the development of future networks infrastructure and the associated services. This includes bringing communication networks beyond 5G and toward 6G capabilities, but also the development of the Internet of Things and Edge Computing technologies. It will address the challenges raised by Europe delay in the deployment of network infrastructure and failure to fully benefit from the full potential of digitalisation. It has as main objective to ensure European technological sovereignty in future smart networks and digital services, to strengthen the uptake of digital solutions, and to foster the development of digital innovation that answers to European needs and that are well aligned with societal needs. The study concluded that an institutionalised partnership under article 187 is the preferred option for the implementation of this initiative.

7. Candidate Institutionalised European Partnership in Metrology

This initiative focuses on metrology - that is the science of measurement and the provision of the technical infrastructure that underpins accurate and robust measurements throughout society; measurements that underpin all domains of science and technology and enable fair and open trade and support innovations and the design and implementation of policy and regulations. It will address challenges in the fragmentation of national metrology systems across Europe and the need to meet ever-increasing demands on metrology infrastructure to support the measurement needs of emerging technologies and important policy domains in climate, environment, energy and health. The main objective of the initiative is to establish a sustainable coordinated world-class metrology system in Europe that will increase and accelerate the development and deployment of innovations and contribute to the design and implementation of policy, regulation and standards. The study concluded that an A185 Institutionalised Partnership is the preferred option for the implementation of this initiative.

8. Candidate Institutionalised European Partnership on Transforming Europe's Rail System

This initiative focuses on the development of a pan-European approach to research and innovation in the rail sector. It will address the challenges raised by the lack of alignment of research and innovation with the needs of a competitive rail transport industry and the consequent failure of the European rail network to make its full contribution to European societal objectives. It will also strengthen the competitiveness of the European rail supply industry in global markets. Accordingly, the objectives of the initiative are to ensure a more market-focused approach to research and innovation, improving the competitiveness and modal share of the rail industry and enhancing its contribution to environmental sustainability as well as economic and social development across the European Union. The study concluded that an institutionalised partnership under article 187 is the preferred option for the implementation of this initiative.

9. Candidate Institutionalised European Partnership for Integrated Air Traffic Management

This initiative focuses on the modernisation of the Air Traffic Management in Europe - an essential enabler of safe and efficient air transport and a cornerstone of the European Union's society and economy. The proposed initiative will address the challenges raised by an outdated Air Traffic Management system with a non-optimised performance. The current system needs to be transformed to enable exploitation of emerging digital technologies and to accommodate new forms of air vehicle including drones. The objective is therefore to harmonise European Air Traffic Management system based on high levels of digitalisation, automation and connectivity whilst strengthening air transport, drone and ATM markets competitiveness and achieving environmental, performance and mobility goals. This would create €1,800b benefits to the EU economy if the current initiative can

be built on and accelerated. The study concluded that an Institutionalised Partnership under Art. 187 TFEU is the preferred option for the implementation of this initiative.

10. Candidate Institutionalised European Partnership on Clean Aviation

This imitative focuses on further aeronautical research and innovation to improve technology leading to more environmentally efficient aviation equipment. It will address the challenges raised by the growing ecological footprint of aviation and the challenges and barriers faced by the aviation industry towards climate neutrality. It will also strengthen the competitiveness of the European aeronautical industry in global markets. Accordingly, the objectives of the initiative are to ensure that aviation reaches climate neutrality and that other environmental impacts are reduced significantly by 2050, maintain the leadership and competitiveness of the European aeronautics industry and ensure safe, secure and efficient air transport of passengers and goods. The Impact Assessment study assessed the options for implementation that would allow for an optimal attainment of these objectives. The study concluded that an institutionalised partnership under Art. 187 TFEU is the preferred option for the implementation of this initiative.

11. Candidate Institutionalised European Partnership on Clean Hydrogen

The report assesses the impact of potential initiatives to support, through research and innovation, the growth and development of clean hydrogen, among which an Institutionalised European Partnership is one of the options assessed. The existing challenges for clean hydrogen include the limited high-level scientific capacity and fragmented research activities, the insufficient deployment of hydrogen applications, and consequently weaker EU scientific and industrial value chains. Environmental, health and mobility pressures are also driving the need for cleaner hydrogen generation, deployment and use. An initiative for clean hydrogen must have as a main objective the strengthening and integration of EU scientific capacities, to support the creation, capitalisation and sharing of knowledge. This is necessary to accelerate the development and improvement of advanced clean hydrogen applications, the market entry of innovative competitive clean solutions, to strengthen the competitiveness of the EU clean hydrogen value chains (and notably the SMEs within them), and to develop the hydrogen-based solutions necessary to reach climate neutrality in the EU by 2050. The study concluded that an Institutionalised Partnership under Art. 187 TFEU is the preferred option for the implementation of this initiative.

12. Candidate Institutionalised European Partnership on Safe and Automated Road Transport

This initiative focuses on Connected, Cooperative and Automated Mobility: the use of connected and automated vehicles to create more user-centred, all-inclusive mobility, while also increasing safety, reducing congestion and contributing to decarbonisation. With current road traffic collisions and negative local and global environmental impacts not reducing quickly enough, it will address the challenges raised by the current fragmentation of research across the field, and the threat to European competitiveness if the research agenda does not advance quickly enough. The initiative will focus on strengthening EU scientific capacity and economic competitiveness in the field of CCAM, whilst contributing to wider societal benefits including improved road safety, less environmental impact, and improved accessibility to mobility. The study concluded that a co-programmed partnership is the preferred option for the implementation of this initiative.

13. Candidate Institutionalised European Partnership for a Circular Bio-based Europe

This initiative focuses on intensifying research and innovation allowing to replace, where possible, non-renewable fossil and mineral resources with biomass and waste for the production of renewable products and nutrients, in order to drive forward sustainable and climate-neutral solutions that accelerate the transition to a healthy planet and respect

planetary boundaries. It will address the challenges raised by the fact that the EU economy does not operate within planetary boundaries, is not sufficiently circular and is predominantly fossil based. It will also address the insufficient research and innovation (R&I) capacity and cross-sectoral transfer of knowledge and bio-based solutions, as well as risks posed to the European bio-based industry's global competitiveness. The study concluded that Institutionalised European Partnership based upon Article 187 TFEU is the preferred option for the implementation of this initiative.

14. Candidate Institutionalised European Partnership for Innovative SMEs

The initiative is envisaged as a continuation of the Eurostars 2 programme which is managed by the Eureka network. The initiative focuses on international collaborative R&D of innovative companies, facilitated through a network of national funding organisations as included in the Eureka network. The funded projects are bottom-up and involve small numbers of project partners. The candidate partnership addresses a niche issue namely limited opportunities for international bottom-up collaboration. The partnership provides thus an opportunity for SMEs for international R&D collaboration but does not address specific technological, social, or environmental challenges. Its main objective is to improve the competitiveness of European SMEs through collaborative funding. The study concluded that a co-funded partnership is the preferred option for the implementation of this initiative.

PART II. Horizontal studies

1. Horizontal Analysis of Efficiency and Coherence in Implementation

The focus of this report is on the coherence and efficiency in the current European Partnership landscape under Horizon Europe and the potential to enhance efficiency in the European Partnerships' implementation.

European Partnerships are geared towards playing a pivotal role in tackling the complex economic and societal challenges that constitute the R&I priorities of the Horizon Europe Pillar II and are in a unique position to address transformational failures. Multiple potential interconnections and synergies exist between the candidate European Partnerships within the clusters, but few are visible across the clusters.

As for the improvement of the efficiency in implementation of institutionalised partnerships under Art. 187, potential efficiency and effectiveness gains could be achieved with enhanced collaboration. An option for a common back-office sharing operational implementation activities is worth exploring further through a detailed feasibility study in order to assess whether efficiency gains can be made. Ideally this would be co-designed as a common Partnership approach, leading to a win-win situation for all partners.

2. Impact Modelling of the Candidate Institutionalised European Partnerships

This report presents the results of the use of a macroeconomic model to assess the economic and environmental impacts of the preferred options identified in the individual 13 impact assessment studies. The model used is E3ME. It includes explicit representation for each EU Member State with a detailed sectoral disaggregation.

The impact modelling estimated the impacts of the envisaged initiatives at an aggregated as well as individual level. In total, 14 macroeconomic models have been run, one per reviewed initiative with a time horizon of 2035 and one that combines all initiatives with a time horizon of 2050. The results of each of these models were compared with those of a baseline scenario, which corresponds to a situation where the initiatives would be funded through regular Horizon Europe calls rather than European Partnerships.

EUROPEAN COMMISSION

Part II. Horizontal Studies

1. Horizontal Analysis of Efficiency and Coherence in Implementation

Authors

Bea Mahieu, Julien Chicot, Paul Simmonds (Technopolis Group)

Patries Boekholt (IPM)

Angus Hunter (Optimat Ltd)

2020 Directorate-General for Research and Innovation EN

Abstract

This document is the final report of the Impact Assessment Study for Institutionalised European Partnerships under Horizon Europe. The study was conducted from July to December 2019, under coordination of Technopolis Group.

The focus of this report is on the coherence and efficiency in the current European Partnership landscape under Horizon Europe and the potential to enhance efficiency in the European Partnerships' implementation.

European Partnerships are geared towards playing a pivotal role in tackling the complex economic and societal challenges that constitute the R&I priorities of the Horizon Europe Pillar II and are in a unique position to address transformational failures. Multiple potential interconnections and synergies exist between the candidate European Partnerships within the clusters, but few are visible across the clusters.

As for the improvement of the efficiency in implementation of institutionalised partnerships under Art. 187, potential efficiency and effectiveness gains could be achieved with enhanced collaboration. An option for a common back-office sharing operational implementation activities is worth exploring further through a detailed feasibility study in order to assess whether efficiency gains can be made. Ideally this would be co-designed as a common Partnership approach, leading to a win-win situation for all partners.

Executive Summary

This document is the final report of the Impact Assessment Study for Institutionalised European Partnerships under Horizon Europe. The study was conducted from July to December 2019, under coordination of Technopolis Group. In this report we assess the coherence and efficiency in the European Partnership landscape under Horizon Europe (as defined in December 2019) and investigate the potential to enhance efficiency in the European Partnerships' implementation, building upon the knowledge and experience gained during the impact assessment studies of the 13 candidate Institutionalised Partnerships in the context of this study.

Our mapping and analysis of the European Partnerships portfolio showed that the partnerships are geared towards playing a pivotal role in tackling the complex economic and societal challenges that constitute the R&I priorities of the Horizon Europe Pillar II. They address in particular the overarching EU policy priorities of the European Green Deal, a people-centred economy, the fit for the Digital Age, and a stronger Europe in the world. A key feature that distinguishes European Partnerships from other collaborative research instruments is the focus on the development of Strategic Research and Innovation Agendas (SRIA) that are shared and committed to by all partners in the partnership. It places European Partnerships in a unique position to address transformational failures. Addressing directionality failures through the development of shared visions on the goal and direction of the required system transformation process is at the core of the European Partnership policy instrument. All of the European Partnerships also find their rationales in addressing systemic failures. They aim at reducing the fragmentation in specific fields and technological systems and at integrating further nascent and disarticulated value chains in order to accelerate the development and diffusion of innovations.

In relation to the **coherence** of the European partnership landscape, multiple potential interconnections and synergies exist between the candidate European Partnerships within the clusters. There are, however, only a few potential interconnections across the clusters. In other words, clusters still act as silos. Exceptions to the rule are the technology- and methodology-oriented partnerships. We see a critical role for the European Commission services in enhancing collaboration and bridging the gaps in particular between the industry- and member states-led partnerships. The creation of a platform to facilitate networking and knowledge exchange opportunities between these partnerships, grouped in cross-cluster 'partnership focus areas', could be beneficial from this perspective.

We propose to centre the future **Criteria Framework** on the core processes and systems in the partnerships' management structure, distinguishing only between requirements set for the selection of the partnerships and those for implementation. This would not only clarify to the partnership consortia what is required from whom in the organisation, it would also provide guidance to the Commission officials which documents to consult in their oversight and monitoring function.

As for the improvement of the **efficiency** in implementation of institutionalised partnerships under Art. 187, potential efficiency and effectiveness gains could be achieved with enhanced strategic collaboration, i.e. taking advantage of the synergies and complementarities of R&I activities. For the future, an option could be that part of the operational functions that do not depend on the thematic context of a Partnership domain are joined up and provided by a formally established common back-office for all (or the majority) of JUs. Such a 'common back-office' option, sharing operational implementation activities, is worth exploring further to assess whether efficiency gains can be made. The implications for legal, financial and administrative aspects are complex and would need a detailed **feasibility study**. The feasibility study also would need to assess the appropriate relationships between the back office, the Joint Undertakings, the Commission services, the industrial partners and any third parties directly involved. The final legal structure for a common JU back office will need to be examined in due time. Ideally this would be co-designed as a common Partnership approach, leading to a **win-win situation** for all partners.

Table of Contents

List of Figures

List of Tables

1 Introduction

This document is the final report of the Impact Assessment Study for Institutionalised European Partnerships under Horizon Europe. The study was conducted from July to December 2019, under coordination of Technopolis Group.

In this report we assess the coherence and efficiency in the current European Partnership landscape under Horizon Europe and investigate the potential to enhance efficiency in the European Partnerships' implementation, building upon the knowledge and experience gained during the impact assessment studies of the 13 candidate Institutionalised Partnerships in the context of this study.

Chapter 2 focuses on the European Partnerships landscape. We summarise the key findings of the portfolio mapping and analysis conducted during the study, considering the functions and objectives of the European Partnerships and how they are intended to contribute to the achievement of the Horizon Europe objectives and priorities. The investigation of the linkages and potential interconnections between the currently envisaged partnerships allows us to draw conclusions and formulate recommendations to enhance future coherence and efficiency.

In Chapter 3 we consider the process for the decision-making on the European Partnerships, the definition of their modality of implementation and selection. Based upon our experience in the application of the specific selection criteria during the impact assessment studies, we contribute to the refinement and operational design of the criteria for the selection, implementation, monitoring, evaluation and phasing-out for the three types of European Partnerships. We formulate a proposal for an improved flow of the decision-making process and for the design of a new criteria framework as guidelines for the drafting of partnership proposals.

Chapter 4 contains the outcomes of our analysis identifying possible scenarios for the enhancement of the efficiency in the implementation of the Art. 187 Institutionalised Partnerships.

The report has the following Appendices:

- Appendix A: Key features of the partnership forms for implementation
- Appendix B: The taxonomy of failures requiring policy interventions that we used as framework for our analysis of the European Partnerships' functions
- Appendix C: The detailed outcomes of our portfolio mapping and analysis of the European Partnerships landscape
- Appendix D: The outcomes of the detailed analyses of the criteria for the selection, implementation, monitoring, evaluation and phasing out of the European Partnerships
- Appendix E: An overview of the methodological framework used for the impact assessment studies

2 Efficiency and Coherence of the European Partnership landscape

2.1 Analytical framework

The assessment of the efficiency and coherence of the envisaged European Partnership landscape under Horizon Europe relies on a meta-analysis of the positioning of the candidate institutionalised European Partnerships within this landscape and the broader European R&I environment. The analytical framework developed for this purpose allows for a sufficiently detailed view on the potential for overlaps and/or duplication among the European Partnerships and/or with other EU programmes to occur.

The meta-analysis critical dimensions which helped capture the rationales for the partnerships, their implementation modalities and modes of action, their positioning along the 'R&I pathway/ pipeline' and their functions in the related innovation systems. These dimensions include:

- **The R&I focus and objectives**. This relates directly to the strategic and specific objectives of the partnerships, including their intended contribution to the EU policy priorities and the Sustainable Development Goals (SDGs)

- **The targeted types of stakeholders**. They consist of the future partners as well as beneficiaries of the activities in these partnerships. The categories include research performing organisations, research funding organisations, industry, public administration bodies, end-users, etc –tailored to the specificities of each system considered

- **The type of research funded**. We use the Technology Readiness Level (TRL) categorisation as a proxy for the positioning of the partnerships along the 'R&I pathway' or 'research and innovation pipeline', thus illustrating the extent to which they can/should feed and build upon each other in the context of a specific thematic area/ R&I priority

- **The market, systemic and transformational failures addressed**. This intends to map the role or 'function' of the specific partnerships in the specific ecosystem. By using a common taxonomy of these failures[1], we set the basis for comparability and ultimately, indications of potential overlaps, complementarities and/or room for a more intense collaboration. For this purpose, the same taxonomy is used also in the individual Impact Assessment studies

Taking into account that partnerships may address multiple failures – and therefore have multiple expected impacts - and target multiple stakeholders in a single ecosystem, we used the thematic area or R&I priority that constitute the focus of a set of partnerships as the overarching dimension for our analysis. The analysis was conducted at the cluster level.

Overlaps may occur when partnerships with a similar R&I focus and funding similar types of research involve or target similar stakeholders along the value chain in the specific areas, addressing different failures. Duplications may occur when these partnerships address identical failures. Partnerships may be complementary when within a specific area, they have similar higher-level objectives but target different types of stakeholders, fund different types of research or address different failures.

This portfolio mapping mostly relied on the review of the description of the candidate European Partnerships provided by the European Partnership. The main source of information was the descriptive fiches of the initial 44 Partnerships prior to the Consultation

[1] Weber, K. Matthias, and Harald Rohracher (2012) 'Legitimizing Research, Technology and Innovation Policies for Transformative Change. Combining Insights from Innovation Systems and Multi-Level Perspective in a Comprehensive "failures" Framework'. *Research Policy* 41(6): 1037–47.

with the Member States in May 2019. The European Commission provided similar fiches for the five remaining partnerships, once it agreed with the Member States to add them to the list of candidates in October and November 2019. All the aforementioned dimensions were mapped for each the candidate European Partnerships exclusively based on these fiches.

The preliminary mapping produced based on the results of this desk research was, in a second step, complemented with the outcomes of the individual impact assessment studies and discussions with European Commission officials informed on the landscape of co-funded and co-programmed partnerships.

2.2 Positioning of the European partnerships in the Framework Programme

2.2.1 EU priorities for the period 2021-27

Horizon Europe is to be set in the broader context of the pronounced systemic and holistic approach taken to the design of the new Framework Programme and the overarching Multi-annual Financial Framework (MFF) 2021-27.

In her Political Guidelines for the next European Commission 2019 – 2024, the new President of the European Commission put forward six overarching priorities for the next five years, which reach well beyond 2024 in scope: A European Green Deal; An economy that works for people; A Europe fit for the Digital Age; Protecting our European way of life; A stronger Europe in the world; and A new push for European democracy. These priorities build upon A New Strategic Agenda for 2019–2024, adopted by the European Council on 20 June 2019, which targets similar overarching objectives. Together with the United Nations Sustainable Development Goals (SDGs), they will shape future EU policy responses to the challenges Europe faces and will steer the ongoing transitions in the European economy and society.

The MFF 2021-27 strives to provide a framework that will ensure a more coherent, focused and transparent response to Europe's challenges. A stronger focus on European added value, a more streamlined and transparent budget, more flexibility in order to respond quickly and effectively to unforeseen demands, and above all, an effective and efficient implementation are among the key principles of the MFF. The objective is to strengthen the alignment with Union policies and priorities and to simplify and reform the system in order to "unlock the full potential of the EU budget" and "turn ambitions into reality". The intention is to combine investment from multiple programmes in order to address key cross-cutting priorities such as the digital economy, sustainability, security, migration, human capital and skills, as well as support for small businesses and innovation.[2]

These principles underlying the MFF 2021-27 are translated in the intent for Horizon Europe "to play a vital role, in combination with other interventions, for creating new solutions and fostering innovation, both incremental and disruptive."[3]. The new Framework Programme finds its rationale in the daunting challenges that Europe is facing, which call for "a radical new approach to developing and deploying new technologies and innovative solutions for citizens and the planet on a scale and at a speed never achieved before, and to adapting our policy and economic framework to turn global threats into new opportunities for our society and economy, citizens and businesses."

In the Orientations towards the first Strategic Plan for Horizon Europe, the need to strategically prioritise and "direct a substantial part of the funds towards the areas where

[2] European Commission (2018) *A Modern Budget for a Union that Protects, Empowers and Defends. The Multiannual Financial Framework for 2021-2027*. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2018) 321 final.

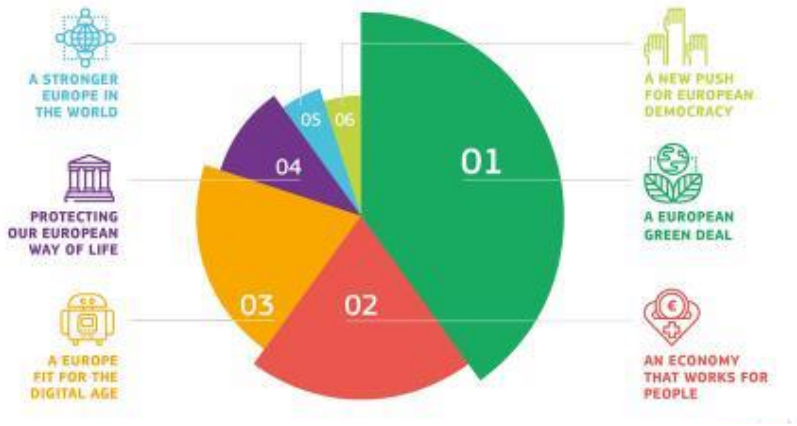
[3] European Commission (2019) *Orientations towards the first Strategic Plan for Horizon Europe*.

we believe they will matter the most" is emphasised. The Orientations specify, "Actions under Pillar II of Horizon Europe will target only selected themes of especially high impact that significantly contribute to delivering on the political priorities of the Union."

Figure 1, below, gives an indicative overview of how the EU political priorities are supported under Horizon Europe. It shows the major emphasis placed on contributing to the priority 'A European Green Deal', aimed at making Europe the first climate-neutral continent in the world. At least 35 % of the expenditure from actions under the Horizon Europe Programme will address the Sustainable Development Goal 13: Climate Action.

Especially the R&I activities funded under Pillar II, including seven Partnership Areas (see below), are expected to contribute to the attainment of these objectives, in an interconnected manner.

Figure 1: Targeted impacts under Horizon Europe by priority



Note: Preliminary, as described in the General orientations towards the first Strategic Plan implementing Horizon Europe. Source: European Commission (2019) Orientations towards the first Strategic Plan for Horizon Europe, December 2019.

2.2.2 European Partnerships under Horizon Europe

The Horizon Europe Regulation (common understanding) defines European Partnerships as "*an initiative where the Union, prepared with early involvement of Member States and/or Associated Countries, together with private and/or public partners (such as industry, universities, research organisations, bodies with a public service mission at local, regional, national or international level or civil society organisations including foundations and NGOs), commit to jointly support the development and implementation of a programme of research and innovation activities, including those related to market, regulatory or policy uptake*."[4]

It stipulates that "parts of Horizon Europe may be implemented through European Partnerships" and establishes three forms of European partnerships: Co-programmed European Partnerships, Co-funded European Partnerships, and Institutionalised European Partnerships in accordance with Article 185 or 187 TFEU or in compliance with the EIT Regulation. Art. 8 of the regulation describes the key features of these partnership types.

Table 1, below, lists the main distinguishing elements for the different forms of implementation of the partnerships. A more complete description is provided in Appendix A to this report.

[4] Council of the European Union (2019) *Proposal for a Regulation of the European Parliament and of the Council establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rule for participation and dissemination*. Common understanding 7942/19.

Table 1: Distinctive features of the different partnership types

Partnership type	Key features
Co-programmed European Partnership (CP)	This form of European Partnership is based upon a *Memorandum of Understanding* or a *Contractual Arrangement* signed by the European Commission and the private and/or public partners. Private partners are typically represented by one or more industry association, which also functions as a back-office to the partnership. It allows for a *high flexibility* in the profile of organisation involved, objectives pursued, and/or activities implemented. Co-programmed European Partnerships address *broader communities* across a diverse set of sectors and/or value chains and where the actors have *widely differing capacities and capabilities*. They may encompass one or more associations of organisations from industry, research, NGOs etc as well as foundations and national R&I funding bodies, with no restriction on the involvement of international partners from Associated and non-associated third countries. Different configurations are possible: private actors only, public entities only, or a combination of the two.
Co-funded European Partnership (CF)	The Co-funded Partnership is based on a *Grant Agreement* between the Commission and the consortium of partners, resulting from a call for a proposal for a programme co-fund action implementing the European Partnerships in the Horizon Europe Work Programme. Programme co-fund actions provide co-funding to a programme of activities established and/or implemented by entities managing and/or funding research and innovation programmes. Therefore, this form of implementation only allows to address public partners at its core (comparable to the Article 185 initiatives below), while industry can nevertheless be addressed by the activities of the partnerships, but not make formal commitments and contributions to it.
Institutionalised European Partnership (IP)	This type of Partnership is the most complex and high-effort arrangement and will be based on a Council Regulation (Article 187) or a Decision by the European Parliament and Council (Art 185) and implemented by dedicated structures created for that purpose. The legal base for this type of partnership limits the flexibility for a change in core objectives, partners, and/or commitments as these would require amending legislation. The partnership members have a high degree of autonomy in developing the strategic research agenda and annual work programmes and call topics, based on a transparent and accessible process, and subject to the approval of the Commission Services. The choice of topics addressed in the (open) calls are therefore strongly aligned with the needs defined.
Institutionalised Partnerships based upon Art 185 TFEU	Article 185 of the TFEU allows the Union to participate in *programmes jointly undertaken by Member States* and limits therefore the scope of partners to Member States and Associated Third countries.
Institutionalised Partnerships under Art. 187 TFEU	This type of Institutionalised Partnership brings together a stable set of partners with a strong commitment to taking a more integrated approach and requires the set-up of a dedicated legal entity (Union body, Joint Undertaking) that carries full responsibility for the management of the partnership and implementation of the calls. Different configurations are possible: partnerships focused on creating strategic industrial partnerships where, most often, the partner organisations are represented by one or more industry associations, or in some cases individual private partners; partnerships coordinating national ministries, public funding agencies, and governmental research organisations in the Member States and Associated Countries; or a combination of the two (the so-called tripartite model).

All European Partnerships will be designed in line with the new policy approach for more objective-driven and impactful partnerships. All European Partnerships will be based on a Strategic Research and Innovation Agenda / roadmap agreed among partners and with the Commission. For each of them the objectives, key performance and impact indicators, and outputs to be delivered, as well as the related commitments for financial and/or in-kind contributions of the partners will be defined ex-ante.

European Partnerships are expected to adhere to the "principles of Union added value, transparency, openness, impact within and for Europe, strong leverage effect on sufficient scale, long-term commitments of all the involved parties, flexibility in implementation, coherence, coordination and complementarity with Union, local, regional, national and, where relevant, international initiatives or other partnerships and missions." In Annex III of the Regulation, a set of principles and criteria are set out for the selection and implementation of the European Partnerships along these principles, as well as for their monitoring, evaluation and phasing-out.

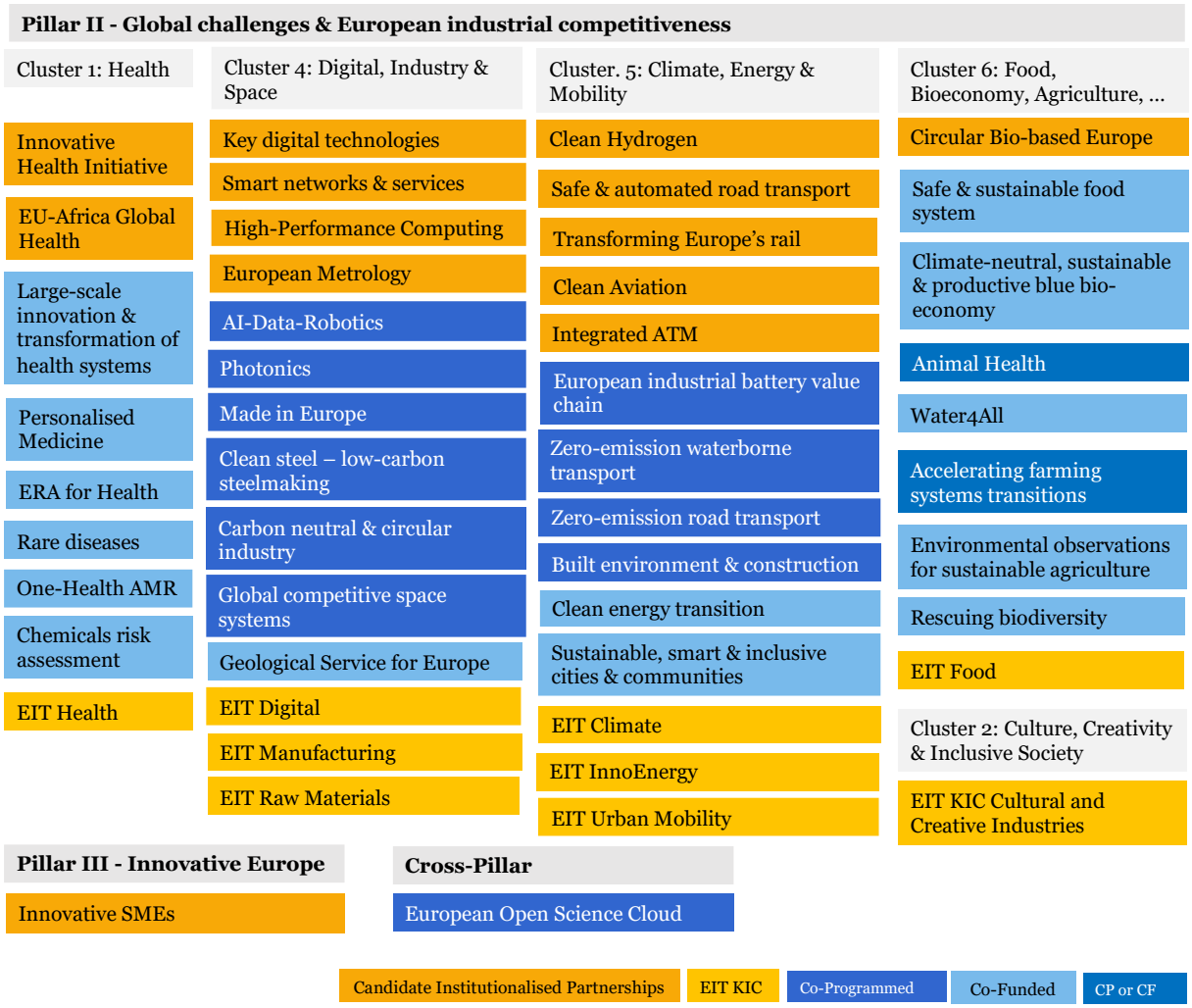
The European Partnerships are **firmly set within the context and structure of the Framework Programme**. Most of the candidate European Partnerships relate and contribute to R&I activities funded under the Horizon Europe Pillar II – Global Challenges and European industrial competitiveness, and a specific cluster within that Pillar– even though several partnerships are of relevance to multiple clusters. The exceptions are the candidate Institutionalised Partnership for Innovative SMEs which finds its allocation in Pillar III – Innovative Europe, and the cross-pillar European Open Science Cloud partnership (see Figure 2, below).

The candidate European Partnership portfolio currently encompasses 49 partnerships.

There are only three partnerships for which implementation as an Institutionalised Partnership under Art. 185 is an option, i.e. European metrology, the EU-Africa Global Health partnership, and Innovative SMEs. Ten partnerships are candidates for Institutionalised Partnerships under Art. 187. Fourteen partnerships are candidate Co-funded ones, eleven partnerships are proposed as Co-programmed ones, and for two partnerships the proposed form for implementation still needs to be decided upon (Co-funded or Co-programmed).

Candidate Institutionalised Partnerships under Art 187 and Co-programmed Partnerships are concentrated in the more technology- and industry-oriented Cluster 4 (Digital, Industry and Space) and Cluster 5 (Climate, Energy and Mobility). Co-funded Partnerships prevail in Cluster 1 (Health) and Cluster 6 (food, bioeconomy, natural resources, agriculture & environment).

Figure 2: Current landscape of candidate European Partnerships (2019)



Source: European Commission (2019) Orientations towards the first Strategic Plan for Horizon Europe, December 2019.

2.2.3 Contribution to the Horizon Europe priorities and objectives

Our mapping and analysis of the European Partnerships portfolio, reported in detail in Appendix C, show that the partnerships are geared towards playing a pivotal role in tackling the complex economic and societal challenges that constitute the R&I priorities of the Horizon Europe Pillar II. The European Partnerships address in particular the overarching EU policy priorities of the European Green Deal, a people-centred economy, the fit for the Digital Age, and a stronger Europe in the world.

Figure 3, below, shows the R&I priorities in the specific clusters to which the partnerships are expected to contribute in a particularly intensive manner, thanks to the funding of *Institutionalised* Partnerships covering the specific intervention areas.

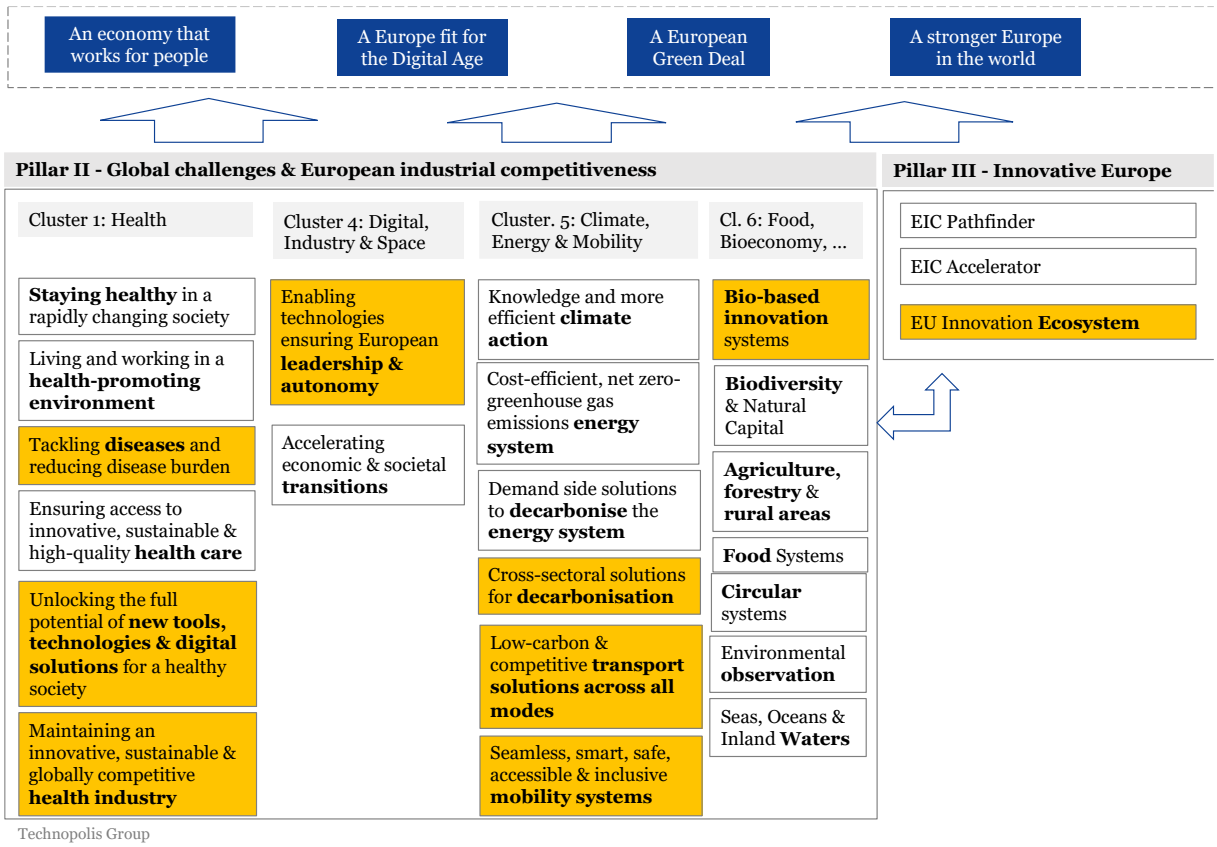
The December 2019 *Orientations towards the first strategic plan of Horizon Europe* do not envisage any European Partnership under Cluster 2 (Culture, creativity and inclusive society) and Cluster 3 (Civil security for society). Nevertheless, the European Commission agreed with the Member States in October 2019 on adding cultural and creative industries as a priority field for a new KIC in the Strategic Innovation Agenda of the European Institute of Innovation and Technology (EIT) 2021-2017.

The Innovative SMEs partnership is the single candidate institutionalised European Partnership proposed outside Pillar 2. It will instead contribute to building an "innovative Europe" under Pillar 3 whose ambition is to reinforce the synergies between research and

education organisations, entrepreneurs and the business sector (including SMEs), among other actors. Attention is placed on improving the European ecosystems such that they become more supportive to the development and deployment of disruptive and market-creating innovations. In parallel of other initiatives, such as the European Innovation Council, the Innovative SMEs partnerships will support cross-border research and innovation projects driven by SMEs (without any top-down thematic prerequisite) to help them expand further their markets and thereby accelerate the deployment of innovative solutions for the benefits of all citizens across Europe.

Finally, the European Commission proposes pursuing the European Open Science Cloud initiative as a cross-pillar partnership under Horizon Europe, in line with the cross-pillar objective of mainstreaming open science and making it "the new modus operandi for EU research and innovation"[5].

Figure 3: Major contribution of the candidate institutionalised European Partnerships to the Horizon Europe objectives and priorities (2019)



Technopolis Group

In the **Health cluster**, the portfolio of envisaged European Partnerships aim at contributing to all of the R&I orientations in the cluster, with however a more pronounced focus on the '*tackling diseases and reducing the disease burden*' objective, which is addressed by five out of the ten partnerships (amongst which one candidate Institutionalised Partnership). Objectives aimed at an improved exploitation of digital solutions and competitiveness of the EU health-related industry are addressed by two partnerships amongst which one candidate Institutionalised Partnership.

The European Partnerships provide only limited support for the assessment of environmental and social health determinants, uniquely addressed from a chemical risks' perspective.

[5] European Commission (2019) Orientations towards the first Strategic Plan for Horizon Europe.

In the **Digital, Industry and Space cluster**, the key R&I priorities are grouped in two broad categories: (I) Enabling technologies ensuring European leadership and autonomy; and (II) Accelerating economic and societal transitions. The majority of the partnerships directly contribute to the first strand of priorities. All of the Partnerships show a strong involvement of industry. Partnerships envisaged to support R&I in specific intervention areas, such as advanced manufacturing, are mainly co-programmed partnerships. Candidate Institutionalised Partnerships are in the digital sphere and metrology. Most of the partnerships are also long-standing initiatives, building upon partnerships existing under Horizon 2020 or even FP7 and on the work of one or more European Technology Platforms (ETPs). The major exception is the partnership 'Global competitive space system', focusing on space technologies.

The main objectives of the **Climate, Energy and Mobility cluster** are to fight climate change, improve the competitiveness of the energy and transport industry as well as the quality of the services that these sectors bring to society. There are 14 candidate Partnerships that align with this cluster of which eight (including five Article 187 initiatives and three EIT-KICs) are possible Institutionalised Partnerships. There are no candidate Article 185 Partnerships in this cluster. The others are envisaged as either Co-programmed and/or Co-funded Partnerships.

There is a strong orientation of the possible Institutional Partnerships towards the mobility area and more limited direct synergies between the envisaged Partnerships and the 'climate science & solutions' priority. Of course, the climate change challenge underpins the whole of this cluster, except where the focus is on industrial competitiveness, but this will also be at least partially dependent on innovation related to clean energy and mobility products and services.

The key objective of Cluster 6, '**Food, Bioeconomy, Natural Resources, Agriculture and Environment'** is to advance knowledge, expand capacities and deliver innovative solutions to accelerate the transition towards the sustainable management of natural resources (such as biodiversity, water and soils). The cluster has a large realm and aims to address a wide range of challenges relating to climate change, biodiversity and ecosystems, natural resources, and the production and consumption patterns that may affect them.

The proposed portfolio of partnership covers the full range of R&I orientations under Cluster 6. All but one of the proposed partnerships contribute at least to some extent to orienting R&I activities towards the development of food systems that will ensure both sustainable and healthy diets and food and nutrition security for all. The food system has an impact on several challenges. It directly relates to nutrition and diets, access to food, food security, and has an influence on the use of natural resources, water and soil pollution, climate change. Food waste is a key component of circular systems and biomass has strong potential to offer bio-based energy solutions. Finally, the transformation of food systems should take into consideration demographic changes and the accelerating urbanisation (which reduces lands available for food production but offers opportunities for new types of agriculture such as urban farming).

Two R&I orientations are covered by less than half of the proposed partnerships: Environmental Observations (even though achievement in this area could make significant contribution to the other areas) and Bio-based innovation systems (which is nevertheless at the core of the candidate Institutionalised Partnership for a Circular Bio-based Europe).

2.3 Functions of the European Partnerships

The Horizon Europe Regulation provides little information on the purpose and function of the European Partnerships, beyond the indicated expectation that they will demonstrate that they are

"more effective in achieving the related objectives of the Programme through involvement and commitment of partners, in particular in delivering clear impacts for the EU and its citizens, notably in view of delivering on global challenges and research and innovation objectives, securing EU competitiveness, sustainability and contributing to the strengthening of the European Research and Innovation Area and, where relevant, international commitments."

In order to have a more precise indication on the expected added value of the European Partnerships and their function as a policy instrument under Horizon Europe, we set out the context of the international practice in the use of public-private and public-public partnerships for research and innovation and the recent history of these partnerships in the Framework Programmes (Section 2.3.1). In Section 2.3.2 we summarise the findings of our portfolio analysis, mapping out the rationale for the current European Partnerships. The full analysis is available in Appendix C to this report. Based on these inputs and contexts, we draw up the intervention logic for the European Partnership as policy instrument in Section 2.3.3.

2.3.1 Partnerships in the international context and the Framework Programmes over time

In the international practice as well as R&I policy literature, a distinction is made between public-private and public-public partnerships.

Public-private partnerships (PPPs) and public-to-public partnerships (P2P) became part of the EU policy mix for R&I in the beginning of the 2000s after the adoption of the Lisbon strategy and the introduction of the European Research Area (ERA). A key notion in the ERA intervention logic was that a more coordinated implementation of national and European research and innovation programmes would lead to an increased scientific, managerial and financial integration of European research and innovation. Interoperable and integrated national research systems would allow for better flows of knowledge, technology and people.

Public-to-public partnerships were intended to facilitate this process by addressing fragmentation in the R&I landscape and reducing duplication of efforts. They were also a tool to encourage alignment of policy objectives within the European research and innovation area. The Expert Group conducting a meta-evaluation of the Art 185 partnerships under Horizon 2020 considered, "Article 185 initiatives aim at addressing common challenges in specific research areas by creating economies of scale and synergies between national and EU research programmes and investments. Their ambition is to achieve scientific, managerial and financial integration amongst national research programmes in a given field. What sets them apart from other 'partnering' initiatives is their long-term perspective, the scale of national co-funding and their international visibility." [6]

Public-private partnerships, instead, had two main objectives: to address the fragmentation of research efforts between the private and public sector and across borders, and to increase public and private investment in research. They were technology-oriented and centred around the European Technology Platforms (ETPs). They were designed to stimulate a pooling of resources between the EU, the private sector and the Member States and strongly motivated by a wish to improve international competitiveness of industries - and as of 2010, to tackle emerging societal challenges.[7]

A recent Horizon 2020 Policy Support Facility report highlighted that the strategic importance of these partnerships goes beyond the traditional reasons research-industry collaboration schemes because of their "longer-term, horizontal commitments frequently

[6] European Commission (2017) Meta-evaluation of Article 185 initiatives – Report of the Expert Group

[7] EPRS (2017) Public-private partnerships in research, Briefing

to address strategic and challenge-driven questions with a long-term vision connecting with governmental priorities. They are horizontal multi-partner arrangements, often among otherwise competing partners, that have a unifying goal."[8] As the OECD points out, "the drivers behind the rise of strategic PPPs include the need for business to reduce risk and uncertainty in cutting edge technologies and for governments to achieve more from research investments at times of budgetary constraints."[9]

2.3.2 Rationale for the European Partnerships under Horizon Europe

Our analysis of the rationale for the European Partnerships under Horizon Europe departed from the concept that R&I policy interventions find their justification in the need to rectifying 'failures' in the research and innovation system. These may range from 'market failures' (e.g. private firms investing a socially sub-optimal amount in research) going on to failures in the way our research and innovation systems work ('systemic failures') and culminating in the need to find ways to reach beyond market forces and intervene to address the societal challenges by fostering systemic transitions ('transformational failures').[10]

Seeing the key function of strategic R&I partnership instruments to foster integration and long-term collaborations, it bears no surprise that all of the European Partnerships find their main rationales in addressing **systemic failures** – independently of their form of implementation.

The European Partnerships intend primarily to solve **network failures**. Many candidate Partnerships aim at reducing the fragmentation of the European R&I landscape in specific fields and technological systems and at integrating further nascent and disarticulated value chains in order to accelerate the development and diffusion of innovations. This is especially the case for Partnerships in Cluster 4 (Digital, Industry, Space) where the most common systemic failures relate to insufficient collaboration between systems actors and poorly integrated value chains – or the need to integrate extended ecosystems in order better to exploit emerging opportunities.

Fragmented value chains or dysfunctional systems affecting the development of innovative solutions are systemic failures that also most of the Partnerships under Cluster 5 (Climate, Energy, Mobility) are facing. Some intend to stimulate collaboration and ensure the proper functioning of innovative cycles that will enable the development and market introduction of innovation and ensure the European industrial leadership in batteries, hydrogen technologies and built environment. In other sectors, the complexity of the underpinning systems in terms of number and types of actors calls for partnerships to encourage collaboration and avoid unnecessary duplication of research and innovation efforts. This is particularly relevant for initiatives relative to transport technologies and systems, such as road transport, railway, aircraft, air traffic management systems, and shipping.

The lack of coordination across sectors and between all relevant stakeholders are issues that are most common among the proposed partnerships in the Health cluster. In Cluster 6 (Food, Bioeconomy, etc), systemic failures also relate most commonly to fragmented and potentially duplicate research and innovation efforts and insufficiently integrated value chains. Four of them intend to increase collaboration between the different system and value chain actors and pool resources in order to accelerate the development of innovative solutions.

[8] Terttu Luukkonen, Erik Arnold, Carlos Martínez Riera , Mutual Learning exercise, Evaluation of Complex PPP Programmes in STI, Horizon 2020 Policy Support Facility, 2017

[9] Organisation for Economic Co-operation and Development (2014) Strategic public/private partnerships in science, technology and innovation – Final Report, Working Party on Innovation and Technology Policy

[10] The taxonomy of failures requiring policy intervention that was used for this analysis is provided in Appendix B

Pooling resources and research and innovation efforts is expected also to address **capability failures** and help creating **critical mass** and avoid unnecessary duplication of research efforts. The candidate EU-Africa Global Health partnership (IP, 185) and the Partnership on Rare Diseases (CF), for example, explicitly address the need for an enhanced critical mass in the field of infectious diseases, while the candidate partnership on Personalised medicine (CF) aims at capitalising on existing efforts in order to reach the necessary critical mass at the EU level and bring personalised medicine to the clinic. In Cluster 6 (Food, Bioeconomy, etc), the mitigation of biodiversity loss is a challenge cross-cutting many sectors beyond the exploitation of natural resources. Several candidate partnerships, such as those on Blue economy, Accelerating farming systems transitions, Water for all and Food systems, integrate European research and innovation efforts geared towards rescuing biodiversity to safeguard life on Earth and aim at contributing to a better understanding of ecosystems and the development of solutions to safeguard biodiversity.

Capability failures in terms of **knowledge absorption or skills shortages** are observable especially in fast-growing technologies and sectors such as ICT (for example in the photonics and high-performance computing partnerships). The EU-Africa Global Health candidate partnership (IP, 185) explicitly addresses the inadequate capacity for clinical research in disease-endemic countries. In general, however, these are failures that especially the EIT Knowledge and Innovation Communities (KICs) address, gathering, among others, education and training organisations with a view of solving skills shortage and increasing absorption capacities of European businesses. EIT KIC Digital, for example, aims to foster collaboration between research organisations, education and training institutions in order to improve digital skills. The other two EIT KICs in Cluster 4 pursue the same objective but in their respective fields – raw materials and manufacturing.

Finally, in some instances, European Partnerships also set up common infrastructures in order to strengthen the evidence base for innovative solutions, thus addressing **infrastructure failures**, often at the international level. The candidate partnership Accelerating farming systems transitions (CF) in Cluster 6, for example, intends to support the development of experimental platforms for co-creation of sustainable farming practices, while the partnership for Environmental observations for sustainable agriculture (CF) aims at implementing a shared infrastructure for the exchange of standardised earth and environmental observation data. In Cluster 1 (Health), the Rare Diseases candidate partnership (CF) addresses the need to enhance the capacity for collecting and sharing all relevant rare disease data at EU and international level, while the Chemicals risk assessment partnership (CF) aims at pushing forward the uptake of research results into chemical regulatory processes by strengthening the science-policy interface and the global evidence base for chemicals. This partnership is also one of the few that explicitly indicates **institutional failures** (i.e. failures related to regulatory frameworks) in its rationale. Another partnership is the Smart networks and services one (IP, 187) in Cluster 4, indicating the need for creating global consensus on standardisation and regulatory issues for the roaming of innovative smart networks and services.

A key feature that distinguishes all European Partnerships from other collaborative research instruments is the focus on the development of Strategic Research and Innovation Agendas (SRIA) that are shared and committed to by all partners in the partnership. It places European Partnerships in a unique position to address **transformational failures**.[11]

The need to address these failures is to be set against the pronounced focus in Horizon Europe on tackling complex and multi-faceted challenges such as the ones defined in the UN Sustainable Development Goals. Addressing these challenges requires more than the development of a single (technological) solution. It requires more profound and disruptive

[11] Weber, K. M., & Rohracher, H. (2012). Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive 'failures' framework. *Research Policy*, 41(6), 1037-1047.

changes to the existing R&I systems, i.e. systemic 'transitions' towards a strengthened and large-scale directionality of the R&I efforts, better demand articulation, more integration of (sectoral) R&I policies, and an enhanced capacity for 'reflexivity', i.e. flexibility in adapting R&I strategies to changing needs and the capacity to anticipate these changes.

The requirements that the Horizon Europe Regulation sets on the European Partnerships are directed towards maximising the European Partnerships' effects from this perspective, more specifically in relation to directionality and reflexivity (see Section 4.2, below).

Addressing **directionality failures** through the development of shared visions on the goal and direction of the required system transformation process is at the core of the European Partnership policy instrument. Participatory procedures by which members have opportunities to exchange views and jointly define the orientations of their partnership are key to ensure the needed buy-in and commitment.

While Co-funded Partnerships emphasise the need for directionality in the broader research communities and among national research and public sector actors, Co-programmed and Institutionalised Partnerships under Art. 187 typically indicate the need for a **strengthened and large-scale directionality of the R&I efforts** in order to integrate ecosystems and value chains, and/or to ensure alignment with public service stakeholders and research communities. Examples are: the need to align aviation research and innovation efforts and to ensure that they follow a systemic and holistic approach beyond the sole aircraft design in the partnership Clean Aviation (IP, 187); the need to build consensus on research and innovation roadmaps and priorities among all road transport actors in the Towards zero-emission road transport partnership (CP); the need for a common vision among air traffic management stakeholders to appropriately coordinate research, development and demonstration of new concepts and systems in the Integrated ATM partnership (IP, 187); and the need to stimulate cross-sectoral collaboration and to mobilise all relevant actors towards a common strategic research agenda for increasing the competitiveness of the manufacturing industry and reducing its environmental footprint in the Made in Europe partnership (CP).

Multi-level policy coordination is a strongly felt need in most European Partnerships, independently of their form of implementation. In line with the ERA policy, it relates to the need for a stronger alignment and integration of European, national and regional R&I policies, funding programmes and investments. European Partnerships intend to ensure such coordination by involving the right set of actors, such as national authorities competent in various relevant domains, and encouraging them to align their strategies and roadmaps with the directions agreed upon.

The Clean Energy Transition partnership (CF), for example, indicates the need to align and coordinate national strategies and funding mechanisms around European targets and goals to accelerate the transition of energy systems to climate neutrality. A similar need to align national R&I strategies and funding programmes with EU goals and objectives is expressed by the partnership A climate-neutral, sustainable and productive Blue Economy (CF/CP), the Transforming Europe's rail system partnership (IP, 187). The Water4All (CF/CP) and One Health (CF) partnerships emphasise the need to coordinate and rationalise research and innovation efforts at all levels in order to attain the desired societal effects. All partnerships in the digital field (Key Digital Technologies; Artificial Intelligence, Data and Robotics; Smart Networks and Services; European High Performance Computing) indicate the need to align national strategies on digital technologies with a single EU strategy and coordinate national investments in the technologies or infrastructures, amongst other to achieve critical mass.

A few European Partnerships address also **policy coordination failures at the national levels**. Not surprisingly, two of them are Co-funded partnerships and one is a candidate Institutionalised Partnership under Art 185. The Sustainable, Smart and Inclusive Cities & Communities partnership (CF), building upon the work of the JPI Urban Agenda under

Horizon 2020, aims at ensuring a comprehensively integrated, interdisciplinary and cross-sectoral approach to policy initiatives for stimulating the transition of the complex urban systems facing multifaceted challenges. The partnership Fostering an ERA for health research (CF) indicates the need for co-ordination of **funding strategies** and strategic research agenda between major European funders, public and private, in order to create critical scales of investments and gains in cost-effectiveness.

Finally, in some instances, the European Partnerships may gather actors along the value chains. More specifically, it can be relevant to stimulate further interactions between researchers and innovators, on the one side, and consumers and end-users, on the other. System transitions indeed require **demand articulation** to ensure that innovative solutions have potential for uptake and large diffusion.

Examples of European Partnerships that explicitly mention such an orientation are the Accelerating farming systems transitions partnership (CF), indicating the need to set long-term directions for knowledge co-creation through experiments involving and reconnecting producers and consumers, and the Large-scale innovation & transformation of health systems in a digital & ageing society (CF), which aims at addressing the lack of an operational platform that links researchers & innovators to national/local health authorities, technology and services providers, investors, patient/citizen and professional advocacy groups.

Only few partnerships explicitly mention issues related to **market failures** in their rationale, and only Co-programmed or Institutionalised Partnerships under Art 187, and EIT KICs. In most cases, the market failures relate to need to **mitigate the risks** linked to investments in research and innovation activities.

The Innovative Health Initiative (IP, 187) and EU-Africa Global Health (IP, 185) in Cluster 1 address the lack of investments in the development of solutions to specific health challenges, while the candidate Institutionalised Partnership for a Circular Bio-based Europe (IP, 187) is intended to solve a shortage of industry investments in the development of bio-based products whose markets do not have yet certain long-term prospects. A similar issue of high (technological and/or market) risks for first movers constituted a driver for candidate partnerships in Cluster 5 (Climate, Energy and Mobility). In this cluster, partnerships acted as initiatives to de-risk investments in the development and deployment of climate change solutions, hydrogen and other low-carbon technologies as well as low-emission aircrafts.

Market failures are not explicitly mentioned as the main rationales for any of the candidate European partnerships under Cluster 4 (Digital, Industry, Space), even though mechanisms are needed to share risks in investing in the development and deployment of some (still immature) technologies. Clearly, the partnerships considered the systemic/transformational aspect of their function to be more important, possibly also bearing in mind that market failures may be addressed also through the Horizon Europe calls. The proposed partnerships under Cluster 6 (Food, Bioeconomy, Natural resources, Agriculture, Environment) would marginally address market failures. The lack of information on the benefits of sustainable farming practices is among the main rationales for the Accelerating farming systems transitions (FP).

2.3.3 Intervention logic for the European Partnerships

As mentioned above, an objective that is common to all European Partnerships is to create a platform for 'concertation', i.e. in-depth and ongoing consultation of the relevant actors in the European R&I system for the **co-development of a strategic research and innovation agenda.** The primary ambition is therefore to generate commitment to a common strategic research and innovation agenda (SRIA). For the private actors involved, this would allow for a de-risking of their R&I investments and provide predictability of investment paths, for the public actors, it serves as a means to inform national policy-

makers on EU investments and allows for coordination and alignment of their efforts to support R&I in the field at the national level.

In Co-programmed European Partnerships (CP), the private and public partners are directly involved in the SRIA development, which is then proposed to the European Commission for implementation in the Horizon Europe work programmes. Co-funded European Partnerships, (CF), instead, bring MS together to invest at scale in key R&I issues of general and common interest. The joint programme of activities is agreed by the partners (i.e. national Research Funding Organisations of the MS involved) and with the EU. These partnerships typically focus on societal grand challenges and specifically, areas of high public good where EU action will add value while reflecting national priorities and/or policies. The ultimate intent is to create the greatest possible impact by pooling and/or coordinating national programmes and policies with EU policies and investments, helping to overcome fragmentation of the public research effort.

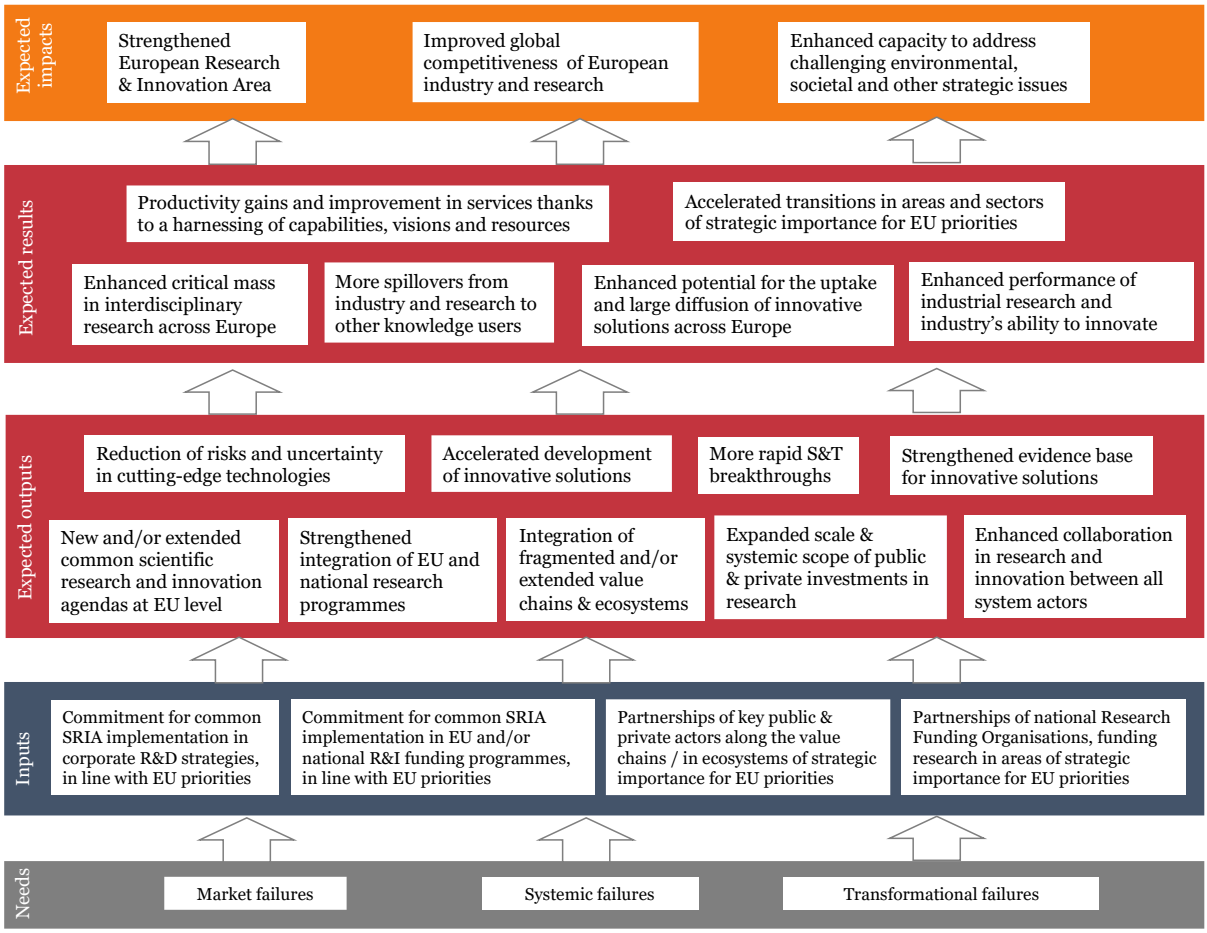
Institutionalised European Partnerships (IP) aim at a strong integration of R&I agenda's in the private and/or public sectors in Europe in order to address a strategic challenge or realise an opportunity. The focus is on major long-term strategic challenges and priorities beyond the framework of a single Framework Programme where collective action – by private and/or public sectors – is necessary to achieve critical mass and address the full extent of the complexities of the ecosystem concerned. In the case of IPs based upon Art 185 TFEU, the aim is to reach the greatest possible impact through the integration of national and EU funding, aligning national strategies in order to optimise the use of public resources and overcome fragmentation of the public research effort. Institutionalised Partnerships based upon Art. 187 TFEU aim at reaching the greatest possible impact by integrating the strategic R&I agendas of private and/or public actors and by leveraging the partners' investments in order to tackle R&I and societal challenges and/or contribute to Europe's wider competitiveness goals.

The **intervention logic** for the European Partnerships in Figure 4, below, builds upon the current partnerships' rationales and objectives as reported in the previous section and indicates the types of outputs, results and impacts that can be expected from this policy instrument thanks to the key features that the different European Partnership types have in common, as described above.

The **extent and speed** by which the expected results and impacts will be reached, will depend on the scale of the research efforts leveraged, the profile of the partners involved and strength of their commitments, and the breadth of scope in the research activities funded.

In general (but not forcefully), the effects can be expected to be stronger in the Institutionalised Partnerships than in Co-programmed and especially Co-funded partnerships.

Figure 4: Intervention logic for the European Partnership instrument



Technopolis Group

It would be a nearly impossible task to draw out intervention logics for the different types of partnerships as they are envisaged to be implemented under Horizon Europe. In fact, **Horizon Europe seems to be stepping away from the previous distinction between public-public and public-private partnerships in the decision-making on the form of implementation for the initiatives**. The borderline between the different partnership modes has become rather blurry, with choices for their implementation most often depending on legislation aspects and practical concerns.

The overview of the rationales for the current European Partnerships in the section above shows that only in some cases, a clear distinction can be made between rationales – and therefore objectives – of the different types of European Partnerships. Most often, these differences are related to the type of partners that provide financial contributions to the partnership (i.e. industry or MS), as suggested also in the description of the partnerships' objectives in the beginning of this section. However, the overview of the partnership types' distinctive features in Section 0, above, indicates that in contrast to the related partnership forms under Horizon 2020, Co-programmed European Partnerships and Institutionalised Partnerships based upon Art. 187 can be launched also for partnerships coordinating (only) national ministries, public funding agencies, and governmental research organisations in the Member States, i.e. without active industry participation. In addition, the industry-oriented European Partnerships are expected to take a strong systemic approach, wherever possible integrating also national and/or regional research funding efforts.

2.4 Coherence of the European Partnership landscape

In this section we summarise the key findings from our analysis on the interconnections that are - or could be - envisaged among partnerships in the different clusters as well as between the partnerships and other EU R&I initiatives beyond the Framework Programme. The full analysis is available in Appendix C to this report.

2.4.1 Interconnections among the candidate European Partnerships

Multiple interconnections can be identified between the candidate European Partnerships, both within and among the clusters. Most often, these possible links are explicitly stated or recognised in the partnership descriptions or impact assessments.

Figure 5, below, gives an overview of all European Partnerships that are currently (2019) envisaged for funding under Horizon Europe, categorising them into two major groupings: 'horizontal' partnerships focused on the development of technologies, methods and resources/materials, and 'vertical' partnerships focused on the needs and development of a specific application area, be it industrial or societal.

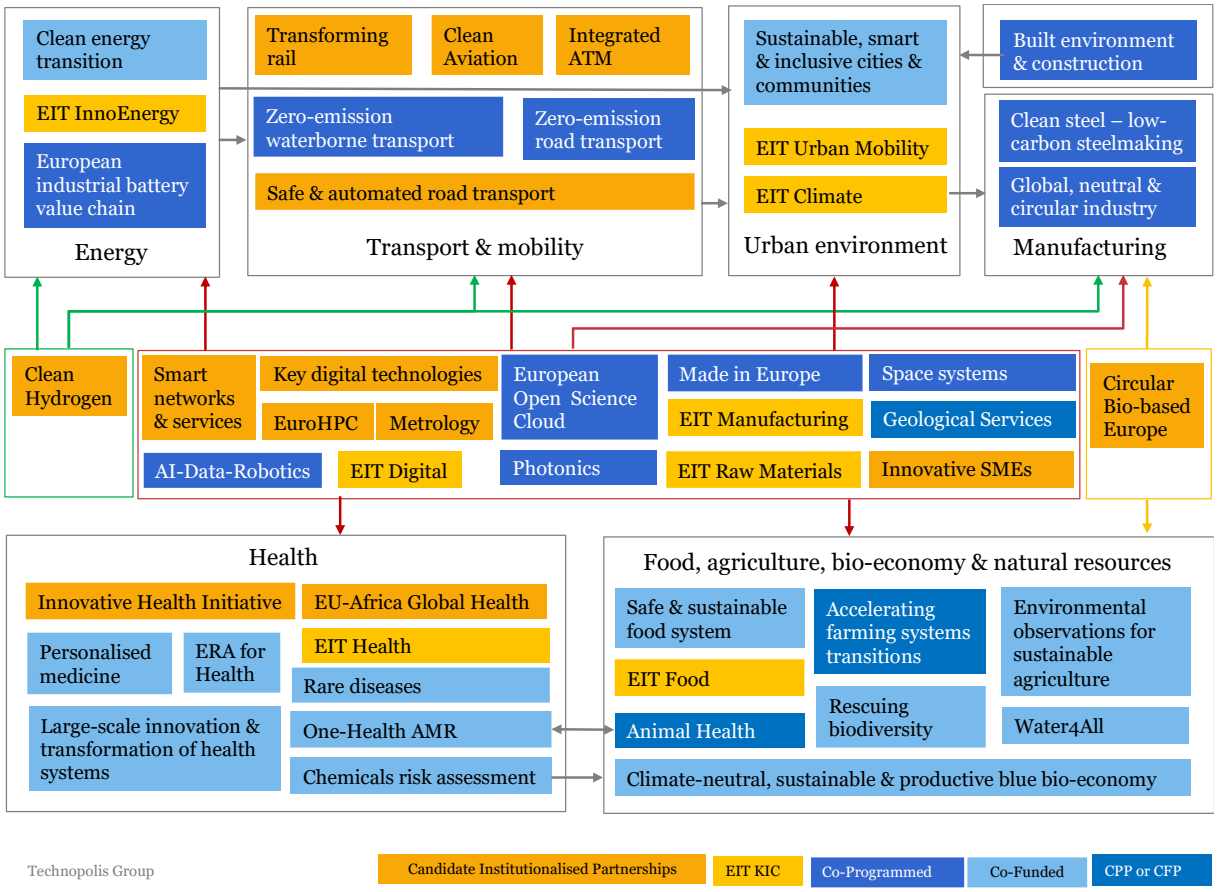
The diagram shows the central position of the **'horizontal' partnerships** in the overall landscape, those that expect to develop methodologies and technologies for application in the other priority areas. These 'horizontal' partnerships are funded predominantly in Cluster 4 (Digital, Industry and Space). Exceptions are the Clean Hydrogen partnership funded in Cluster 5 (Climate, Energy and Mobility) and the circular Biobased Europe one, funded in Cluster 6 (Food, Bioeconomy, Natural resources, Agriculture and Environment). Similarly, the cross-pillar European Open Science Cloud partnership will facilitate research partnerships by providing an infrastructure for the storage, management, analysis and re-use of research data, while the Pillar 3 Innovative SMEs partnership will support SMEs in their cross-border collaborative research and innovation projects. Multiple interconnections were mentioned between these 'horizontal' partnerships and partnerships in the other clusters.

Multiple interconnections are envisaged also among the **industry-oriented 'vertical' partnerships**, grouped in the upper banner of the diagram. Under Horizon Europe, they have in common a pronounced focus on enhancing sustainability. Important linkages are envisaged especially between the partnerships addressing the energy and mobility sectors, which are closely interlinked and face many common challenges. We do see a cluster approach emerging, though: linkages with the two partnerships in the 'manufacturing' field, funded under Cluster 4, could be identified only for the EIT Climate KIC.

The lower banner includes the '**vertical' partnerships in the societal application areas**. In this case as well, only a limited number of interconnections are envisaged between the partnerships in the two areas. An exception is the newly envisaged cross-cluster European Partnerships 'One Health AMR'.

The overall picture emerging is that, when going beyond these technology- and methodology-oriented partnerships, there are only a few interconnections across the clusters. In other words, clusters still act as silos, despite the good policy intentions. The most recently approved candidate partnerships 'Sustainable, smart and inclusive cities & communities' and 'One-Health AMR' are a step in the direction of breaking through this pattern. Both of these envisaged partnerships are Co-funded ones, illustrating the important work done in the Horizon 2020 Joint Programming Initiatives (JPI).

Figure 5: Interconnections within the landscape of European Partnerships under Horizon Europe



Going more in-depth, we identified many cases of synergies and complementarities among the partnerships in the clusters, but only little evidence on clear overlaps. Even in cases where similar R&I topics were covered and/or the same stakeholders involved or targeted, the different failures addressed, or directionality of the envisaged partnerships pointed at strong synergies and complementarities rather than overlaps.

The EIT KICs are a special case. Their positioning in the landscape of European Partnerships merits further consideration, both in terms of a strengthened attention for coordination at the strategic level, avoiding potentially overlapping strategic research and innovation agendas, and in their potential coordinating role between partnerships.

Even though the EIT KICs often involve similar industry and research actors as the European Partnerships and focus on similar R&I topics, in many clusters they currently appear rather as stand-alone initiatives. In the health and digital and manufacturing areas, for example, their distinctive relevance in the system seems to relate predominantly to their focus on the knowledge triangle and entrepreneurship. In Cluster 5, we noted that both EIT KIC InnoEnergy and the partnerships for Clean Energy Transition intend to develop strategic research and innovation agendas that will give the directions needed to coordinate R&I activities and align EU, national and local policies and strategies. As they will operate in the same domain, synergies may exist between them. This may imply considering mechanisms for ensuring the alignment between both future strategic research and innovation agendas and the goals they respectively pursue. If the partners are the same, a unique agenda could be envisaged if relevant. Similarly, considering the multifaceted dimension of the urban systems and issues, the proposed partnership on Sustainable, smart and inclusive smart and communities may benefit from the actions undertaken and/or planned in the EIT KIC Climate and the EIT Urban Mobility. The three EIT-KICs related to the Cluster 5 areas, i.e. EIT InnoEnergy, EIT Climate and EIT Urban Mobility map precisely with the cluster topics and could also perhaps play a coordinating role by providing a commercialisation link between the European research, innovation and education activities in these three thematic areas.

A similar function could be envisaged for the EIT Food KIC in Cluster 6, seeing the centrality of research related to the food system in this cluster and the central position of the partnership for Safe and sustainable food systems in the cluster and its linkages with most of the other partnerships. At a cross-cluster level, the bio-based systems that the initiative for a Circular Bio-based Europe aims to develop can contribute to the objectives of EIT Climate (mitigation of climate change) and EIT Raw Materials (curbing the overexploitation of raw materials).

A final note regards the concentration of co-funded partnerships in the two societal application areas and the concentration of co-programmed partnerships in the technology- and industry-oriented ones. It suggests a limited active involvement of industry actors in the development of SRIAs in the former, and a limited integration of national research strategies and programmes in the latter.

While this 'division of tasks' is clearly rooted in the technology-oriented approach to innovation in the past, the high ambitions and expectations set on the European Partnership instrument under Horizon Europe in terms of fostering transitions and transformations in the European R&I system suggest the need to strengthen linkages.

In this context we should bear in mind the findings of the ERA-LEARN analysis on the partnership landscape, investigating the potential to adjust and streamline the partnership landscape.[12] One of the conclusions of the analyses at cluster levels was that, "With the exception from the Food and Natural Resources cluster, connections between public-public and public-private and other partnerships are limited even in areas that are represented in all communities (e.g. in clusters Health and Digital and Industry." Formal and informal connections among these two types of partnerships were close to non-existing. In the Food cluster, there were "limited interconnections" with EIT KIC.

In other words, **industry-led partnerships seem worlds apart from Member States-led ones**.

In this context, we see a critical role for the European Commission services to take up an interservice governance of the European Partnership portfolio, in collaboration with the 'Transitional Forum for R&I Partnerships' at the Member States level, in order to enhance collaboration and bridge the gaps between these two types of partnerships – as well as to foster and facilitate the creation of cross-cluster collaboration between existing partnerships. The creation of a platform to facilitate networking and knowledge exchange opportunities between leading organisations and actors in different partnerships, grouped in cross-cluster 'partnership focus areas', could be beneficial from this perspective.

2.4.2 Interconnections with other EU R&I initiatives

In the context of the Impact Assessment studies for the candidate Institutionalised Partnerships, the study teams identified important opportunities for collaboration with a range of EU R&I initiatives beyond the Framework Programme. This regarded especially the candidate partnerships in the digital and transport areas, as well as the candidate partnerships for Clean Hydrogen and Circular Biobased Europe. EU programmes under the MFF 2021-27 for which collaboration is most often envisaged are the Digital Europe Programme and the Connecting Europe Facility. The Strategic Forum for Important Projects of Common European Interest (IPCEI) equally raised the interest in specific domains (hydrogen and microelectronics).

The following is a summary of the considerations made in the impact assessment reports.

[12] ERA-LEARN (2018), Synthesis Report on the Partnership Landscape in view of the clusters in Horizon Europe

The **Digital Europe Programme** (DEP) is of obvious importance for the candidate partnerships in the digital sphere, seeing its focus on reinforcing Europe's capacities in high performance computing, artificial intelligence, cybersecurity and advanced digital skills and ensuring their wide application across the economy and society. The **Connecting Europe Facility** (CEF) instead, will develop and modernise the trans-European networks in the fields of transport, energy and digital and facilitate cross-border cooperation in the field of renewable energy, taking account of the long-term decarbonisation commitments and with emphasis on synergies among sectors.

CEF is expected to target synergies in the areas of connected and autonomous mobility, clean mobility based on alternative fuels, energy storage and smart grids. Several of these technologies have important applications in the rail sector and are therefore of interest to candidate partnerships such as *Transforming Europe's Rail System, Safe and Automated Road Transport, and Clean Hydrogen.*

Several envisaged partnerships in the *Health* cluster indicated potential support from other EU initiatives, specifically in terms of connectivity between hospitals, medical centres and research centres enabling amongst other the cross-border exchange of patients' health in the EU (the CEF) and support for the deployment of common digital data-solutions and reinforcing the digital infrastructure and skills (DEP).

The *Smart Networks and Services* initiative envisages the need for large-scale testing and experimentation activities in order to validate and integrate the innovative technological building blocks. It therefore foresees synergies to be created with the *Connecting Europe Facility* and *Digital Europe* Programme.

For the candidate *European Partnership in HPC*, cooperation with the Digital Europe Programme (DEP) and the Connecting Europe Facility (CEF-2) programme would support the initiative in developing and building the HPC infrastructure and ecosystem throughout the EU. The Connecting Europe Facility-2 Programme is expected to ensure terabit connectivity between existing and future supercomputing centres, while the DEP support "will focus on large-scale digital capacity and infrastructure building, aiming at a wide uptake and deployment across Europe of critical existing or tested innovative digital solutions".[13] Furthermore, the EuroHPC JU has also made the argument that additional investments from **structural funds (ERDF)** may be needed to realise a supercomputing infrastructure as well as the development of applications. Such ERDF contributions would have to be coordinated with deployment and innovation actions funded through DEP in the case of projects with a common European interest or regional relevance.

Synergies with the work under the **Strategic Forum for Important Projects of Common European Interest** (IPCEI) were noted by the *Clean Hydrogen* and the *Key Digital Technologies partnerships*:

- The Strategic Forum for IPCEI has identified six key strategic value chains of specific importance for EU's industries and competitiveness. Three of these value chains are directly relevant to hydrogen: the "Hydrogen technologies and systems", "Low CO2 emissions industry" and "Connected, clean and autonomous vehicles" value chains

- The value chain of KDT is also addressed through the IPCEI's framework's support for microelectronics. The IPCEI on microelectronics involves around 30 direct participants that will carry out approx. 40 closely interlinked sub-projects focusing on energy efficient chips, power semiconductors, smart sensors, advanced optical equipment and compound materials. The orientation of the IPCEI is on downstream applications, research and innovations, which are complementary to upstream R&I activities. The IPCEI on microelectronics is expected to integrate the views of relevant initiatives under

13 European Commission (2019) *Partnership for European High-Performance Computing*. Fiche for the consultation with Member States

H2020, such as ECSEL, on topics such as the challenges and opportunities for enhancing competitiveness in Europe through R&I, maximising impact and avoiding duplication. It is also foreseen that under the next MFF (2021-2027), the European Partnerships will have a systemic effect beyond R&I, strengthening the strategic value chains

Two candidate Institutionalised Partnerships also mentioned additional financing opportunities in their field;

- The **ETS Innovation Fund** is one of the world's largest funding programmes for demonstration of innovative low-carbon technologies and therefore of direct relevance to the *Clean Hydrogen partnership*. The Innovation Fund focuses on: Innovative low-carbon technologies and processes in energy intensive industries, including products substituting carbon intensive ones; Carbon capture and utilisation (CCU); Construction and operation of carbon capture and storage (CCS); Innovative renewable energy generation; Energy storage

- The *Circular Biobased Europe* partnership noted two potential sources for access to finance for SMEs in the bio-based industries sector, i.e. the **European Investment Bank** and the **Circular Bioeconomy Thematic Investment Platform** that is part of the 2018 Bioeconomy Strategy action plan. These initiatives may help support bringing bio-based innovations closer to the market and de-risking private investments in sustainable solutions, even though they may not entirely solve the funding gaps, e.g. for demonstration and flag projects.

These two candidate partnerships may find support for its activities also in the **Programme for Environment & Climate Action (LIFE)** under the Natural Resources and Environment heading. This programme provides grants for pilot and demonstration projects for the environment and resource efficiency, as well as climate change mitigation and adaptation. In particular, it covers innovative technologies, with a preference for implementation in close-to-market conditions, at industrial or commercial scale.

Finally, the partnership for *Environmental Observation for a sustainable agriculture* may benefit from activities funded under the Digital Europe Programme and EU space policy initiatives such as **Copernicus** and **GEOSS**.

3 Efficiency in the decision-making process on the European Partnerships landscape

In the context of this study, Impact Assessment studies were conducted for 13 candidate Institutionalised partnerships. These impact assessment studies were intended to support the Commission services in the decision-making on the funding under Horizon Europe of the proposed initiatives - and in the proposed form. They were conducted in the period of July to December 2019.

In this chapter, we cover two key components of the planning and selection of the European Partnerships that influenced the methodological frameworks and results of these impact assessments:

- The process for the decision-making on the form of implementation for the initiatives and their selection as a European Partnership (Section 3.1) and
- The Criteria Framework, which turns the criteria for the selection, implementation, monitoring, evaluation and phasing-out of the European Partnerships that were defined in the Horizon Europe Regulation, into concrete guidelines (Section 3.2).

In both cases, we build upon experience gained during the Impact Assessment studies for the candidate Institutionalised Partnerships.

3.1 The decision-making process

We first draw our lessons learned from the impact assessment studies (Section 3.1.1). Specifically, we cover two factors that constituted an element of complexity for their implementation: the timeliness of the exercise, and closely connected to it, the integration of the criteria for the selection of the European Partnerships into the impact assessment methodology. A brief overview of the methodological framework used for the impact assessments is provided in Appendix E to this report.

In Section 3.1.2, we cover a third element in the decision-making process where we see room for improvement, i.e. the distinctive features of the European Partnership modes of implementation.

3.1.1 Lessons learned from the Impact Assessment studies for the candidate Institutionalised Partnerships

The impact assessment studies for the candidate Institutionalised Partnerships had a two-fold objective: on the one hand, they were to refine the design of the initiative (definition of the problems, objectives and intervention logic), going also beyond what was already envisaged by the European Commission services in the inception impact assessment; on the other hand, they were to collect the evidence and conduct the impact assessment.

The **timeliness of the exercise**, taking place when the design process of the initiatives for their implementation under Horizon Europe was still in course, created complexity in the process and rendered the stakeholder consultation less valuable for the decision-making on the most appropriate modes for implementation during the studies' options assessment.

The collection of the stakeholders' opinions on potential impacts and their positions in relation to the possible forms of implementation was hindered by the fact that in most cases, the directionality of the initiatives under Horizon Europe was still an element for discussion, within the partnership consortia and between the consortia and the Commission services because of the extended expectations set on European Partnerships under Horizon Europe compared to Horizon 2020.

In addition, parallel negotiations between the Commission services and partnership consortia in relation to the rules for implementation of the new partnership forms were in several cases still ongoing. These discussions covered topics that are critical for the assessment of effectiveness, efficiency and coherence in an impact assessment. They included the openness of the calls and the level of industry financial contributions in Article 187 partnerships, the legal value of EU commitment to co-programmed partnerships, and the role of the Member States in both these types of partnerships. As negotiations on the Multiannual Financial Framework and the budget of Horizon Europe were still ongoing at the time of the impact assessment studies, the study teams also did not have a sufficiently comprehensive view on the investments required for the different implementation modes to conduct an accurate cost-efficiency assessment.

The expectation that the impact assessments would integrate the Horizon Europe European Partnerships **selection criteria** into their criteria for assessment created some additional issues. While the selection criteria related to effectiveness and coherence fit reasonably well in the Better Regulation impact assessment structure, more problematic was the coverage of the other three criteria groupings, i.e. the criteria of Openness and Transparency, Additionality and Directionality, and the Ex-ante demonstration of commitment. The issue was again the timeliness of the exercise: a detailed proposal that would describe topics such as the measures defined to ensure openness and transparency, the agreed-upon R&I investment and contribution by the partners, the assessment strategy, exit strategy etc was needed for this assessment, while the information available from the candidate partnership consortia did not yet reach that level of detail.

They were also expected to conduct the **'necessity test'**, i.e. to assess the extent to which a European Partnership would allow for more effectiveness than the standard Horizon Europe calls. Pivotal for this test in the context of an impact assessment was the identification of the Horizon Europe calls as Option 0 as well as Baseline Option, thus allowing for a comparative analysis of the three partnership forms (Options 1-3) along all of the assessment dimensions – in relation to the Horizon Europe calls as well as in relation to each other .

This approach created an important discrepancy with the approach set out in the Better Regulation Guidelines related to the **definition of the baseline**. Specifically, the Better Regulation guidelines require developing a baseline scenario as the option of "changing nothing", thus allowing for the use of existing data (and existing growth trends) as a basis against which alternative options are compared. Using the future Horizon Europe calls as a baseline option, instead, has contributed to making quantitative comparative assessments a challenge in these studies.

It also implied that the impact assessment considered two broad options only: the proposed EU initiative would take the form of either Framework Programme call or a partnership. The impact assessment study teams could not consider the relevance and potential value of other EU programmes (e.g. CEF or DEP) for the implementation of the initiative. Whereas the identification of policy options is a pivotal step in an impact assessment and should be as comprehensive as possible, in the present study, restrictions were imposed limiting the scope of the impact assessment of the candidate institutionalised partnerships.

While understanding the particular situation in which the impact assessment studies of the candidate Institutionalised Partnerships took place and the related time constraints, we recommend the Commission to ensure an appropriate time frame for these exercises in the future. Our proposal is also to take a stepwise approach to the collection of the data needed throughout the decision-making process, and to conduct impact assessments only in the last stage of the process. The necessity test, instead, should take place in the first stages.

We cover this further in the next section.

3.1.2 Proposal for an improved decision-making process

As shown in Figure 6, below, we would envisage a stepwise approach to the decision-making process for the European Partnerships:

- The first step would entail the issue framing and problem definition, followed by the investigation of the EU added value for the intervention and the definition of the objectives. It would conclude with the 'necessity test', i.e. the key question whether a European Partnership is truly needed

- The next step consists in the decision-making on the form of implementation of the partnership. At the risk of over-simplifying a complex and lengthy process, we indicate two questions that are at the core for the choice between Co-programmed and Institutionalised Partnerships under Art. 187 on the one hand, and Co-funded and Institutionalised Partnerships under Art 185 on the other

- The third step consists in the final selection of the European Partnership, based upon negotiations with the European Commission and for the Institutionalised Partnerships, an impact assessment geared at *validating* the choices made. The test whether the European Partnership responds to all criteria defined under the Horizon Europe Regulation for their selection is the last and final step.

In broad lines, this process is being followed already now. A key difference, however, lies in the timing of the necessity test and the final test on the selection criteria. In other words, we propose to distinguish an impact assessment from an assessment related to the alignment with the Horizon Europe criteria. In addition, the impact assessment would serve as a *validation* of the choices made, based upon data collected and analysed in the previous steps.

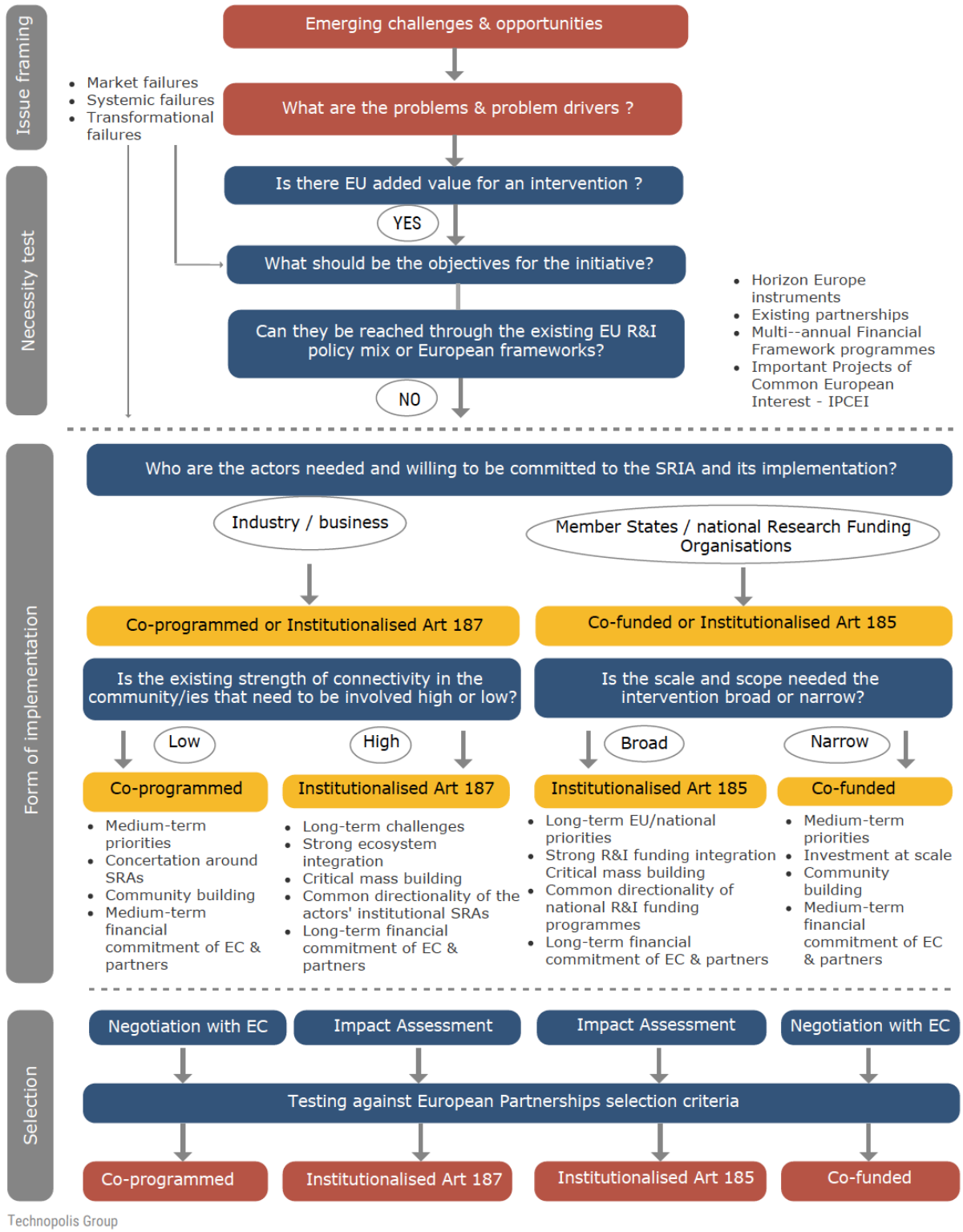
Wee listed in the diagram the **key criteria for the decision-making on the forms of implementation** as they were implemented in the impact assessment studies, even though more criteria were considered, and the process was by no means as straight-forward as depicted in the diagram.

A very first criterion that we applied in the impact assessments is also the one indicated in the diagram, making a distinction between forms of partnerships for industry/business and those for the Member States/Research Funding Organisations. In other words, we applied the 'old' Horizon 2020, despite the fact that as mentioned in Section 0, above, the distinction between the partnership forms in terms of public-public and public-private partnerships is no longer appropriate.

Clear criteria that would clarify when and why to choose for a co-programmed or co-funded partnership and/or an Institutionalised Partnership under Art. 185 or 187 for initiatives that do not involve industry, are not defined (yet). For the sake of future transparency and efficiency, we would encourage the European Commission to do so.

Another major distinction between Co-programmed/Art.187 partnerships and the Co-funded/Art. 185 is that while in the former, the SRIAs are developed and implemented directly by the partnership members (industry), in the latter, the integration is at the level of national programmes and/or policies. At this stage, it is unclear whether this distinction will be kept also under Horizon Europe. In other words, whether the SRIAs in Co-programmed partnerships with no industry involvement will be developed by the research organisations or public agencies that are the direct beneficiaries of the initiative. We would encourage the European Commission to keep the distinction.

Figure 6: Decision-making process for the European Partnerships



3.2 Criteria framework for the European Partnerships

The criteria for the selection, implementation, monitoring, evaluation and phasing out of the European Partnerships as they are described in the Horizon Europe regulation (Annex III) cover five key principles for the European Partnerships: effectiveness, coherence and synergies, transparency and openness/flexibility, additionality and directionality, and the long-term commitments of the partnership partners. It details down what these principles imply for the partnerships in terms of expectations set on them for each phase in the partnership policy cycle (see also Appendix D).

In Section 2.3.2, above, we highlighted the fact that these criteria – and especially those related to directionality and flexibility - are directed towards maximising the European Partnerships' capacity in addressing transformational failures.

In 2018, the Commission presented the Draft Criteria Framework for European Partnerships under Horizon Europe (WK 14470/2018 INIT) to the ERAC Plenary. This Working Paper develops the criteria outlined in Annex III of the Commission Proposal for Horizon Europe in order to facilitate more exacting presentations of ideas for European Partnerships. The purpose of this document was to "further develop the criteria framework to support developing ideas for European Partnerships in line with the ambition of the new approach, and their preparation and implementation." It covers all forms of partnerships, including the EIT KICs.

In this section we first consider the ease of use of the current Draft Criteria Framework in general. In Section 3.2.2 we then propose a revised structuring for a new criteria framework, with a specific focus on its use the planning and formulation of proposals for European Partnerships.

3.2.1 Ease of use of the current draft criteria framework

The expanded criteria listed in the Draft Criteria Framework remain very much in line with the ambition of the Commission's stated new approach to European Partnerships, with guidance that is relevant at different stages in a partnership's lifecycle, from the selection through to the implementation, monitoring, and evaluation and winding up.

On a positive note, the 20-page Working Paper provides helpful guidance for use in ex ante impact assessments of candidate Institutionalised Partnerships ahead of their consideration for selection. It is more expansive than the criteria in Annex III of the Horizon Europe regulation and more pertinent than the more generic guidelines in the Better Regulation Impact Assessment procedure.

It is however a challenging document to use, in part because of its format (linear) and length (20 pages, 9,200 words) and in part because of its exhaustive nature (4 lifecycle stages, 14 level 1 criteria and 67 level 2 criteria). The Draft Criteria Framework is also made more challenging from an operational perspective because similar to the Annex III in the Regulation, it is centred on concepts and principles (such as openness and transparency) and relies on the reader or end-user to cross-reference what is required to be defined when, for each of the three types of European Partnership.

There is also a further complication inasmuch as there is a subset of criteria that has to be addressed by all partnership proposals (all modalities) and a second and longer set of criteria that is expected to be addressed only where it is appropriate to the nature of a specific partnership. This contingent approach appears to be applicable among partnerships of the same type as well as between partnerships of different modalities and is tough to follow even after several careful read throughs.

3.2.2 Proposal for a revised structuring of the criteria framework

We considered that in order to enhance the user-friendliness of the next criteria framework and serve as operational guidelines, it needs to indicate the task or function in the partnerships' management structure that would need to take care of the specific requirement and when. It would not only clarify to the partnership consortia what is required from whom in the organisation, it would also give guidance to the Commission officials which documents to consult in their oversight and monitoring function.

For this purpose, we used as basis for our exercise the **standard processes and systems for policy and programme design, planning and evaluation,** shown in Figure 7, below.

There are two levels in the management structure to consider:

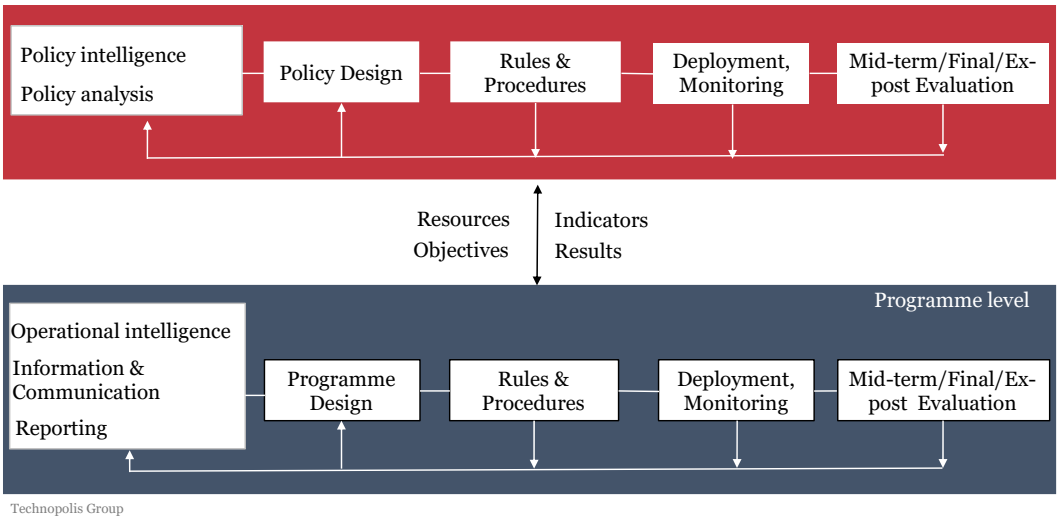
- The **policy level** is where the partnership strategy, SRIA and work programmes are designed. It is where the overall strategic thinking takes place, tapping upon the available 'policy' strategic intelligence and outcomes of analyses to support decision making. It is also the level where the 'rules of conduct' are decided upon, i.e. the principles and internal regulations of strategic importance, such as those related to partnership membership. At this level, a monitoring and evaluation system will be drafted for the partnership as a whole, including KPIs

- The **programme** level is where the operational level where the policy is implemented. 'Programme design' relates to the refinement of the strategy and workplans, obviously in close collaboration with the policy level, through the definition of 'action lines' for the calls. At this level, 'rules of the game' relate to the application submission and evaluation process, and project management. The monitoring and evaluation system operates at the project and action level. Operational intelligence in relation to the partnership's field and its actors is crucial, amongst other to implement the required information and communication activities to target beneficiaries and other actors in the system. This is also the level that takes care of the (operational) reporting to the EC.

Performance objectives for the partnerships are defined at the policy level and 'passed on' to the programme level where alignment of the action lines and projects objectives are ensured. Evaluations of projects and action lines jointly feed into the evaluation at the policy level.

It should be noted that various other functions are implemented at the various level. We cover these further in Chapter 0, below, and focus here only on the ones of importance in the context of the criteria set by the Regulation.

Figure 7: Framework for policy and programme design, planning and evaluation



We propose to centre the future criteria framework on these core **processes and systems in the partnerships' management structure**, distinguishing only between the requirements set for the selection of the partnerships and those for their implementation. Implementation tasks are closely intertwined (e.g. the monitoring and evaluation system - and indicators defined – are closely related to the data reporting system of the EC). For the sake of consistency in our approach centred around the needs and functions of the partnership organisations, we therefore prefer not to split the implementation requirements into more detailed categories.

Table 2, below, sets this recommendation into practice. It builds upon a criteria matrix where the criteria for the European Partnerships have been aggregated based on the principles they refer to and the tasks they imply allocated to the policy and programme structure components as shown in Figure 7, above. This matrix is included in this report in Appendix D.

Similar to the Draft Criteria Framework, it extends the criteria defined in the regulations to include also **what the expectations mean from an operational perspective**. For example, we took into account that objective trees, intervention logics and performance indicators need to be defined not only at the level of the partnership overall, but also at the level of 'action lines' in the work plan and the individual projects, ensuring coherence in the partnership's portfolio with all actions geared towards the attainment of the policy objectives. Table 2 therefore provides the structure for **comprehensive guidelines**, to be used in the various stages of the decision-making process set out in Figure 7, above, as well as for the planning and implementation of the partnership in line with the regulations.

We also recommend splitting the Criteria Framework document in two parts with a short introductory section that explains the background and cross-references the relevant legal texts and a second part that presents **four distinct guides**, one for each type of partnership, considering the institutionalised partnerships under Art 185 and Art 187 as two distinct types of partnerships.

As mentioned above, the regulations define also some additional requirements, or specify the requirements for certain partnership types and distinguish between the two types of institutionalised partnerships. During the impact assessment studies, it was clear that this distinction is key.

In addition, we considered that certain requirements are not applicable – or however, only to a limited extent – for one or more partnership types due to their specific characteristics. An example is the requirement at the policy level to define and implement "Measures for active and early involvement of Member States". This requirement is less relevant to apply in the two partnership forms where the Member States and their funding bodies are the lead partners in the partnership itself.

In Table 2, below, we indicate the **types of partnership** that are expected to respond to a specific requirement (cells highlighted in *dark green*). Those for which a specific requirement would be more difficult to apply have the cells highlighted in *light green*. No colour shading stands for non-applicability of the criterion for a partnership type.

Finally, in terms of the concrete implementation of the requirements, and specifically those related to evaluation, we highlight the importance of the partnerships' function in the landscape of EU R&I initiatives and the expectation that they would take a systemic approach.

The systemic function of the partnerships implies that they should not be considered as alone-standing initiatives. Their added value cannot be assessed by considering only their own impact pathways, perceived in a linear fashion, and through the use of the standard Horizon Europe output, result and impact indicators.

We recommend the Commission and partnerships to foresee the use of indicators that aim at assessing the **effectiveness from a systemic perspective**, in terms of complementarities and synergies reached, thanks to, for example, collaborations and joint calls set up with other initiatives.

Examples of effects to consider are co-publications between organisations active in different communities, the creation of strategic cooperation relationships between organisations and/or integration of research communities (which can be assessed by means of network analysis), the enhancement of technologies, products and/or services thanks to the creation of complementarities, etc.

The **need for data** that would allow for evaluations to assess these systemic effects of the partnerships needs to be considered both by the Commission and the partnerships at the moment of the launch and foreseen in the common EU e-database.

The establishment of **baselines** at the launch of the partnerships is key for a successful assessment of these outputs and results, and their related impacts.

Finally, we recommend the Commission to foresee a **'system evaluation'**, i.e. cross-partnership evaluations – at the partnership area and/or cluster level - in order fully to capture and assess the added value of the European Partnerships within its policy instruments portfolio.

As mentioned in the PSF Mutual Learning Exercise on the evaluation of complex PPP programmes in STI, "A system level evaluation is typically concerned with bottlenecks and imbalances. An evaluation at this level would focus less on the 'goodness' of individual programmes and more on the collective. It might conclude that a very well-designed programme is superfluous. In other words, this level is more interested in policy alternatives and is therefore likely to use resources to examine several initiatives."

Table 2 Structuring of the criteria for European Partnerships along the partnerships' management systems and processes

Partnership management systems & processes	Criteria for the selection, implementation, monitoring, evaluation & phasing-out of the European Partnerships	Principles (Art 8 & Annex III)	Co-programmed	Co-funded	Art 187	Art 185
SELECTION						
Policy level						
Policy design	Common strategic vision of the purpose of the partnership	Additionality & Directionality	■	■	■	■
	Partnership objectives tree	More Effectiveness	■	■	■	■
	Partnership intervention logic (impact pathways)		■	■	■	■
	Partnership targets & KPI definition		■	■	■	■
Policy analysis	Partnership alignment with FP objectives	More Effectiveness	■	■	■	■
	Comparative analysis of potential effectiveness versus Horizon Europe calls & other EU initiatives		■	■	■	■
	Analysis of the value chain in the research area and the stakeholders involved versus the profile of the partnership's partners		■		■	
	Geographical reach of partnership			■		■
	Assessment of positioning in EU R&I landscape	Coherence & synergies	■	■	■	■
	Demonstration of expected long-term qualitative and significant quantitative leverage effects	Additionality & Directionality	■	■	■	■
Rules & procedures	Measures for the involvement of all stakeholders in the priority setting process	Transparency & Openness	■	■	■	■
	Modalities for the dissemination & exploitation of results		■	■	■	■
	Open access/user strategy, along the value chain Involvement of international organisations		■	■	■	■

Partnership management systems & processes	Criteria for the selection, implementation, monitoring, evaluation & phasing-out of the European Partnerships	Principles (Art 8 & Annex III)	Co-programmed	Co-funded	Art 187	Art 185
	Ex-ante agreement with the legally committed partners on exit strategy & measures (conditions and timeline)	Additionality & Directionality				
	Commitments from all involved sides for financial and/or in-kind contributions of the partners	Long term commitment				
	Commitment of the partners for financial and/or in-kind contributions and integration of their relevant activities using a Programme co-fund action					
	Financial and/or in-kind contributions from partners other than the Union at least equal to 50% and may reach up to 75% of the aggregated European Partnership budgetary commitments					
Monitoring & Evaluation System	Definition of a method for the measurement of key performance indicators	Additionality & Directionality				
Programme level						
Rules & procedures	Measures ensuring detailed information on the evaluation process and results from all calls for proposals within partnerships, to be made available timely and accessible in a common e-database	Transparency & Openness				
	Measures ensuring information to SMEs and promotion of their participation					
	Approach to ensure • Information on the functioning of the governance • Visibility of the Union • Communication and outreach measures					
	Approach to ensure flexibility in the action lines definition & implementation measures in order to adjust to changing policy, societal and/or market needs, or scientific advances, and/or to increase policy coherence between regional, national and EU level	Additionality & Directionality				

Partnership management systems & processes	Criteria for the selection, implementation, monitoring, evaluation & phasing-out of the European Partnerships	Principles (Art 8 & Annex III)	Co-programmed	Co-funded	Art 187	Art 185
IMPLEMENTATION						
EC evaluation strategy	Evaluation at cross-partnership, partnership area and/or cluster level - complementarities, synergies, overlaps	Coherence & synergies				
Policy level						
Policy intelligence	Analysis of potential implementation barriers at national level	Coherence & synergies				
	Rationale for co-operation with other R&I initiatives					
	Identification of priority Member States to involve	Additionality & Directionality				
	In the absence of renewal, appropriateness of measures ensuring phasing-out of FP funding (possible continued transnational funding by national or other Union programmes, private investment etc					
	If renewal deemed relevant: most effective policy intervention mode for any future action					
	If renewal deemed relevant: positioning European Partnership in European Partnerships landscape and its policy priorities					
Policy design	Measures to overcome implementation barriers at national level	Coherence & synergies				
	Co-operation measures with other R&I initiatives					
Rules & procedures	Measures for active and early involvement of Member States	Additionality & Directionality				
Monitoring & Evaluation System	Progress towards objectives, KPIs	Effectiveness				
	Final evaluation at action lines level - results & impact at EU & national levels					
	Final evaluation at partnership level - results & impact at EU & national levels					
	Mid-term evaluation at partnership level / achievements, impacts and potential needs for corrective measures					
	Effectiveness of co-operation measures with other R&I initiatives - partnership level					

Partnership management systems & processes	Criteria for the selection, implementation, monitoring, evaluation & phasing-out of the European Partnerships	Principles (Art 8 & Annex III)	Co-programmed	Co-funded	Art 187	Art 185
	Effectiveness of measures to overcome implementation barriers at national level - partnership level	Coherence & synergies				
	Effectiveness of measures promoting SME participation - partnership level	Transparency & Openness				
	Quantitative and qualitative leverage effects, including on committed and actually provided financial and in-kind contributions	Additionality & Directionality				
	Visibility and positioning in the international context					
	Impact on R&I related risks of private sector investments					
Information & Communication	Communication on priority setting rationale	Transparency & Openness				
	• Information on the functioning of the governance • Visibility of the Union • Communication and outreach measures					
Programme level						
Operational intelligence	Target audience for communication and outreach measures	Transparency & Openness				
	Identification of need/focus for joint actions with MS beyond R&I	Additionality & Directionality				
	• Changing policy, societal and/or market needs, or scientific advances • Needs for enhanced policy coherence between regional, national and EU level					
Programme design	Joint actions with MS also beyond R&I	Additionality & Directionality				
	Action lines intervention logics / Contribution to partnership objectives & KPIs	Effectiveness				
Monitoring & Evaluation System	Action lines intervention logics, KPIs, deliverables, outputs	Effectiveness				
	Mid-term evaluation at action lines level / achievements, impacts and potential needs for corrective measures					

Partnership management systems & processes	Criteria for the selection, implementation, monitoring, evaluation & phasing-out of the European Partnerships	Principles (Art 8 & Annex III)	Co-programmed	Co-funded	Art 187	Art 185
	Effectiveness of co-operation measures with other R&I initiatives - action lines level	Coherence & synergies				
	Effectiveness of measures to overcome implementation barriers at national level - action lines level					
	Effectiveness of measures ensuring openness for participation in calls for proposals	Transparency & Openness				
	Effectiveness of measures promoting SME participation - action lines level					
Rules & procedures	Measures ensuring continuous openness for participation in calls for proposals	Transparency & Openness				
Information & Communication	Information to SMEs promoting their participation	Transparency & Openness				
	Communication on measures ensuring openness for participation in calls for proposals					
Reporting	Implementation of communication and outreach measures	Transparency & Openness				
	Detailed information on the evaluation process and results from all calls for proposals within partnerships, to be made available timely and accessible in a common e-database					
	Information on the functioning of the governance					
	Visibility of the Union					
	Communication and outreach measures					

Notes: Cells highlighted in *dark green* indicate the types of partnership that are expected to respond to a specific requirement. Cells highlighted in *light green* indicate types of partnerships for which a specific requirement is more difficult to apply to. No colour shading stands for non-applicability of the criterion for a partnership type.

4 Improving efficiency of implementation of institutionalised partnerships

While the broad set of different partnerships have shown good progress and various impacts since their introduction at the start of the European Research Area, a number of issues have arisen regarding their implementation. In particular for the partnerships developed under the Article 185 and 187, a review is needed whether their governance, their work processes and operational management are efficient and in line with Horizon Europe's new and more impact focused approach aiming at synergies, openness and systematic approach as reflected in the legal base criteria. This section will look in particular at how the **implementation of the Article 187 initiatives** could in the future better support them in achieving policy objectives and impact; better coherence, collaboration and complementarity, as well as facilitate the set-up, implementation and phasing out. The section also looks at possibilities for increasing the efficiency of the programme management and implementation structure, more centralised use of services, better access to and availability of data, improving the involvement of Member States and Associated Countries, in line with the Terms of Reference.

A synthesis of key common problems identified by mid-term evaluation studies of Partnerships, by the ERAC Working Group on Partnerships and by interviews can be structured following the key aspects of the Partnership implementation:

- Governance (and legal context)
- Strategy development process
- Translation of strategies in concrete Work Plans
- Operational implementation which includes:
  - Managing the research funding process (grant management)
  - Communication, dissemination and outreach
  - Tasks to shape the ecosystem, such as involvement in regulation, policy development, cross-JU cooperation and standardisation

The Impact Assessment studies for the candidate Institutionalised European Partnerships were also used to inform this analysis. However, during the course of the studies it became clear that stakeholders involved in the preparation of candidate partnerships were not yet in a position to provide detailed views on the operational implementation of the proposed future partnerships, as they were still negotiating the shape of alternative implementation models with the Commission. Thus, it is too early to make a full assessment of the best way to improve the overall efficiency of implementation of the preferred options for future initiatives. Nevertheless, some suggestions can be made how to improve the coherence of implementation between the initiatives in the future.

European Partnerships in Horizon Europe need to be more effective and efficient. Efficiency entails more than cost efficiency of the administrative implementation of the partnership alone. The entire set up of the initiative from its legal establishment, its strategy development to its communication and outreach activities, contribute to achieving the greatest impact in the most efficient manner. Particularly if new European Partnerships live up to their expectations to be a key strategic player in shaping effective European R&I eco-systems to deliver on EU priorities, the activities that complement the grant management functions are essential.

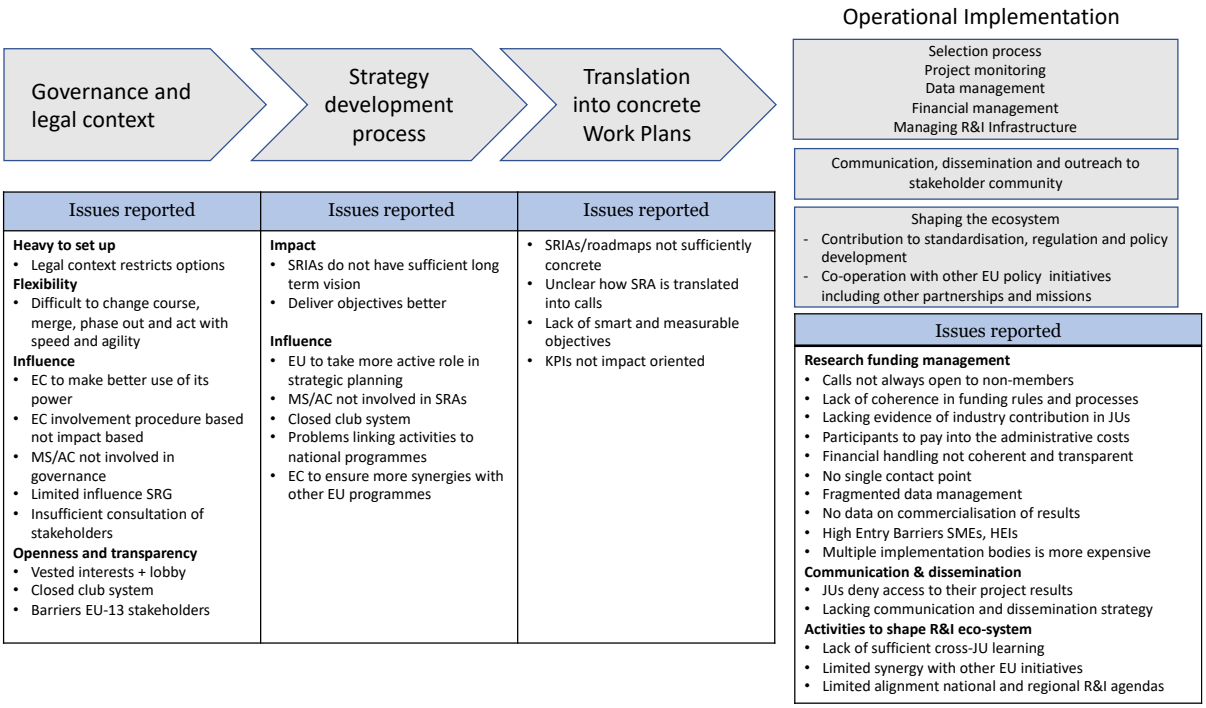
The following sections make a problem analysis based on the current experiences with institutionalised partnerships, in particular Art 187 partnerships and Public-Private Partnerships (PPPs) in general (in the international context). A number of options for changes addressing these problems are suggested, each showing their potential positive as well as potential negative effects.

4.1 Synthesis of problem analyses in implementing public-private partnerships

In preparation for Horizon Europe the Commission is considering the most effective and efficient way to implement particularly the Article 187 Partnerships. In the current Article 187s and related Joint Undertakings (JUs), there are a number of critical issues that have been raised, by the European Member States and Associated Countries (synthesised in the abovementioned ERAC Working Group report), by the Commission services as well as in independent evaluations and mid-term reviews of the current JUs.[14] Interviews with those involved with the implementation of these partnerships as well as the results from the Impact Assessments provided additional perspectives on efficiency issues. Policy analysis literature on the management of PPPs provided good practice inspiration.[15]

The following map (Figure 8) summarises the key issues raised along the four key aspects of partnership governance and implementation described in the previous paragraph. Not all issues raised apply to all Article 187 initiatives. However, they have influenced the perception of partnerships in general and Article 187 partnerships in particular.

Figure 8 Key issues for Institutionalised Partnership (art. 187) governance and implementation



Source: IPM

Quite a number of the critical issues are closely related to the Criteria Framework set out for European Partnerships under Horizon Europe, in particular to the need to deliver clear impact, openness, transparency and coherence of implementation (see Section 3.2, above).

[14] See for summary of mid-term evaluations European Commission, Interim Evaluation of the Joint Undertakings operating under Horizon 2020, SWD (2017) 338 final; Council of the European Union, ERAC ad hoc WG on Partnerships, Final Report, WK 14345/2018 INIT, 23 November 2018.

[15] Luukkonen et al (2017), Evaluation of Complex PPP programmes in STI, Mutual learning Exercise, Policy Support Facility, DG Research and Innovation; Hessels, L., Deuten, J., (2013), Coördinatie van publiek-privaat onderzoek, van Variëteit naar maatwerk, (Coordination in public-private research, from Variety to Customisation), Rathenau Institute, The Hague; OECD (2016), "Strategic public/private partnerships", in OECD Science, Technology and Innovation Outlook2016, OECD Publishing, Paris.

4.2 Governance and legal context of public-private partnerships

Regarding the governance of Article 187s partnerships and their JUs recurring issues reported by stakeholders are related to their complex set up, their (lack of) flexibility and agility, the (lack of) influence of various types of stakeholders and problems with transparency and openness.

4.2.1 Heavy to set up

Joint Undertakings (JUs), based on article 187 of the Treaty on the Functioning of the European Union, are a special legal instrument of implementing Horizon 2020 through a public-private partnership (PPP) in key strategic areas. The option for a Joint Undertaking is chosen where there is a sufficient scale and scope and other forms of partnership would not fulfil the objectives or generate the necessary leverage. The JUs organise their own research and innovation agenda and award funding to projects on the basis of competitive calls. Currently eight Article 187 initiatives have set up a Joint Undertaking, a legal entity to manage the partnership. The decision to establish a Joint Undertaking is done by the European Council. The top-level objectives are set out in the legislation creating an institutionalised partnership and in the Statutes of the JU. The set up and financial regulations are defined in the Council Regulations and vary for each JU. In FP7 and Horizon 2020 there is no unitary model for the set-up of JUs.

As top-level objectives, commitments and partners are set in a legally binding documents at the start of an institutionalised partnership, it is difficult to change the direction of these partnerships. It is in the development of the strategic research agenda and the Annual Work Plans that directions can be changed.

Given this heavy procedure, an Article 187 should only be set up, if other types of partnership cannot achieve the same objectives and impacts compared to other partnership models.

4.2.2 Flexibility

Flexibility of implementation should be an essential part of a partnership. The ability to change direction if dominant trends in technology, markets and societies ask for this keeps R&I policies relevant. DG Research and Innovation's Policy Support Facility supported a mutual learning exercise on the evaluation of complex PPP programmes in science, technology and innovation (STI). The focus of the exercise was mainly on national PPP initiatives. The MLE report states that

"... the dynamic nature of economics, societal norms, and the ongoing development of national research and innovation (R&I) systems implies the emergence of new technology needs on an on-going basis. It is therefore most relevant to embed ***flexibility*** *in the resources to be made available for the PPP in order to meet these evolving needs. It also implies that the overall programme resources should not be allocated to a single policy implementation tool."* [16]

At the same time the European Partnerships are intended to have high level ambitions, making a real impact with a long-term orientation. In the debate on flexibility in European partnerships we can distinguish two levels: at the level of the portfolio of partnerships within a research framework programme and at the level of individual partnerships.

Firstly, flexibility can be related to the establishment and phasing out of new partnerships. The relatively high administrative burden of setting up an Article 187 with a Joint

16 Luukkonen et al (2017), Evaluation of Complex PPP programmes in STI, Mutual learning Exercise, Policy Support Facility, DG Research and Innovation, page 5. See: https://rio.jrc.ec.europa.eu/en/policy-support-facility/mle-evaluation-complex-ppp-programmes-sti

Undertaking would be less suitable for research and innovation topics with a short time frame of relevance (say less than 5 years). The consideration here is that once an Article 187 is set up, the risk of terminating well-functioning networks could lead to a reluctance to its phasing out, leaving less flexibility in the entire portfolio of European partnerships. Indeed, all Article 187s established since FP7 have continued in Horizon 2020, with one (ECSEL) continuing as a merger.

One option is that the key partners and particularly the industrial partners are asked to plan for a succession of their JUs that is not based on an Article 187, but a more self-sufficient model or with alternative sources of public funding such as contributions from Member and Associated States. If this is planned from the start it is likely that more efforts are made to align the partnership with national, regional or other European R&I initiatives. This needs no change the JU organisational model, but a change in strategic direction.

A second perspective on flexibility is to ensure is that an existing partnership can adapt its work plans to changing policy or market needs or scientific advances. This asks for speed and agility in the implementation of Strategic Research and Innovation Agendas (SRIA) and Annual Work Plans. The interim evaluation of JUs did not find any problematic issues relating to their flexibility of implementation. On the contrary, IMI2 was commended for its rapid and efficient reaction to the Ebola crisis. A lack of flexibility in the definition of call themes was considered as a potential barrier for SME participation. More flexibility can be assured if the SRIA is regularly updated and reviewed. Data analysis on the pipeline and portfolio of projects should be conducted regularly to assess is specific sub-domains of the SRIA should be phased out or rather expanded. The time cycle of renewing the SRIA will vary from topic by topic depending on the speed of technology, market or societal changes that affect the roadmap.

3.2.3 Influence

According to the Interim Evaluation of the Joint Undertakings operating under Horizon 2020, the key strength of the JUs is their **ability to engage major, strategic industry partners** in priority areas of the Union, across borders and business sectors and lead a step change in comparison to standard research.[17] This strength can be partly attributed to the set-up of the Joint Undertakings which gives the Industry Partners a certain degree of freedom to manage the programme. This raises a sense of ownership which in turn supports the creation of a wider community. Indeed, the interim evaluation of JUs found that they have managed to attract a high interest of major players to be actively involved in the JUs.

Nevertheless, many independent expert groups call for a wider range of stakeholders to be included in the governance and management of the JUs.[18] These are not necessarily more industry partners, but also stakeholders in the entire value chain and regulators (e.g. health and safety, standards, etc.) and end users and customers to foster further deployment of the outcomes of the research projects. In addition, one interim evaluation of JUs found that even when a partnership has a Stakeholder Forum in its governance structure, its role and structure could be enhanced to improve openness and transparency.[19]

While the decision power can remain with the partners that provide a financial contribution to the JU, there is a need for an intensified and wider consultation in the strategy development process as well as in the translation of the common vision into Annual Work

[17] European Commission, 2017, Commission Staff Working Document, Interim Evaluation of the Joint Undertakings operating under Horizon 2020, SWD(2017) 338 final.

[18] Ibid, page 23.

[19] See the Interim Evaluation of FCH2, page 8.

Plans. This wider consultation is likely to contribute to a wider participation and inclusion of more and other stakeholders in selected projects.

A point of concern expressed in the ERAC Working Group is the limited influence of Member and Associated States on the strategic direction of the JUs. In addition, the interim evaluation of JUs found that in a number of cases the advisory groups had only limited impact on the Governing Boards' strategic research decisions. This would imply that in a number of JUs only a limited set of interested parties – the partners that contribute - influence the direction of the partnership.

The aforementioned MLE report stresses the need for stakeholder involvement in both the design and implementation of the partnership. But the report also stresses that the stakeholders involved should have a 'connectivity' to be able to deliver a common vision:

"The successful design and implementation of PPPs requires taking into account some important initial considerations. These include foremost the extent of technological development of the research performing organisations and of industry in the country. Whilst PPPs appear to function well at very different levels of technological development, the stakeholders involved in the PPP need to be able to design Strategic Research Agendas that are consistent with their needs and capabilities. There is, therefore, a need for connectivity among stakeholders." [20]

The set-up of the JUs with its legally binding commitments means that the governance structure has Industrial Members (or Core Partners) who have signed up to commit efforts and resources to the JUs. This set up already creates a difference in status of potential beneficiaries: between members and non-members. An essential issue is finding the right balance between asking companies for binding commitments (e.g. contributing to administrative costs) and the advantages received for this commitment. It is unlikely that industrial partners will financially commit themselves for a long term, without knowing that there will be some advantages coming from that commitment. Most JUs have created the possibility to become an Associated Partner with the goal to opening up to a wider set of stakeholders. Each JU has its own procedure for this. An option to address this issue is to make it mandatory to have an open membership policy for all eligible partners that can have a relevant contribution to the partnership.

The literature on complex PPPs also has examples that too much openness (or in the phrasing of the aforementioned MLE report: lack of connectivity) in the development of SRIA strategies could hamper their effectiveness. The Finnish SHOK programme was a typical example of a PPP initiative in a number of thematic domains closely related to a limited number of industrial sectors. The independent evaluation of the initiative found that the SHOK programme had too many parallel objectives, some of them conflicting with each other.[21] The other tension was between short term incremental industrial research needs and leading-edge academic research interests. Interestingly a severe criticism of the SHOK concept was that the model was **too inclusive**, therefore hampering the focus of the PPPs.

"Criticisms remain in relation to SHOK selection and their inclusiveness. ... and perhaps a more selective policy should have been utilised in establishing the SHOK topics while the SHOKs themselves might benefit from being internally more selective with respect to membership, both within focus areas and programmes. The general ethos of openness and

[20] Luukkonen et al (2017), Evaluation of Complex PPP programmes in STI, Mutual learning Exercise, Policy Support Facility, DG Research and Innovation, page 5. See: https://rio.jrc.ec.europa.eu/en/policy-support-facility/mle-evaluation-complex-ppp-programmes-sti

[21] Lähteenmäki-Smith, Kaisa, Halme, Kimmo, Lemola, Tarmo, Piirainen, Kalle, Viljamaa, Kimmo, Haila, Katsi, Kotiranta, Annu, Hjelt, Mari, Raivio, Tuomas, Polt, Wolfgang, Dinges, Michael, Ploder, Michael, Meyer, Susanne, Luukkonen, Terttu, Georghiou, Luke (2013) "Licence to SHOK?" External evaluation of the strategic centres for science, technology and innovation, Publications of the Ministry of Employment and the Economy, 1/2013.

inclusiveness moreover is not necessarily the best policy in developing excellence and cutting-edge innovation." (page 313)

In summary, the Institutionalised Partnerships should open up the involvement of more and other stakeholders, to inform their decision-making processes and develop a common vision with high ambitions for achieving impact.

3.2.4 Governance structure not conducive to alignment

Today's governance structure is organised around individual JUs. There is no formal process or platform where multiple JUs can collaborate, although recently more joint activities have occurred. The development of the SRIA of individual JUs should at an early stage in the process be matched and compared with those of other JUs and possibly the EU Missions to identify synergies and overlaps. Particularly within a thematic cluster this exchange could be embedded in the governance system for Institutionalised Partnerships. For instance, members of the governance boards of JUs that are likely to have synergies with one or more Partnerships could act as Observers in the adjacent governance boards, particularly as SRIAs are developed. An annual common platform of all Institutionalised Partnerships (both Article 185 and Article 187 initiatives) could be held to inform each other of opportunities to launch joint calls or to discuss a division of labour. These should be well prepared – for instance by the Commission representatives on the governance boards – to identify which research and innovation topics could be tackled in a more coherent manner.

An issue that has been put forward, particularly by the ERAC Working Group, is the lack of alignment of the activities of the JUs with that of the Member States and regions. Some of the JUs have an Advisory Board with representatives of the Member States. The interim evaluation reported that in some cases these Boards have little influence on the decisions taken by the Governing Boards or on the development of the SRIAs. ECSEL has financial contributions provided by Participating States and therefore the Public Authorities Board has formal responsibilities. This is however not the case for EuroHPC JU which also has national financial contributions. In SESAR JU Member States participate through Eurocontrol.

For all other JUs the public contributions are made by the European Commission, so EU Member States have no formal responsibility in individual JUs. Alignment with national and regional R&I policies could contribute to leverage the efforts in a particular thematic area. While Member States have slowly progressed to align programmes in P2P domains, it would ask for considerably more efforts to align national R&I agendas in the PPP domains, with strong national interests in different industries and sectors. Nevertheless, a more systematic communication with Advisory Boards with representatives of the Member States is an option for improvement.

3.2.5 Options for change

Table 3, below, lists options for changes in the governance of Art 187 partnerships. It seems that many of the issues that have been reported can be tackled without a major organisational change in the JU structure. By applying some common basic principles that can be included in the Statutes and making them mandatory for all JUs, most issues can be addressed. This would require that the Commission has a clear internal agreement across all DGs involved, what these common principles should be.

Table 3: Options for changes in governance

Options	Advantages	Disadvantages
Make it mandatory to widen the Governance Board to include stakeholders from value chain, regulators and end users as observers.	• Increased openness in membership • Greater view on future deployment of results	• The Governing Board becomes too large to make effective decisions • Loss of sense of ownership among industry members
Ensure regular rotation in Governance Board membership	• Less risk of vested interests to shape the JU across its lifetime	• Loss of expertise and continuity
Make it mandatory for each JU to have a State Representative Group (SRG) and improve the interaction with Governing Boards	• Member States and other Participating states better informed about the activities of the JUs • Opportunity to build better alignment with national and regional R&I agendas • Gives opportunities to develop plans for new types of multilateral partnerships at the end-of the JUs life-cycle	• Without an empowerment of the SRG in the Governance system this could have little effect on strategic decisions • Geo-political considerations may overrule objective-oriented strategic considerations • Additional Consultation structures could slow down the JU and risk that too many 'wish lists' are put on the table leading to lack of focus
Make it mandatory to develop an open membership policy and/or a minimum number of non-members private sector representatives in the Governing Board	• More stakeholder involved in governance and strategy development process • Larger diversity in representatives in leadership positions	• Connection between partners who commit financially and partners with a vote in the decision making less distinct
Enhance the stakeholder consultation elements in the Governance of Partnerships	• Provides systematic and regular feedback and insights to shape the SRAs and Annual Work Plans of the partnerships	• Official Stakeholder Fora set up without a real influence on decision making in Partnership

It is clear that the advantages of increased openness and transparency should be considered to having significant weight to enhance and widen the political support for Institutionalised European Partnerships. Considering between advantages and disadvantages is a matter of finding the right balance so that all partners are willing to commit for the long term.

4.3 The strategy development process

4.3.1 Influence

An institutionalised partnership requires a strong commitment from all partners. Industry commitment is expected to be legally binding and for the longer term. A strong factor behind this commitment is a sense of ownership by the industrial partners. Independently managing the Joint Undertaking increases the sense of ownership.

One element of this independency is the development of a Strategic Research and Innovation Agenda (SRIAs) or multi-annual roadmap that sets out the specific goals and objectives of the partnerships and defines the research and innovation activities that need to be performed to achieve these objectives. As above mentioned, the governance and management set-up of each JU differs and subsequently the process by which these SRIAs are developed are different as well.

The issue of openness and transparency in this respect relates to which stakeholders contribute to shaping the strategic research agenda. In the current situation the JUs' members or core partners are the key stakeholders to develop the SRIA. It is usually the Governing Board that defines this SRIA. The advantage of this is that a strong leadership could be developed with a clear and focused strategy a community that is relatively homogenous in its objectives. In some JUs the European policy agenda is a clear part of the SRIA, such as the SET Plan for the FCH2 JU.[22] For the BBI JU extensive consultation has taken place with public and private stakeholders.[23] However, in other JUs the process is mostly done by its members and the influence of external stakeholders is less transparent.

Again, a balance needs to be found between a focused strategy with clear set of objectives for the members that have committed themselves for the long term on the one hand, while on the other hand allowing other stakeholders, whether from the value chain, potential users, regulators or policymakers from national and regional governments to have an influence on the problem definition used to build an SRIA as well as on selecting the priorities of the agenda.

4.3.2 Impact orientation

In the future of European partnerships, it is expected that their vision and ambitions are more impact oriented and aligned with European policy objectives. It is also expected that partnerships take on board a wider set of stakeholders, including those that can enhance deployment. This has repercussions for the strategy formulating process as more actors with a variety of visions and objectives will need to be included. In most of the first and second generations European PPPs, the key objective was to contribute to European competitiveness in a particular sector or technology domain. This perspective on objectives has evolved in Horizon Europe. A main objective of Horizon Europe, and in particular its second Pillar is to generate knowledge, strengthen the impact of research and innovation in developing, supporting and implementing Union policies and support the access to and uptake of innovative solutions in European industry, notably in SMEs, and society to address global challenges, including climate change and the Sustainable Development Goals.[24]

[22] European Commission, 2017, Expert Group Report, Interim Evaluation of the Fuel Cells and Hydrogen 2 Joint Undertaking (2014-2016) operating under Horizon 2020.

[23] European Commission, 2017, Expert Group Report, Interim Evaluation of the Biobased Industries Undertaking (2014-2016) operating under Horizon 2020.

[24] European Commission, 2019, Orientation towards the first Strategic Plan for Horizon Europe, page 8.

4.3.3 Options for change

The key question here is how the organisational set-up of the partnerships can improve them to deliver their objectives better. A stronger effort from all stakeholders in an early phase of the initiative to develop a clear logical framework of objectives, with well-developed argumentation how the R&I activities foreseen are going to contribute to those objectives could be a part of a go-no-go decision. This strategy should be co-created by the formal public and private partners, to develop a balanced set of goals that are relevant for both European policy and industry. This does not require a major change in the organisational set-up, rather a dedicated effort built in the process of developing a solid SRIA.

Table 4: Options for change in the SRIA development process

Options	Advantages	Disadvantages
Ensure an extensive stakeholder consultation process with wide set of stakeholders as part of the SRIA development process	• The SRIA has wider perspective than those of Members only • More attention to deployment and uptake • Opportunity to include long term considerations into the SRIA	• Objectives become too broad if too many perspectives are taken on board
Agree on an appropriate timing to review and renew the SRIA at the start of the JU	• The renewal of SRIAs is not postponed • Improves agility and flexibility	• The JU responds to immediate 'hot-topics' and loses sight of the long-term direction in the common vision
Make it mandatory for JUs to have a well-developed logical framework with concrete objectives and targets and with a set of KPIs that match these objectives and the resources that are foreseen to be invested. This could be a pre-condition before officially starting the JU.	• The clear impact orientation of the partnership is made clear from the start of the partnership • Helps in the prioritisation choices that have to be made in the SRIA • Helps to identify opportunities for synergies and collaboration with other partnerships and EU initiatives	• Could lead to loss of flexibility and agility as changes to the original vision on the road to impact are not accepted by all stakeholders
Involve Member States, Associated and relevant regions in the communication and outreach activities of a JU to ensure that relevant stakeholders from all countries are made aware of the JU opportunities at an early stage of strategy development.	• Early awareness of potential beneficiaries that have not been included • Increases the active involvement of national and regional policy makers, contributing to better policy alignment	• Additional management burden for the JUs to coordinate this

The advantages of increased openness and transparency and the assurance of having better KPIs with a clearer view on expected impacts outweigh the possible disadvantages. Nevertheless, the risks of the disadvantages need to be kept in mind to ensure that solutions for one problem bring about new problems. The involvement of more stakeholders in the outreach will only reap the advantages if there is serious commitment from those stakeholders to engage and invest resources. If not, the disadvantage of the additional burden to the JUs will outweigh the potential advantages of more inclusiveness.

4.4 Translation of strategy development process in concrete work plans

A criticism heard on JUs is that their long-term visions are not sufficiently translated into concrete roadmaps with smart and measurable objectives.

A strategic research agenda or roadmap, assuming this is developed in an open and transparent manner, needs to be subsequently translated into an Annual Work Plan including defining the calls for proposals. Defining the exact topic of the calls for proposals is a delicate matter. The calls should fit with the Annual Work Plan and reflect the key elements of the strategic research agenda. In terms of efficiency of implementation, the better the Annual Work Plans and calls match the key objectives of the Partnership, the more likely to achieve impacts.

4.4.1 Steering the SRIAs and the definition of KPIs

The Commission approves the Annual Work Plan of the initiative covering all activities and resources. That means the Commission is in a position to provide the check and balances to ensure that the Work Plan is in line with the top-level objectives, the SRIAs and is sufficiently open and transparent.

The aforementioned MLE report on PPPs stresses that it is important to steer the use of PPPs for the promotion of public interests. This can be achieved by adequate monitoring and evaluation, avoiding conflicts of interest by using external experts in the evaluation of programme agenda's and the selection of projects. In addition, there is a plea for maintaining final power to allocate the funds by the public funders. "*The management of PPPs requires active input from the government agencies involved in order to steer the instrument towards the desired track."*[25] This finding is in line with the OECD's findings on factors of success of strategic public private partnerships in R&I: in particular good governance and public leadership are key factors ensuring success of PPPs. These include setting clear objectives and activities/responsibilities well defined for each participant, operational rules and implementing regular monitoring and evaluation, transparency, consultation with stakeholders and the establishment of dispute settlement and exit strategies. [26]

Key Performance Indicators (KPIs) are set in order to improve the understanding of JUs' strategic challenges from the perspective of the management, decision makers and societal stakeholders and to justify support for the JU instrument on the basis of its impact. [27] There has been criticism on the JUs regarding their use of KPIs. Several interim evaluations expert groups call to re-visit and re-define the whole set of KPIs. They were considered too limited to administrative parameters and operational measures with insufficient attention to the R&I achievements and outcomes.

[25] Luukkonen et al (2017), Evaluation of Complex PPP programmes in STI, Mutual learning Exercise, Policy Support Facility, DG Research and Innovation, page 5. See: https://rio.jrc.ec.europa.eu/en/policy-support-facility/mle-evaluation-complex-ppp-programmes-sti

[26] OECD (2016), "Strategic public/private partnerships", in OECD Science, Technology and Innovation Outlook 2016, OECD Publishing, Paris, https://doi.org/10.1787/sti_in_outlook-2016-10-en.

[27] Interim evaluation of Joint Undertakings operating under Horizon 2020, page 55.

4.4.2 Options for change

For efficiency of implementation the question is relevant which actors are involved in the process of defining these KPIs. If we assume two types of KPIs, first those common to all JUs, secondly on cross-cutting issues reflecting their contribution to deliver on EU priorities and secondly JU specific KPIs, the industry stakeholders involved in the JU management should have a strong role in defining the latter type in line with the JUs objectives, while the Commission should play a lead role in defining the first type of KPIs. The cross-cutting themes should be initiated as a joint effort between Commission and JUs in a particular thematic area. To develop a meaningful set of KPIs covering both efficiency and effectiveness a process of co-creation between the public and private partners will be needed to include general and specific KPIs as objectives and goals are too diverse between JUS to have only one unified set for all.

Table 5 summarises the options for changes in translating SRIAs in concrete Work Plans is response to a number of issues on this aspect of JUs.

Finding the balance between the advantages and disadvantages is a delicate negotiation process between the Partners involved and is difficult to measure beforehand and for all JUs in general.

Table 5: Options for change in translating SRIA in concrete Work Plans

Options	Advantages	Disadvantages
European Commission to use its powers on the Governing Boards in a more proactive manner	• Better alignment Work Plan with SRIA • Better alignment Work Plan with EU policy objectives • Checks to avoid overlap with other EU R&I funding	• Slowing down the process of defining Annual Work Plans and calls • Decreased sense of ownership of private partners
Regular assessments of portfolio of R&I projects and their progress, achievements and external coherence to underpin the definition of next Work Plan	• Allows to identify gaps in Work Plan • Allows to identify missing crucial actors in the value chains • Allows to identify sub-themes that show little progress • Improves agility and flexibility	• Risk of the partnership being too short term oriented • Risk of too much micro-management and overlooking unexpected promising technological avenues • Requires state-of-the-art project date systems
Develop a set of KPIs as a co-creation process between all partners; combine generic and context specific KPIs with a process and impact orientation	• Improving sense of ownership of KPIs and their achievements • KPIs closely matched with concrete and measurable objectives of partnership • KPIs closely connected to EU policy objectives	• Could take up quite some time and effort to come to a consolidated set that can be used during the whole life cycle of the partnership

4.5 Operational implementation

4.5.1 Managing the entire R&I funding process

As JUs are relatively independent bodies in Horizon 2020 the organisation of the operational implementation of the Work Plan varies between the eight running JUs. The interim evaluation of JUs (excluding EuroHPC JU that has been in operation only since 2018) found that the current JUs have made considerable progress in their operational efficiency compared to the JUs in FP7. The aspects of efficiency that these JU interim evaluations considered were:

- Timely execution of the functions: time-to-grant, time-to-pay and average evaluation cost per proposal.
- Cost-efficiency of the management and control arrangements.
- Budget execution of commitment and payment appropriations
- Simplification and reduction of the administrative burden for the participants.

These are the operational efficiency functions related to the core business of JUs: to manage the allocation of R&I funding (grant management) in an efficient, transparent and fair manner to potential beneficiaries. Some of the JUs will also need to manage and operate large R&I infrastructures. These can be labelled as the first type of operational implementation activities.

Nevertheless, there are quite a number of issues raised on these implementation aspects in the interim-evaluation reports, by the ERAC Working Group and in the interviews that were conducted on behalf of this Impact Assessment study. These issues are related to transparency and fairness, to data management and financial management. Again, the issues are raised for some JUs, but not for all of them. In addition, the duplication of implementation functions for each JU is less cost-efficient than joining up some functions that need to be conducted across all JUs.

4.5.2 Communication, dissemination and outreach to the stakeholder community

Apart from the abovementioned operational efficiency functions there are concerns about the appropriateness of communication, dissemination and outreach activities, the second type of operational activities that JUs need to carry out. The interim evaluations point out to a number of weaknesses such as the lack of clear communication plans and insufficient efforts to ensure the dissemination of project results. In Horizon Europe it is expected that the JUs make better efforts to conduct these tasks, to reach out to a wider stakeholder community and to promote the take up of the R&I projects' outcomes. The criticism of openness and transparency and accessibility of the JUs activities for companies across the EU could for a large part be addressed by better communication by all the partners involved in the JU.

The low participation rates of entities from EU-13 Member States across all JUs as well as the low participation rates of SMEs in some JUs could be addressed by targeted communication campaigns, although this alone will not be sufficient to boost their participation rates. As aforementioned a close cooperation with the Member States to take part in these communication activities could also contribute to a better alignment of national and EU policies and a better leverage of resources.

In this respect, the JU interim evaluation reports confirmed that the JUs have implemented a range of mechanisms in order to ensure an open and non-discriminatory attitude towards the wider stakeholder community, including the general public. This included various communication tools like an up-to-date, informative website, the use of social media, organisation of and/or participation in events, seminars and conferences and publications

in the specialised and general press.[28] Nevertheless the expert groups on some JUs such as the transport-related ones, IMI2 and FCH identified particular shortcomings and inconsistencies in the communication efforts. As communication requires a good understanding of the wider stakeholder groups that have an interest in the initiatives this type of implementation activity seems most effective if it is performed by the individual JU communities who know the audiences best and can act as single contact point for the stakeholders. It could be considered whether this type of implementation activity could be bundled within a cluster of JUs and other partnerships. That probably depends on the consistency of the topics and stakeholders in a cluster.

The interim evaluation of Joint Undertakings[29] particularly stressed the need to improve on dissemination of knowledge generated by project results, in line with the Commission's Strategy for the Dissemination and Exploitation of Horizon 2020 Research Results. The current JUs under Horizon 20202 are concerned with applied research aimed at improving competitiveness and leadership of European industry. There is a clear tension between publicly sharing of project results and data and the confidentiality needed in a global competitive environment. This sensitivity needs to be taken into account in order to maintain the commitment of the key industrial partners. As the interim evaluation states this is dependent on the specific characteristics of the JUs.

4.5.3 Shaping the wider eco-system

In Horizon Europe it is expected that the European Partnerships exceed their efforts and also make considerable contributions to achieving European policy priorities including through working together with the wider eco-system, including supporting the development of innovation and sustainability-friendly regulations, to standardisation and to collaborate with other EU (including other Partnerships), national and regional initiatives to increase leverage. These are a third type of operational implementation activities. It is expected that the Art 187 initiatives in Horizon Europe have a systemic impact and not simply deliver a large number of R&I projects. This would need a clear involvement from JUs that understands the context of the domain, the value chains involved and the European, national and perhaps even regional policy makers from different sectoral backgrounds whose decisions shape the thematic domain. Thus, the governance and management structures of the partnerships need to have a strong engagement and reaching out approach, with a leadership from the R&I community and a sense of ownership by the industrial partners involved, to make a systemic impact. These activities are very context specific and cannot easily be delegated to a back-office with administrative expertise alone. To improve on this role of the JUs it should be ensured that the Partnership has a clear plan to engage in proactive dialogue with policy makers from relevant sectoral DGs, other Partnerships, national ministries, regulators and standardisation bodies.

4.6 Improving the collaboration and coherence of implementation between Joint Undertakings

Potential efficiency and effectiveness gains could be achieved with enhanced collaboration between the partnerships and particularly the Article 187 initiatives. These improvements could be achieved by strategic collaboration, i.e. taking advantage of the synergies and complementarities of R&I activities.

The experience with many PPPs is that in the early stages of setting up the initiatives, the efforts of strategy development, shaping the stakeholder community and getting the operational implementation organised, tends to be predominantly inward looking. Looking for active collaboration with other initiatives will come when the partnerships are up and running and only if there is a clear added value for partners to join forces with other

[28] European Commission, 2017, Commission Staff Working Document, Interim Evaluation of the Joint Undertakings operating under Horizon 2020, SWD(2017) 338 final, page 48.

[29] Ibid.

initiatives, whether they are other Institutionalised European Partnerships or other types of R&I initiatives. However, already at very early stages of preparing new Article 187 initiatives, SRIAs and roadmaps need to be aligned, particularly for partnerships that develop enabling technologies which are needed in other partnerships. The Governing Boards together with the European Commission services in a particular domain or cluster, should regularly scan the portfolio of initiatives on the basis of the portfolio mapping whether good opportunities exist to pool resources and for instance co-design a call for proposals. Criteria for exploring this could be for instance that a joint problem or challenge addressed stands more chance to be solved with R&I efforts and competences from both R&I communities, when R&I solutions are dependent on parts of value chains not present in one partnership but present in other partnerships, when the deployment of solutions depends on R&I investments of policy actors not directly involved in the partnership (e.g. Member States, regions, regulators). The goal should always be to achieve greater impacts in light of the common challenges. These decisions are highly context specific so there is no one-size-fits all mechanism to make all Institutionalised European Partnerships to actively join forces with other R&I initiatives. The European Commission can take an active role in identifying these potential opportunities and assist partners to join forces at the early stage of preparing for Article 187 initiatives.

Improved efficiencies could certainly be reached through intensified operational collaboration.

For the future of the Article 187 Joint Undertakings it should be considered whether everyone should have its own fully-fledged operational implementation. The analysis in the previous paragraphs showed that quite a number of the organisational functions such as the governance and the strategy development processes have a strong context dependency and should be predominantly be done at partnership level. In potential Partnerships where the intervention logic, stakeholders, R&I activities and value chains have clear-cut overlaps, coordinated governance and strategy development can be considered, avoiding that the objectives of the partnerships become too broad.

However, there are a number of activities that have a low level of context dependency and could be joined up and resources shared. Quite a number of operational activities of the JUs are procured from external service providers (e.g. IT, communication activities, recruitment services, auditing) by each JU separately. Today some JUs have Service Level Agreements (SLAs) with relevant Commission services, for instance for HR services, but these are individual agreements covering different areas. If all this was better streamlined this could create a win-win situation for all partners leading to better harmonisation, more efficiency and less complexity in supervision and support by the Commission services.

Six of the current JUs are located in the same building in Brussels thus that provides a good starting point for further operational cooperation. They share inter-JU framework contracts for IT and insurances. However, currently the SESAR JU office is based in another location in Brussels and Euro HPC JU is located in Luxembourg. This could add a barrier to further collaboration in the future.

Thus, today's situation is one of fragmented operational implementation across all partnerships leading to complex systems of oversight and auditing between JUs and Commission. For example, the European Court of Audits has indicated that far too many audits need to be conducted for the JUs and a more efficient system for this is needed.

For the future an option could be that part of the operational functions that do not depend on the thematic context of a Partnership domain are joined up and provided by a formally established common back-office for all (or the majority) of JUs.

In Horizon Europe there will be a requirement for harmonisation of implementation which is likely going to be overseen by the Common Implementation Centre within the structures of the Commission. A common back-office could make this harmonisation in the preparation processes of future JUs less complex.

A detailed analysis of **efficiency** gains requires comparing today's situation with a possible scenario for a common back-office. However, this would need comparable data on the operational budgets of current JUs and the types of expenditures that are made, with information on staffing allocation to functionalities etc. The Annual Activity Reports of 2018 of the seven JUs[30] that were in operation in that year show that the budget and expenditure data are not comparable across JUs and are at a too aggregate level to distinguish between activities that are Partnership specific and those that are generic.

The size of the different JUs in terms of numbers of staff varies considerably, for a large part depending on the size of the 2014-2020 budget that is managed. Of the 7 JUs in operation in 2018, the smallest number of authorised staff for 2018 was 21 (Shift2Rail) while the largest number of staff was 54 (IMI). The total staff expenditures for 2018 of these 7 JUs was €29 million.[31]

The Annual Activity Reports of the JUs do not specify what type of functions their staff perform or which of these functions are context specific (i.e. requires expertise on the thematic topic of the partnership) and which functions are generic (i.e. could be performed across all institutionalised partnerships). The same holds for other types of expenditure such as communication. Therefore, with the current data on the JUs it is only possible to give a qualitative and tentative projection of what type of operational activities of the JU staff could be done in collaboration. This clearly needs further exploration.

In case the JUs would share certain functionalities in a common back office, there are still considerable roles to be played by the management of the JUs. They will still need a clear figurehead (most likely from industry) who has sufficient gravitas with the R&I community and its stakeholders. The strategy development process, its translation in Annual Work Plans and the interaction with the Partnerships' eco-system will need clear leadership from the individual JUs and Partnerships. If indeed efficiency gains are considerable, the management of the Partnerships can concentrate more efforts on the strategic roles of the JUs.

Table 6, below, provides a tentative overview of functions that could be considered for joint operation across JUs.

Table 6: Overview of functions that could be considered for joint operation across JUs

Functions	Current situation	Option of joint back-office	Comments
Organising calls for grant and proposal evaluations	• Each JU organises this independently.	• A central organisation of logistics, contracting evaluators, managing the data of the evaluation results • Central database of potential evaluators with domain expertise in thematic areas of partnerships	• This (and all other common functions) would need a clear costing model to allocate costs to specific JUs, or alternatively the agreement that these costs are covered by the Union contribution to administrative costs of JUs

30 This includes Clean Sky, IMI, FCH, BBI, Shift2Rail, SESAR and ECSEL. EuroHPC JU was only established in 2018.

31 Excluding National Seconded Experts and procured interim HR services.

Functions	Current situation	Option of joint back-office	Comments
HR related matters	• Each JU has own HR policy and resources • Quite some resources spent on recruitment in some JUs • Some HR facilities are procured from external contractors • Some JUs have a Service Level Agreement with COM for HR	• More consistency in HR policy • More generic resources and expertise for HR matters • Shared HR investment for specialised expertise (IP and legal)	• Ensuring consistency with EC HR policies is already in place
Financial management	• Each JU conducts own financial contract management; differences between JUs • Each JU is audited separately. • Auditing at project level more frequent than in other Horizon 2020 parts and outsourced by JUs thus differences • ECA: too many audits on JUs	• Financial management by one core team of financial staff • Would reduce the number of interfaces for audits and simplifies the auditing of the all JUs • Harmonisation of project auditing	• Simplifies the harmonisation of financial management across JUs in line with Horizon Europe
Communication (internal and external)	• Each JU has a separate communication strategies, teams and resources	• A common back-office can support activities such as event organisation, dissemination of results, setting up website communication • Can help create a more visible Partnership brand	• A considerable share of communication activity is partnership specific (addressing particular target groups, synthesising project results) however there are generic communication activities that can be shared • Needs to avoid duplication of efforts
Data management on calls, project portfolios, information on project results	• Most JUs but not all use e-Corda for project data • Overall IT integration of JUs still difficult	• Harmonised data management • Reduction of IT systems and support that is procured	• This will need to happen regardless of the common back office but will likely be more smooth if managed centrally

Our conclusions are:

An option for a common back-office sharing operational implementation activities is worth exploring further to assess whether efficiency gains can be made.

The implications for legal, financial and administrative aspects of such a joint back-office are complex and would need a detailed feasibility study. The feasibility study would need to include assessing the appropriate relationships between the back office, the Joint Undertakings, the Commission services, the industrial partners and any third parties directly involved (e.g. Eurocontrol or the Member States currently participating in ECSEL). The final legal structure for a common JU back office will need to be examined in due time.

Ideally this would be co-designed as a common Partnership approach leading to a win-win situation for all partners.

Appendix A Key features of the partnership forms

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
Partnership characteristics				
Type of partnership	Suitable for **all types of partners**: private and/or public partners, including MS, foundations and international partners Different configurations possible: Industry only (current cPPPs) Mainly MS (not used under H2020, but planned for Horizon Europe) Combination	Suitable for **all types of partners**: private and/or public partners, including MS, regions, foundations and international partners Different configurations possible: Industry only (majority of current JUs) Mainly MS Combination (e.g. tripartite model, currently ECSEL JU, Euro HPC)	At the core **national funding / research governance bodies**, other partners in addition (e.g. foundations). Provide potential for more efficient interaction with **strategic international partners:** any 'international' funding body can participate independent of the country Needs good coverage - **nearly all Member States**, *since topic is removed from WP*	Participation is limited to **MS and Associated Countries** Non associated third countries only if foreseen in the basic act and subjected to conclusion of dedicated international agreements. Needs good coverage - **nearly all Member States**: ambition is to propose Art 185 only for topics of common interest for all MS and if they have "a major participation" in it The minimum condition of at least 40% of the MS is a measure introduced bearing for geographically focused partnerships, e.g. PRIMA
Form of grouping	One or more association of organisations from industry, research, NGOs etc	A dedicated legal entity –Joint Undertaking or any other structure necessary - that carries full responsibility for the implementation In addition for many (but not all) one or more associations of organisations from industry, research, NGOs etc	Consortium of partners coordinated by a legal entity of one of the MS or a specific representative legal entity	A dedicated legal entity – DIS or any other structure necessary - that carries full responsibility for the implementation

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
Key characteristics	Best suited for partnerships addressing broader communities, and where there is a need for flexibility Partners provide input on the drafting of the respective parts of the Annual Work programme	Stable partners and substantial commitments for contributions from all partners that other forms of partnerships would not allow Stronger commitment of partners to a more integrated approach, resulting in a higher degree of additionality and directionality *compared to co-programmed partnerships*	Best suited for partnerships that rely on pooling / coordinating national programmes and policies with Union policies and investments	Stable partners and substantial commitments for contributions from Participating States (MS & AC) that other forms of partnerships would not allow Stronger commitment of partners to a more integrated approach, resulting in a higher degree of additionality and directionality *compared to co-funded partnerships*
Strength of commitments	Commitments are **not legally binding**, but political/ best efforts	**Legally binding** commitments	Commitments are ensured through the **Grant Agreement**	**Legally binding** commitments
Strategic direction				
R&I focus	**Medium term priorities**	**Long term challenges and priorities** that tend to go beyond a single MFF	**National priorities / policies** Joint programme of activities agreed by partners	**Long term challenges and priorities** that tend to go beyond a single MFF
Main characteristics	Where the primary ambition is to generate commitment to a common strategic research agenda across a diverse set of actors / value chains and where those actors have widely differing capacities and capabilities	Major strategic challenges where collective action – by private and public sectors – is necessary to achieve critical mass on the one hand and to address the full extent of the complexities of the ecosystem on the other	Societal grand challenges and areas of high public good where EU action will add value	Major strategic challenges where collective action by public sectors is necessary to achieve critical mass on the one hand and to address the full extent of the complexities of the ecosystem on the other

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
Basic rationale for policy option	**Concertation of industry/MS around a strategic agenda** Union co-funding large enough to attract strategic investment by private and or public sectors For Industry: de-risking investments and providing predictability of investment paths For MS: inform Union investments and harmonise MS efforts	**Need for high integration** Bring all relevant actors together to fund / execute all actions required to realise or overcome a strategic challenge or opportunity Union co-funding large enough to attract strategic investment by private and or public sectors Fund inter-connected activities at an intensity / scale to make an impact at the EU level	Bring MS together to **invest at scale** in key R&I issues of general interest to most if not all EU MS Union co-funding large enough to attract strategic national investment	**Need for high integration** Bring all relevant MS together to fund / execute all actions required to realise or overcome a strategic challenge or opportunity Union co-funding large enough to attract strategic investment by private and or public sectors Fund inter-connected activities at an intensity / scale to make an impact at the EU level
Programming	Partnerships translate SRIA/Roadmap into priorities for calls – proposed to the EC for implementation in the Annual Work Programmes (AWP) Should be a transparent and accessible process → "element of external advice" (consulting stakeholders, MS, industry)	Drafted by the partnership with high degree of autonomy The AWP needs to be adopted by the governance body of the partnership Should be a transparent and accessible process → "element of external advice" (consulting stakeholders, MS, industry)	Representatives of the participating countries Negotiation process prior to launch of the call (includes negotiation on the budget - insurance of absorptive capacity among MS and willingness for co-funding) Should be a transparent and accessible process → "element of external advice" (consulting stakeholders, MS, industry)	Representatives of the participating countries Should be a transparent and accessible process → "element of external advice" (consulting stakeholders, MS, industry)
Coverage of topic in the Horizon Europe WP	**Full integration** in the FP WP	Normally priorities are fully covered by AWP of the JU, yet in principle possible to keep certain topics for calls in FP to complement WP of the partnership	Intention is to **remove that priority from the FP WP** and give it to the MS for funding under their responsibility	Normally priorities are fully covered by AWP of the A185, yet in principle possible to keep certain topics for calls in FP to

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
		There is an advantage of keeping elements in Horizon EU, but the decision will be based on the scope definition of the partnerships – and taking account of the budget		complement WP of the partnership There is an advantage of keeping elements in Horizon EU, but the decision will be based on the scope definition of the partnerships – and taking account of the budget
Types of actions	Full array of HEU funding instruments typically used under the pillar, from RIAs and Innovation actions to CSAs, prizes, procurement, including specialised applications of actions (e.g. BBI Flagships) (this implies that e.g. Marie Curie actions, research infrastructure funding, EIC instruments etc will not be part of the policy mix)	Full array of HEU funding instruments typically used under the pillar, from RIAs and Innovation actions to CSAs, prizes, procurement, including specialised applications of actions (e.g. BBI Flagships) (this implies that e.g. Marie Curie actions, research infrastructure funding, EIC instruments etc will not be part of the policy mix)	**Broad range of activities** that can be implemented - activities may support networking and coordination, research, innovation, pilot actions, and innovation and market deployment actions, training and mobility actions, awareness raising and communication, dissemination and exploitation, any relevant financial support, such as grants, prizes, procurement, as well as Horizon Europe blended finance or a combination thereof Implemented by "beneficiaries" (i.e. the funding agencies) e.g. through institutional funding programmes, or Implemented by "third parties" receiving financial support, following calls for proposals launched by the consortium	Full array of HEU funding instruments typically used under the pillar, from RIAs and Innovation actions to CSAs, prizes, procurement, including specialised applications of actions (e.g. BBI Flagships) (this implies that e.g. Marie Curie actions, research infrastructure funding, EIC instruments etc will not be part of the policy mix)
EC oversight during implementation	EC approves priorities Currently, depending on the cPPP, the influence of EC and MS can lead to the effect that the call topics and the scope are not to the same extent aligned	EC has voting rights in the governance body approving SRIA/roadmap and annual work programmes (typically 50% of the votes).	EC approves focus in the Grant Agreement based on the negotiation process Approves annual work programmes	EC has no voting right in the governance EC decides on financing of the activities of the initiative by approving annual work programmes

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
	with the roadmap and priorities of the partnership as in Art 187			
MS oversight	Medium (comitology, but having to respect the contractual arrangements)	No longer once basic act is adopted except if there's co-funding by MS (tripartite) (but: MS advisory bodies in place in all industry driven JUs)	High (MS-led) but limited to co-funding MS	High (MS-led) but limited to co-funding MS
Implementation				
Investment level	For industry partnerships: typically in the **same order of magnitude as JUs**	**Up to and more than 1 billion**	Expected to be in the range of **50 – 300 million**, can be larger	**Typically hundreds of millions**
Management & implementation body	**EC / executive agency** In future: if CP with MS: calls using national money managed by MS – EU money managed by EC services	**Joint Undertakings / other structures** Possibly more thematically specialised staff than in the executive agencies	By the consortium of partners in activities under their responsibility **Decentralised management** is the default	Usually under the responsibility of **Dedicated Implementation Structure** (DIS) designated by the Participating States (usually in the form of an association) with thematically specialised staff
Management of calls	Calls for proposals published in the Work Programmes of Horizon Europe	In principle, open calls (in some A187 some calls ring-fenced for JU partners which is in contradiction with the criteria of Annex III. Internal policy discussions is on whether this should be allowed)	Usually **decentralised approach** (only the call management is centralised) → Cascading grant → Multiple GAs per project consortium – with different national funding bodies → National funding rules	By default (unless derogations in the basic act) **centralised approach** → Single GA → Single set of rules (but some activities may be implemented by the DIS and some by the PS)

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
				Ambition is to have everything post-call managed by the DIS (MS don't always agree)
Eligibility for participation	FP rules apply, so fully open	FP rules apply by default, so fully open	Any 'international' funding body can participate independent of the country	Default is: participation is limited to MS and Associated Countries. Third countries can participate and provide matching contributions only if there are dedicated international agreements
Eligibility for funding	FP rules apply, so fully open	FP rules apply by default, so fully open → also entities from non-co-funding countries have the right to apply and receive co-funding at same level as in Horizon Europe Exceptions can be foreseen in basic act. E.g. limiting certain calls to beneficiaries from EU MS/AC for strategic reasons In cases of tripartite partnerships where PS also provide funding, the maximum funding rates of the FP cannot be exceeded.	Legal entities in countries that are not part of a CF consortium are usually excluded from receiving funding from the calls IF part of the consortium, AC and non-industrious countries can receive co-funding (similar ruling as under the FP)	FP rules apply by default, so also entities from non-co-funding countries have the right to apply and receive co-funding at same level as in Horizon Europe. Project co-funding cannot exceed the funding rates of the FP.

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
Integration of funding data in EC IT (participation, results)	Using EC IT system → full integration	Using EC IT system → full integration of participation data For results currently sometimes commercial secrecy is claimed	Need to ensure integration of a minimum set of data into EC IT systems – currently limited to data on "beneficiaries' (i.e. funding bodies), no data on "third parties"	Need to ensure integration of a minimum set of data into EC IT systems → participation data is fully integrated
Legal base				
Legal base	**Memoranda of understanding** and/or contractual arrangements between the Commission and the partners	**Regulation by Council** after consultation of the European Parliament and the Economic and Social Committee	**Grant Agreement** between the Commission and the consortium of partners, resulting from a **call for a programme co-fund action** in the Work Programme of Horizon Europe (de-facto non-competitive: integration of all relevant actors upfront) grant agreement = 5-7 years duration	**Decision by European Parliament and Council**
Base for EC decision-making	Partnership proposal	EC proposal based on Impact Assessment	Partnership proposal	EC proposal based on Impact Assessment
Effort for preparation, setting-up, and implementation	Relatively low effort for the setup and implementation	High effort for their preparation and set-up	Moderate effort for their set-up and implementation	High effort for their preparation and set-up

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
Co-funding arrangements				
EU contribution	Not legally defined (but similar range as IPs)	**Between 25% and 50%** of the total budget of the initiative, to be defined individually in the basic act Minimum ratio: 1:1	Funding rate: **30%, in justified cases up to 70%** Consideration can be e.g.: Main element of financial support is to third parties → financial contribution to calls (e.g. transnational ERA-Net calls): lower reimbursement rate Main element of activities is directly implemented by beneficiaries → institutional programmes or specific features: higher reimbursement rate If decision for application of centralised approach → premium (possibly higher EU funding rates)	**Between 25% and 50%** of the total budget of the initiative, to be defined individually in the basic act Minimum ratio: 1:1
Project co-funding rules	Horizon Europe funding rules apply by default	Horizon Europe funding rules apply by default BUT option under discussion is for certain call topics to reduce EU funding rates for industry partners. *Ongoing discussion that will have to take into account possible positive and negative effects*	**National rules and rates** apply, unless otherwise agreed	Horizon Europe funding rules apply by default
Coverage of administration expenditures	Option to finance administration costs through a CSA funded under Horizon Europe - considered a 'must' for CPs led by Member States	Administrative expenditure should not be higher than 4% of the budget. Private partners are expected to contribute substantially to these costs (currently: 50%)	EU contribution = partial reimbursement of eligible costs Eligible costs include the direct costs of the beneficiaries (i.e. the funding agencies) and the costs of funding projects	Administrative expenditure should not be higher than 4% of the budget.

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
		'Taxing' of project participants to contribute in JU admin costs not acceptable under the Financial Regulation	The system implies it is up to the Member States to decide on how to distribute the EU contribution over the activities	
Partners contributions (beyond EU)	In-kind and/or financial contributions agreed in the work plan - typically only in-kind from private partners.	Financial but typically mainly in-kind contributions from private partners Industry partners are expected to contribute In-kind to projects In-kind in additional activities related e.g. to uptake of results	In-kind and/or financial contributions Financial contributions from Member States are typically used for calls for transnational projects. Funding for national programmes/initiatives is considered in-kind contribution	Financial contributions and, if relevant in-kind contributions Financial contributions from Member States are typically used for calls for transnational projects
Eligibility for non-EU countries				
Associated countries				
Eligibility for partner status	In principle yes, subject to policy considerations	In principle yes, subject to policy considerations (for both private partners, and where applicable, as participating state)	Yes	Yes, as participating state
Eligibility for participation in projects	Yes	By default yes, unless derogations in the basic act or in the Annual Work Programme limit eligibility for participation	Yes, if the country participates and contributes to the call in question, or if call provisions allow for unfunded participation	By default yes, unless derogations in the basic act or in the Annual Work Programme limit eligibility for participation
Eligibility for project funding	Yes	By default yes, unless derogations in the basic act or	Yes, if the country participates and contributes to the call in question, or if	By default yes, unless derogations in the basic act or in the Annual Work

	Co-Programmed European Partnerships (CP)	Institutionalised European Partnerships - IP A187	Co-Funded European Partnerships (CF)	Institutionalised European Partnerships – IP A185
		in the Annual Work Programme limit eligibility for funding	call provisions allow for funded participation	Programme limit eligibility for funding
3rd countries (non-AC)				
Eligibility for partner status	In principle yes, subject to policy considerations	In principle yes, subject to policy considerations (for both private partners, and where applicable, as participating state, the latter being subject to international agreement)	Yes (but only receiving Union contribution if listed in Annex to WP or special provisions in call text)	By default no, only if foreseen in the basic act and subject to conclusion of international agreement (as in PRIMA)
Eligibility for participation in projects	Yes	By default yes, unless derogations in the basic act or in the Annual Work Programme limit eligibility for participation	Yes, if the country participates and contributes to the call in question, or if call provisions allow for unfunded participation	By default yes, unless derogations in the basic act or in the Annual Work Programme limit eligibility for participation
Eligibility for project funding	Yes, if listed in Annex to WP or funded participation necessary	By default yes, unless derogations in the basic act or in the Annual Work Programme limit eligibility for funding	Yes, if the country participates and contributes to the call in question, or if call provisions allow for funded participation	By default yes for countries listed in the Annex to the WP, unless derogations in the basic act or in the Annual Work Programme limit eligibility for funding

Appendix B Taxonomy of failures requiring policy intervention

Market failures	
Market power	Inadequate market structures due to the degree of competition and barriers to entry such as strongly concentrated / closed industry sectors or markets
Externalities	Low return on investments due to difficulties, for innovators, appropriating the outcomes of their investments and limiting undesired spillovers to the benefit of competitors. Those externalities often cause low (private) investments, especially for uncertain and risky R&D activities.
Information asymmetry	Actors within a particular market (or system) have uneven access to information. Some may lack the information they need to develop and exploit their innovative products/services.
Systemic failures	
Capability	Factors related to the individuals' and organisations' absence or shortage of the necessary capabilities to acquire and absorb new knowledge, to adapt to new and changing circumstances, to grasp (technological) opportunities, and to switch from old to new (technological) trajectories. At a systemic level, it relates to 'sufficient scale' or 'critical mass'
Network	*Strong network failure:* Interactions between a set of actors are too dense to allow for novel insights or inspirations to emerge. Strong dependence on few partners may lead to lock-in phenomena. *Weak network failure:* Too limited exchange and collaboration between organisations and individuals, which limit co-creation and co-development of new products and services,
Institutional	*Hard institutional failure:* Norms and rules (regulatory framework) hinder innovation. *Soft institutional failure:* Social norms and values, and culture hinder innovation
Infrastructural	Lack of the physical (R&D facilities, ICT infrastructure, transport etc.) and knowledge (knowledge, skills, database etc.) infrastructures needed to enable and stimulate innovation activities.
Transformational failures	
Directionality	Lack of shared vision regarding the goal and direction of the required system transformation process. No coordination between the actors involved in system transformation. Absence of targeted funding for R&I activities and infrastructures, which would define collectively accepted trajectories of development.
Demand articulation	A deficit in anticipating and learning about user needs and constraints. Insufficient use of public demand to orient and leverage wider demand and influence innovation activities. Lack of mechanisms to articulate the demand from various groups of actors.

Policy coordination	Missing or weak coherence between the activities of national, regional, sectoral and technological institutions: lack of coordination between innovation and sectoral policies; lack of coordination between ministries and implementing agencies; no alignment between public and private organisations; mismatches in the timing of policy intervention
Reflexivity	Insufficient ability to monitor progress of (transformative) policy interventions towards the achievement of their objectives, to develop adaptation strategies, to anticipate changes (e.g. by developing strategies with open options taking into consideration uncertainty), and to involve a wide range of actors in the governance process.

Source: Technopolis Group (2018), Modified from Weber & Rohracher (2012)

Appendix C European Partnerships - Portfolio mapping and analysis at the clusters level

C.1 Introduction

This appendix to the Final Report for the Impact Assessment Study for Institutionalised European Partnerships contains the detailed outcomes of the Portfolio Mapping and Analysis activities that were conducted in the context of Task 1 for this study.

The aim was to provide a view on the *possible links and/or overlaps* among the 13 candidate Institutionalised Partnerships and between these European Partnerships and the Co-Funded or Co-Programmed ones. The portfolio mapping and analysis had the **dual objective** to, on the one hand, support the impact assessment studies of the candidate Institutionalised European partnerships and, on the other hand, feed into the horizontal analysis of the overall coherence and efficiency of the European Partnerships' implementation under Horizon Europe. The candidate Institutionalised European Partnerships were therefore at the core of this Portfolio Mapping and Analysis.

The scope of the study also encompassed the wider European R&I landscape, specifically the 'transnational' R&I initiatives in similar thematic areas that may contribute or have an influence on the impacts of these partnerships. Specifically, this regarded other potentially relevant EU initiatives funded under the Multiannual Financial Framework (MFF) 2021-2027, i.e. the Connecting European Facility (CEF), the Digital Europe Programme (DEP), InvestEU, the Single Market Programme, and the LIFE Programme.

We conceived this portfolio mapping and analysis task as a meta-analysis of the positioning of the candidate Institutionalised Partnerships within the European Partnerships landscape and the broader European R&I environment. To structure our analysis, we analysed the following key dimensions of the envisaged European Partnerships, per partnership and all partnerships in one Horizon Europe cluster:

- *R&I focus and objectives* – the contribution of the partnerships to the R&I priorities and intervention areas of the related clusters as well as to the EU policy priorities and the Sustainable Development Goals (SDGs)

- *Market, systemic and transformational failures addressed* – the 'function' of the partnerships in the specific ecosystem, based upon a common taxonomy of these failures (see Appendix B)

- *Types of stakeholders involved and targeted* - the envisaged future partners as well as beneficiaries of the activities in the partnerships. The categories include research performing organisations, research funding organisations, industry, public administration bodies, end-users, etc – tailored to the specificities of each ecosystem

- *Type of research funded.* We use the Technology Readiness Level (TRL) categorisation[32] as a proxy for the positioning of the partnerships along the 'R&I pathway' or 'pipeline', thus illustrating the extent to which they can/should build upon each other

The analysis is based on an extended desk research, a mapping of the interconnections as envisaged in the partnership Inception Impact Assessments and 'Fiches' (as available in November 2019), as well as a consultation of the study teams responsible for the individual impact assessment studies (one for each candidate Institutionalised Partnership) and the relevant thematic European Commission Steering Committees.

[32] We used the following categories: TRL1-4 (fundamental research), TRL 5-6 (applied research), TRL 7+ (development)

It was conducted throughout the duration of the study, in various stages feeding into the individual impact assessment studies of the candidate Institutionalised Partnerships. Various sections of the current report have therefore been introduced also in other deliverables for this study, including the Task 2 Impact Assessment Study reports.

The structure for the reporting of our analyses takes account of the role of the candidate Institutionalised European Partnerships under Horizon Europe, contributing to the objectives and R&I priorities outlined for Pillar II. An exception is the candidate Institutionalised Partnership for Innovative SMEs which is considered of relevance for Pillar III. We therefore present our findings at the level of Pillar II clusters, while however considering the broader landscape of partnerships and other EU initiatives. In each section, we look into the contributions of the partnership portfolio to the cluster R&I priorities, the functions of the partnerships in addressing failures and the stakeholders involved, and a concluding section on the interconnections among the partnerships in the cluster, and between these partnerships and partnerships in other clusters and other EU initiatives (beyond Horizon Europe). The candidate Institutionalised Partnership for innovative and R&D-intensive SMEs is an exception to this approach, being the only partnership envisaged for funding under Pillar III.

We introduce the reporting on the outcomes of our analysis with an overview of the landscape of candidate and envisaged European Partnerships under Horizon Europe.

C.2 European Partnerships in Cluster 1 – Health

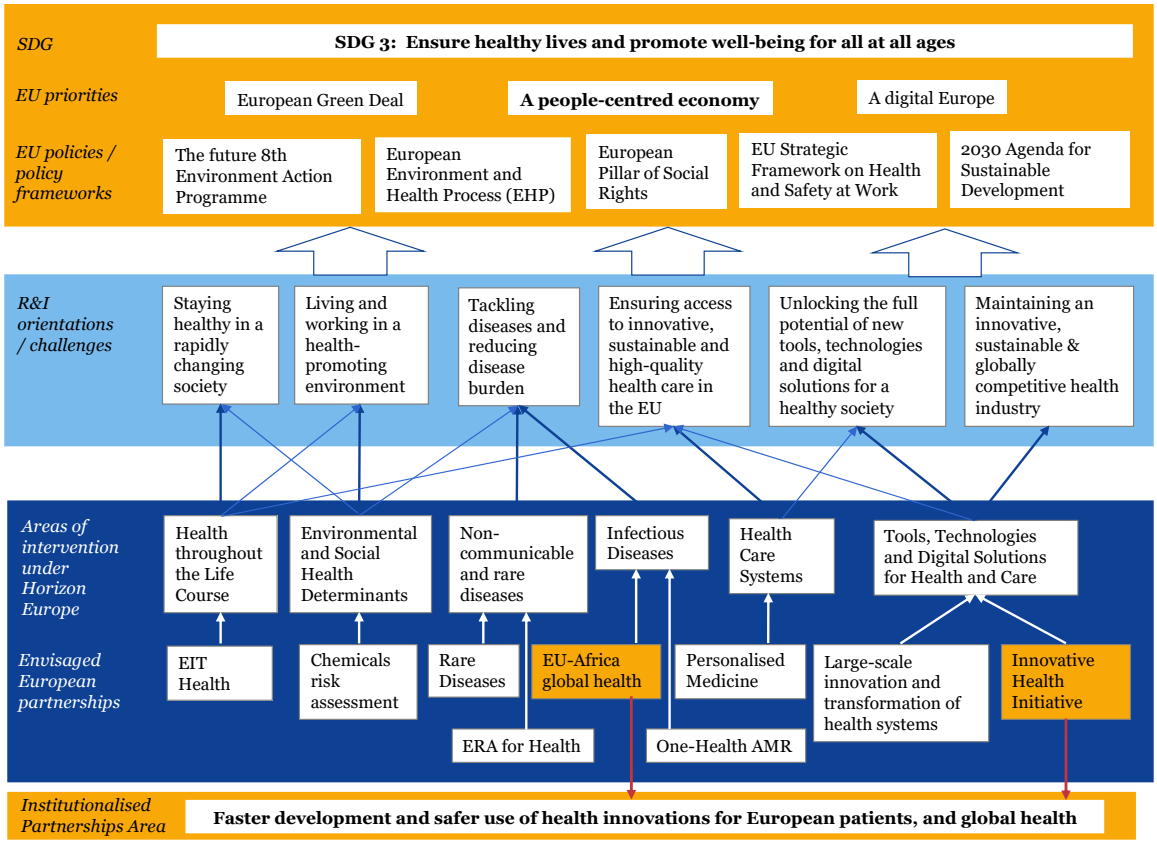
C.2.1 Contribution to the cluster R&I priorities

At the core in this cluster are the R&I orientations that aim at ensuring that citizens stay healthier throughout the life course due to improved health promotion and disease prevention and the adoption of healthier behaviours and lifestyles, the development of effective health services to tackle diseases and reduce their burden, and an improved access to innovative, sustainable and high-quality health care. These objectives require an unlocking of the full potential of new tools, technologies and digital solutions and ensuring a sustainable and globally competitive health-related industry in the EU, allowing for the delivery of, e.g. personalised services. Last but not least, the citizens' health and well-being need to be protected from environmental degradation and pollution, addressing a.o. climate-related challenges to human health and health systems.

As shown in the diagram below, the R&I activities funded under this cluster aim at contributing to the achievement of the Sustainable Development Goal 'Ensuring healthy lives and promote well-being for all at all ages', thanks to investments in research and innovation that focus on three overarching EU policy objectives: 'An economy that works for people', 'A Europe fit for the Digital Age', and 'A European Green Deal' (see Figure 9, below). The Horizon Europe proposal for a regulation defined the areas for possible institutionalised European partnerships on the basis of Article 185 TFEU or Article 187 TFEU as "Partnership Area 1: Faster development and safer use of health innovations for European patients, and global health".

The diagram also shows that the portfolio of envisaged European Partnerships in this cluster aim at contributing to all of the R&I orientations in this cluster. However, there is a pronounced focus on the '**tackling diseases and reducing the disease burden'** objective, addressed by five out of the ten partnerships (amongst which one candidate Institutionalised Partnership, highlighted in yellow). Objectives aimed at an improved exploitation of digital solutions and competitiveness of the EU health-related industry are addressed by two partnerships amongst which one candidate Institutionalised Partnership. The European Partnerships provide only limited support for the assessment of environmental and social health determinants, uniquely addressed from a chemical risks' perspective.

Figure 9: R&I priorities and higher-level objectives of the Horizon Europe Cluster 1 – Health



Technopolis Group

The portfolio of European Partnerships in this cluster predominantly encompasses Co-funded Partnerships, focused on joining the R&I programmes and investments at the national level. There is therefore overall a **limited level of involvement of the private sector** in the development of the SRIAs (i.e. as partners of the envisaged partnerships), be it from the supply or user side in the value chains. The only exceptions are the Innovative Health Initiative and the EIT KIC Health.

Finally, it should be noted that the portfolio includes both 'horizontal' partnerships that have a broad thematic coverage, and 'thematic' partnerships that focus on specific health topics.

Table 7: Portfolio of partnerships in the Health cluster

Candidate European partnership	Currently envisaged implementation mode(s)
EU-Africa Global Health Partnership	Institutionalised
Innovative Health Initiative (IHI)	Institutionalised
European partnership for chemicals risk assessment	Co-funded
Fostering an ERA for health research	Co-funded
Large-scale innovation and transformation of health systems in a digital and ageing society	Co-funded
Personalised Medicine	Co-funded
Rare Diseases	Co-funded
EIT Health	EIT-KIC
One-Health AMR	Co-Funded

C.2.2 Functions of the partnerships and stakeholders involved

Systemic failures are the most common rationale for the proposed partnerships on health, addressing the lack of coordination across sectors and between all relevant stakeholders and in the case of the candidate EU-Africa Global Health partnership and the one on Rare Diseases, the need for an enhanced critical mass and knowledge and skills (Figure 10).

While three European Partnerships (Fostering an ERA for health research, One-Health and Personalised medicine, all co-funded) address transformational failures related to the insufficient coordination of research and innovation strategies and funding priorities, only the Innovative Health Initiative and EU-African Global Health address a market failure caused by the lack of investments in the development of solutions to specific health challenges

The presence in this cluster of various partnerships with a broad thematic coverage (IHI, Fostering an ERA for health research, Large-scale innovations and the EIT KIC) triggers the question of the extent to which these partnerships address similar failures related to similar stakeholder groups as other envisaged partnerships.

Figure 10: Main problem drivers for the envisaged partnerships

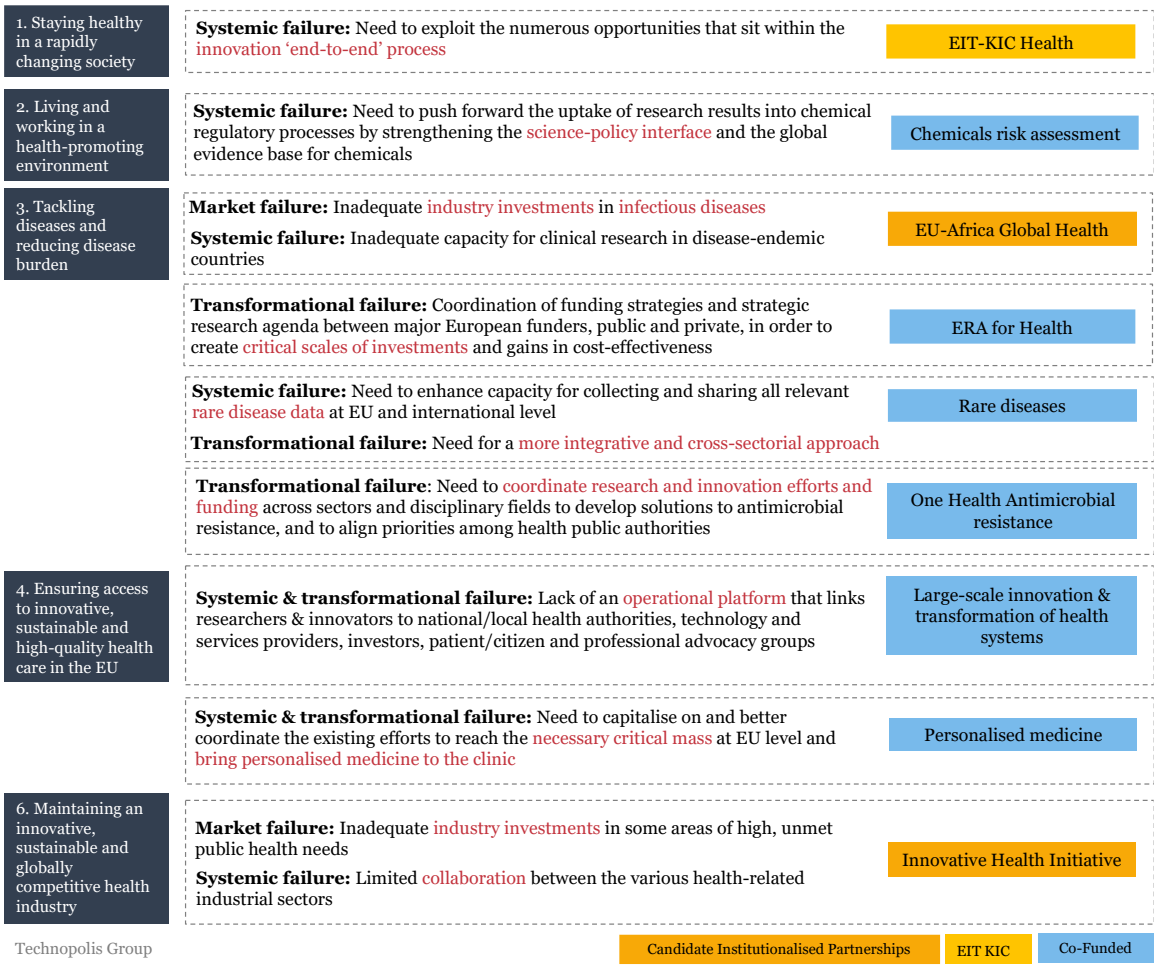
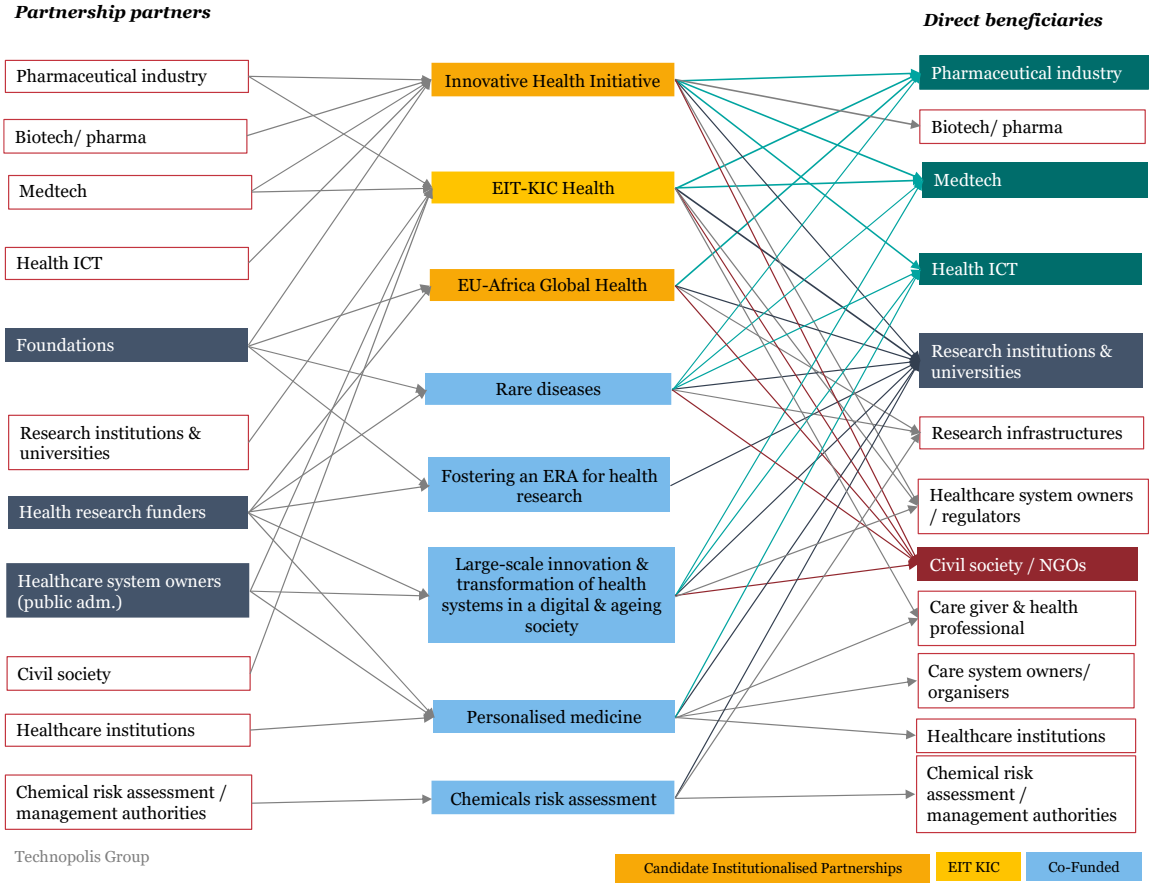


Figure 11, below, shows that in terms of both partners and direct beneficiaries, IHI and the EIT Health involve similar industry stakeholders. Their function in the industry ecosystem, however, seems to suggest a potential synergy rather than overlap. A stronger potential for overlap can be seen between the IHI and Large-scale innovation partnerships, both in terms of failures addressed and targeted beneficiary industry stakeholders.

The figure also shows that actors in the pharmaceutical industry are targeted as direct beneficiaries in both the EU-Africa Global Health and Rare Diseases partnerships. While these partnerships share a common focus on tackling diseases and reducing the disease

burden, the failures they address are distinct. A similar reflection can be made for the EIT Health and Large-scale innovation partnership which share the industry actors in the field of MedTech as target beneficiaries.

Figure 11: Stakeholders involved and targeted



C.2.3 Interconnections between partnerships and initiatives

In this section we consider the research direction for each individual partnership and map out the possible links between the partnerships (in and beyond the cluster), taking account also of the information collected for the analyses above in order to specify the nature of these interconnections.

Multiple interconnections exist between the envisaged and candidate partnerships in the health cluster, both in terms of research topics covered and stakeholders involved in the funded R&I activities. Their positioning along the innovation cycle in Figure 12, below, with the more research-oriented envisaged partnerships to the left and the more innovation-oriented ones to the right allows for a clearer view on the nature of their possible interconnections.

Figure 12 shows that research-oriented envisaged partnerships such as the ERA for Health and One Health AMR can be expected to produce research results that will feed into the R&I activities of multiple other initiatives. In the case of the One Health AMR, for example, research on antimicrobial resistance can be expected to support the EU-Africa Global Health and Innovative Health Initiative candidate partnerships in their efforts to accelerate the development and uptake of health care technologies and innovations in the field of infectious diseases.

The central role of the Innovative Health Initiative emerges from this mapping, expected to "ease the pathway from research to implementation" for the ERA for Health, Personalised Medicine, EU-Africa Global Health and Rare Diseases initiatives.

Figure 12: Interconnections with and among the envisaged partnerships in the Health cluster

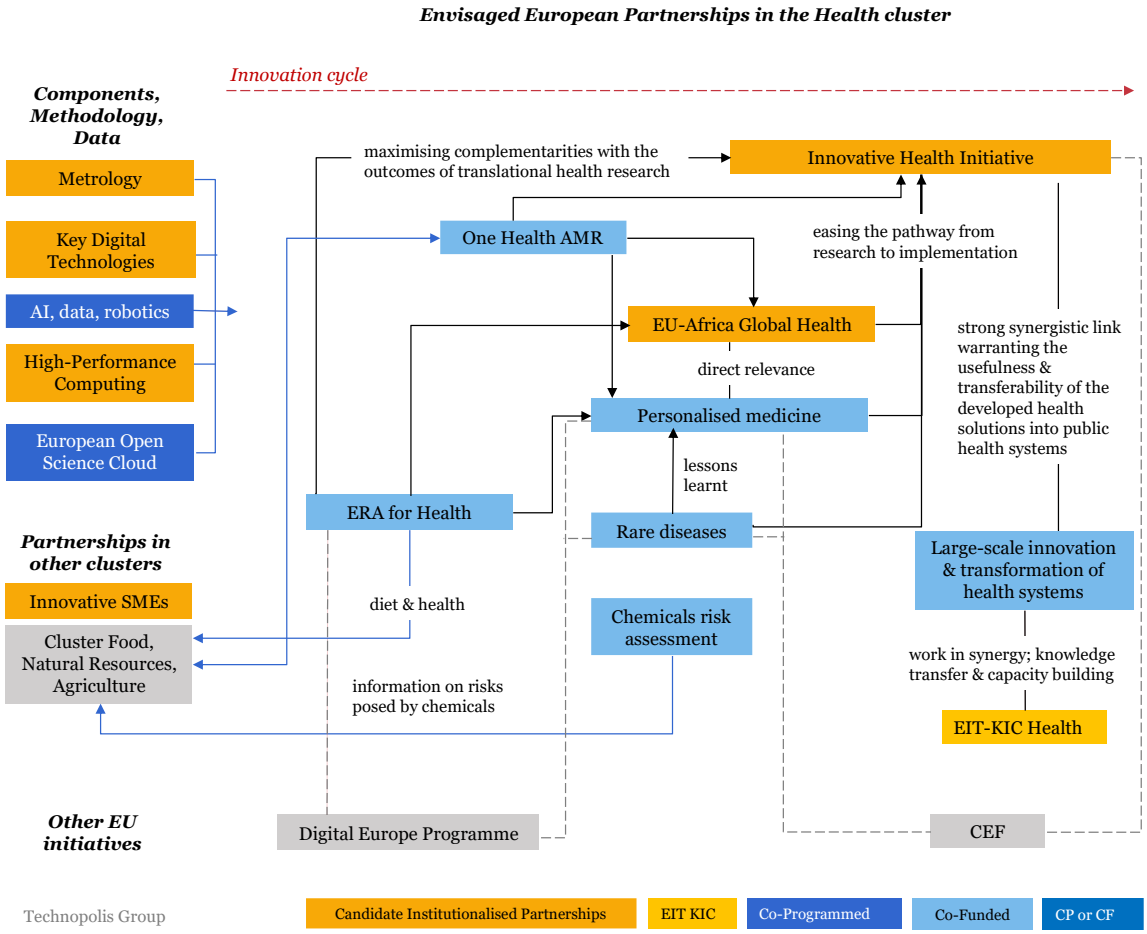


Figure 12, above, also illustrates the important contribution that can be expected from the technological partnerships in the digital sphere, including the contribution of the KDT candidate Institutionalised Partnership in the development of Smart Health and of the AI-data-robotics Partnership that is expected to deliver, e.g., new solutions from ageing – both to health and health care systems. Tapping on the developments in those key digital technology areas for the advancement and improvement of the European healthcare system reflects the EU priority of maximising the potential of the Digital Age. The European Open Science Cloud partnership will also provide an infrastructure for the storage, management, analysis and re-use of research data. Its operationalisation of the FAIR data principles will also help integration of digital technologies into health and health care innovations and contribute significantly to the development of personalised medicine.

A few interconnections with the envisaged partnerships in the food and natural resources cluster exist, specifically in relation to the One-Health concept in the fight against antimicrobial resistance and in terms of the linkages between health and diet and the risks for health posed by chemicals which will be relevant (also) for the envisaged initiatives related to food, farming and water. The Innovative SMEs partnership will provide "horizontal" support to facilitate the cross-border deployment of innovative health solutions which discrepancies in the national regulatory and policy frameworks might otherwise hinder (especially in the health sector).

Finally, several envisaged partnerships indicated potential support from other EU initiatives, specifically in terms of connectivity between hospitals, medical centres and research centres enabling amongst other the cross-border exchange of patients' health in the EU (the CEF) and in relation to support for the deployment of common digital data-solutions and reinforcing the digital infrastructure and skills (DEP).

C.3 European Partnerships in Cluster 4 – Digital, Industry and Space

C.3.1 Contribution to the cluster R&I priorities

In this cluster the focus is on the digitisation of European industry and on advancing key enabling, digital and space technologies which will underpin the transformation of our economy and society at large. The overarching vision for R&I investments is "a European industry with global leadership in key areas, fully respecting planetary boundaries, and resonant with societal needs – in line with the renewed EU Industrial Policy Strategy." The cluster pursues three objectives: 1) ensuring the competitive edge and sovereignty of EU industry; 2) fostering climate-neutral, circular and clean industry respecting planetary boundaries; and 3) fostering social inclusiveness in the form of high-quality jobs and societal engagement in the use of technologies. A human-centred approach will be taken, i.e. technology development going hand in hand with European social and ethical values.

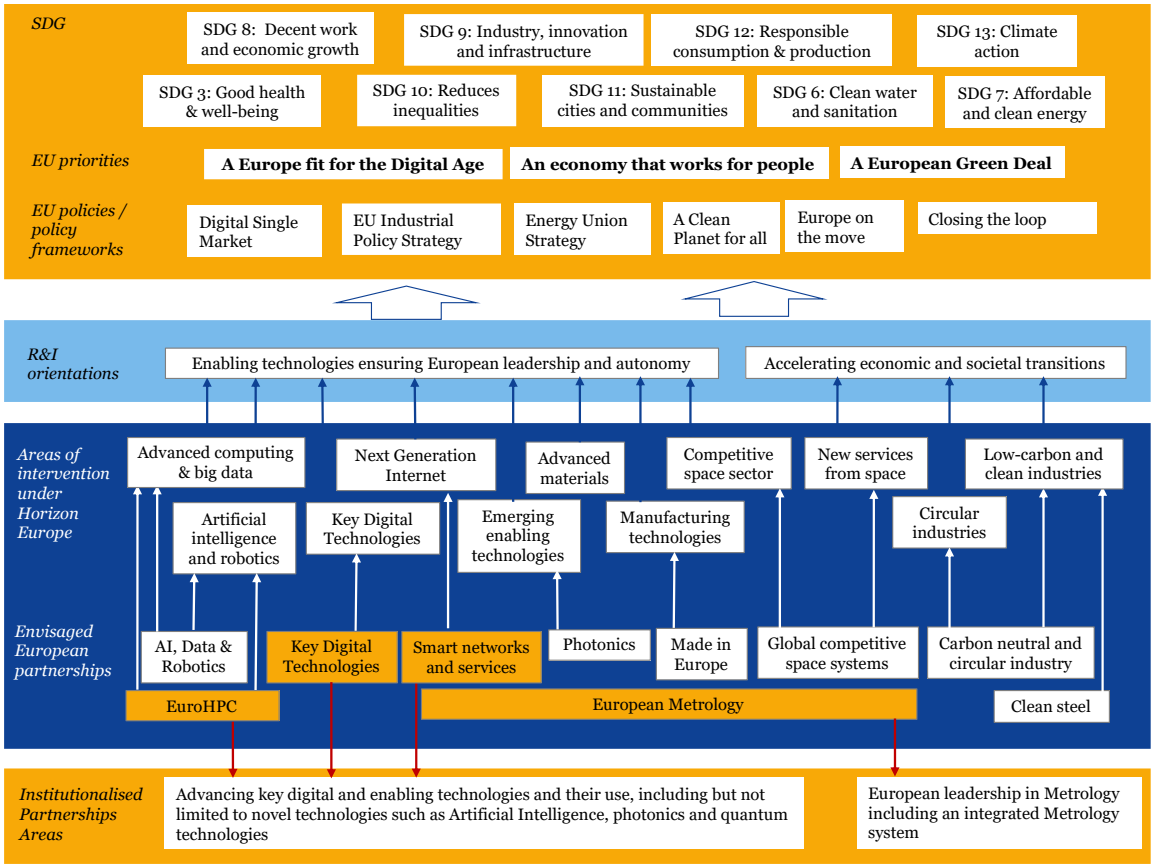
The expected effects on the European economy and society imply that the R&I activities under this cluster will contribute to various Sustainable Development Goals and respond to three key EU policy priorities: 'A European Green deal', 'A Europe fit for the digital age', and 'An economy that works for people'. The Horizon Europe proposal for a regulation defined the areas for possible institutionalised European partnerships as "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" and "Partnership Area 3: European leadership in Metrology including an integrated Metrology system".

In this cluster, the key R&I priorities are grouped in two broad categories: (I) Enabling technologies ensuring European leadership and autonomy; and (II) Accelerating economic and societal transitions (see Figure 13, below). The majority of the partnerships directly contribute to the first strand of priorities.

European Partnerships envisaged to support the R&I in the specific intervention areas are mainly co-programmed partnerships. Exceptions are the candidate Institutionalised Partnerships in the digital sphere and metrology, related to the two Partnership Areas in this cluster. All of these partnerships therefore show a strong involvement of industry. Most of the partnerships are also long-standing initiatives, building upon partnerships existing under Horizon 2020 or even FP7 and on the work of one or more European Technology Platforms (ETPs). The major exception is the partnership 'Global competitive space system', focusing on space technologies.

Multiple convergences exist between the technologies that are covered in the first strand of priorities in this cluster. We describe these further in the section below. In their function of 'enabling' technologies, the partnerships will also make critical contributions to the attainment of the desired 'transitions' in the 'vertical' industry sectors targeted in the second strand of priorities in this cluster as well as in the other clusters. A major contribution from this perspective can be expected from the four candidate Institutionalised Partnerships as well as from the 'Made in Europe' partnership, focused on manufacturing technologies.

Figure 13: R&I priorities and higher-level objectives of the Horizon Europe Cluster 4 – Digital, Industry and Space



Technopolis Group

C.3.2 Functions of the partnerships and stakeholders involved

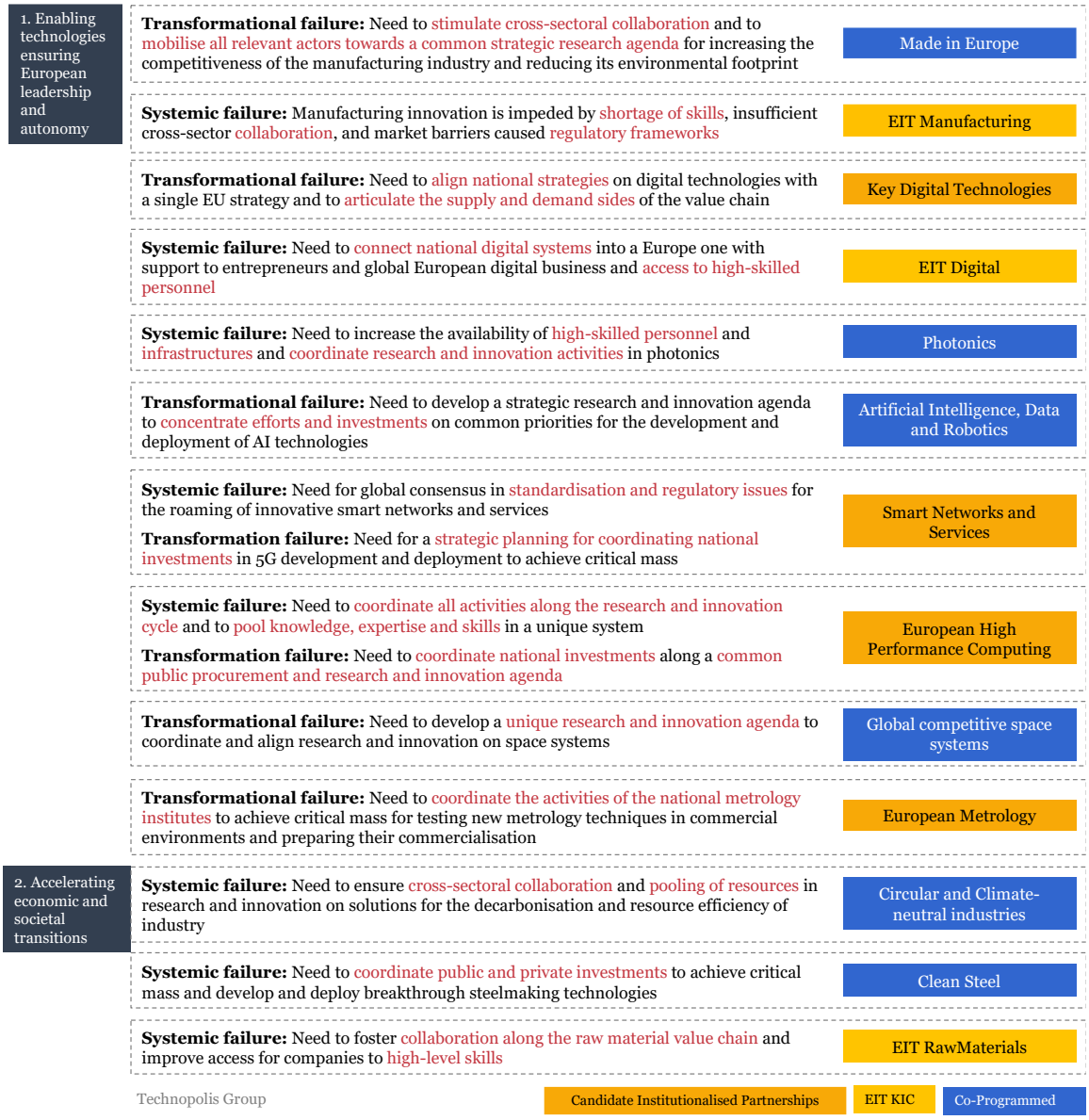
Market failures are not the main rationales for any of the candidate European partnerships under Cluster 4, even though mechanisms are needed to share risks in investing in the development and deployment of some (still immature) technologies (see Figure 14, below).

The proposed partnerships on photonics and high-performance computing must address a shortage of high-skilled workforce. They may benefit from synergies with the candidate EIT KIC Digital that aims to foster collaboration between research organisations, education and training institutions in order to improve digital skills. The other two EIT KICs pursue the same objective but in their respective fields – raw materials and manufacturing and may less likely overlap with other candidate partnerships.

The most common **systemic failures** addressed by the candidate partnerships under Cluster 4 relate to insufficient collaboration between systems actors and poorly integrated value chains – or the need to integrate extended ecosystems in order better to exploit emerging opportunities. In some sectors deemed of key importance for the EU industrial leadership, a strategic research and innovation agenda would concentrate the efforts and investments onto specific priorities. Better coordination of the system actors may also contribute to pooling resources and investments. It would help avoid the unnecessary duplication of efforts and achieve the critical mass necessary for the EU competitiveness and industrial leadership and system transitions. Considering the scope of the proposed European partnerships, potentials for synergies are restricted. They may exist between EIT Manufacturing and Made in Europe and EIT Raw Materials, even though EIT KIC initiatives focus more on education actors.

Various candidate partnerships under Cluster 4 are driven by **transformational failures**. They need the elaboration of a strategic research and innovation agenda to align national research and innovation strategies and programmes with priorities defined at the EU level for system transformations, and plan accordingly public and private investments. Synergies shall be exploited between the relevant actions in Artificial Intelligence, Data and Robotics, High-Performance Computing, and Key Digital Technologies.

Figure 14: Main problem drivers for the envisaged partnerships

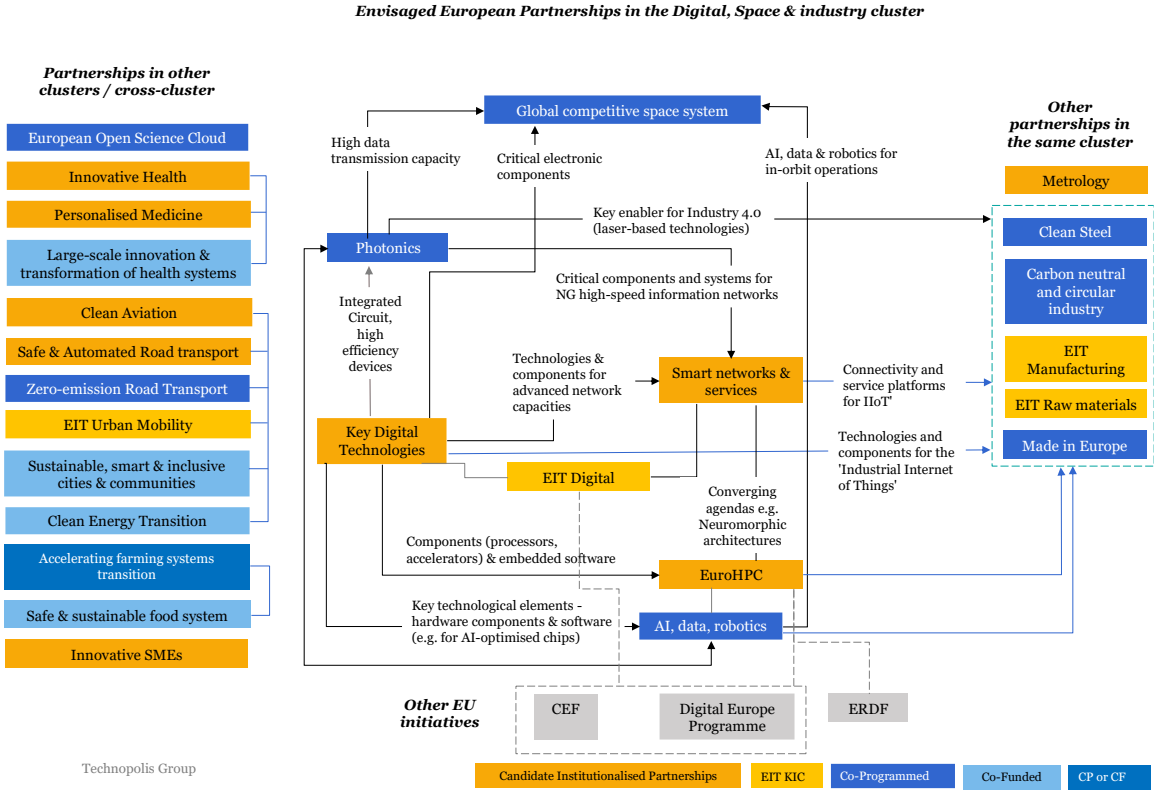


C.3.3 Interconnections between partnerships and initiatives

Figure 15, below, maps out the positioning of the candidate Institutionalised Partnership in this field in the landscape of the envisaged partnerships in Cluster 4, with a specific focus on the ones in the digital field. The three candidate Institutionalised Partnerships covering enabling technologies are all related to digital technologies, i.e. electronic components and systems, 5G infrastructure and high-performance computing. Together with photonics, AI, data technologies and robotics, these partnerships are intended to enable digitalisation of vertical industries such as transport, automotive, manufacturing, energy and health, enable new services and ensure the development and deployment of the 'Industrial Internet of Things' (IIoT). The move towards Industry 4.0 (supported by the Industrial Internet of Things) is crucial for Europe to maintain industrial production in Europe by developing more intelligent systems and machines to increase the added value and remain competitive on the high-end markets.

Figure 15 also shows that developments in the field of IIoT will in the first instance be to the benefit of the other envisaged partnerships in this cluster. It also lists the most important initiatives related to the 'vertical' industries in the other Pillar II clusters that can be expected to draw benefit of these developments in the digital sphere, allowing for the development of 'smart health', 'smart mobility', 'smart grids', 'smart cities', precision farming etc. Metrology research will support the initiatives in the digital sphere by providing accurate state-of-the-art measurement capabilities. Better measurement and calibration systems will especially make a direct contribution to the rolling out of 5G applications and to test and validate and design standards for future generation communication technologies and systems.

Figure 15: Interconnections with and among the envisaged partnerships in the Digital, Industry, Space cluster



There is a close interconnection between the various initiatives in the digital field, taking a full value chain approach and building upon each other for the attainment of future technological advancements. Technologies like 5G connectivity, cloud computing, and Internet of Things (IoT), which find a point of convergence in the Smart Networks and Services initiative, are key elements leading the technological evolution of digital infrastructures towards 'beyond 5G' and later 6G networks. In order to develop a strong industrial and technological base, it will be necessary to guarantee also cybersecurity for these critical infrastructures. While the Smart Networks and Services initiative is expected to set in place the overall architecture of future networks and services (from component to application level), close collaboration with the Key Digital Technologies initiative that complements the value chain at the device level, creating technological breakthroughs on the individual components, will allow for the creation of the service platforms required for, e.g., the 'Industrial Internet of Things', smart cities or the 5G corridors for Connected and Automated Mobility.

The High-Performance Computing initiative, in close interaction with the AI-data-robotics envisaged partnership, will be pivotal in addressing the need to integrate and analyse information for building smarter applications in emerging Smart Cities and the Internet of Things. Addressing future challenges requires scaling to extreme performance levels by means of HPC solutions as well as bringing compute closer to data sources, i.e. enabling computing at the edge. Connected sensors and IoT devices, smart grid, smart cities, software-defined networks, network function virtualization, data-driven cognitive

networking and cyber security utilise edge computing networks to support data transmission over significant distances via distributed and connected communication devices.

The Cluster 4 envisaged European Partnerships and, especially, those related to digital technologies will benefit from the infrastructure developed in the European Open Science Cloud partnership for the storage, management, analysis and re-use of data. In turn, the technological advancement allowed by the research and innovation activities in Cluster 4 could help further improve the infrastructures and related serviced offered by the European Open Science Cloud.

The Innovative SMEs partnership may also interact closely with the Cluster 4 candidate European Partnerships, as its main beneficiaries (SMEs) compose a large share of the digital companies.

C.4 European Partnerships in Cluster 5 – Climate, Energy and Mobility

C.4.1 Contribution to the cluster R&I priorities

Cluster 5, 'Climate, Energy and Mobility', aims to fight climate change while improving the competitiveness of the energy and transport industries as well as the quality of the services that these sectors bring to society. This entails establishing a better understanding of the causes, evolution, risks, impacts and opportunities of climate change, as well as making energy and mobility systems climate- and environment-friendly, smarter, safer, and more resilient, inclusive, competitive and efficient. Actions of this Cluster will contribute to the technological, economic and societal transformations required to achieve climate neutrality, adapt to the locked-in changes that are coming to our climate, and to ensure a socially fair transition, as outlined in the Commission's long-term strategy (adopted in November 2018) (see Figure 16, below).

Activities in this cluster will contribute to multiple United Nations Sustainable Development Goals, with the most direct impact on SDG 7 (Affordable and clean energy), SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). In addition, SDG 3 (Good health and well-being), SDG 6 (Clean Water and Sanitation), SDG 8 (Decent work and economic growth), and SDG 12 (Responsible production and consumption) will be positively impacted. The cluster will also contribute to at least three of the six main ambitions for Europe: 'A European Green Deal', 'A people-centred economy' and 'A Digital Europe'.

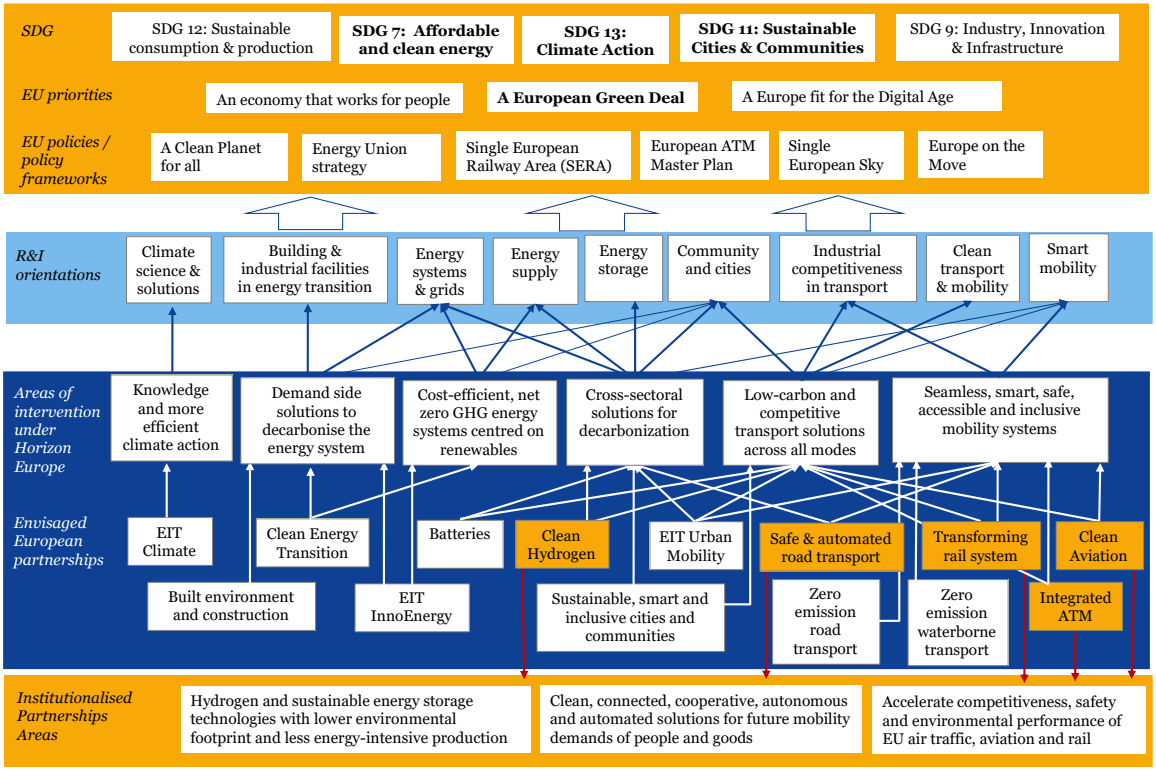
The cluster is directly relevant to several of the areas for possible institutionalised European partnerships on the basis of Article 185 TFEU or Article 187 TFEU, namely:

- Partnership Area 4: Accelerate competitiveness, safety and environmental performance of EU air traffic, aviation and rail.
- 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.

Cluster 5 is structured under six areas of intervention under Horizon Europe and nine R&I orientations. Figure 16, below, shows the portfolio of envisaged European Partnerships that are relevant to this cluster and their link to the areas of intervention. There are 14 candidate Partnerships that align with this cluster of which eight (including five Article 187 initiatives and three EIT-KICs) are possible Institutionalised Partnerships. There are no candidate Article 185 Partnerships in this cluster. The others are envisaged as either Co-programmed and/or Co-funded Partnerships.

The diagram shows the strong orientation of the possible Institutional Partnerships towards the mobility area and more limited direct synergies between the envisaged Partnerships and the 'climate science & solutions' priority. Of course, the climate change challenge underpins the whole of this cluster, except where the focus is on industrial competitiveness, but this will also be at least partially dependent on innovation related to clean energy and mobility products and services.

Figure 16: R&I priorities and higher-level objectives of the Horizon Europe cluster Climate, Energy and Mobility



Technopolis Group

C.4.2 Functions of the partnerships and stakeholders involved

Solutions to the challenges of Cluster 5 are sometimes immature. Investments for their development are often insufficient, because first movers are still exposed to high (technological and/or market) risks. The candidate partnerships for climate change solutions, hydrogen and other low-carbon technologies as well as low-emission aircraft aim to address this market failure by pooling public and private resources in collaborative research and innovation activities. Considering the enabling nature of hydrogen technologies, initiatives to de-risk investments in their development and deployment may benefit the other candidate partnerships (see Figure 17, below).

Most of the partnerships proposed under Cluster 5 face systemic failures relating to fragmented value chains or dysfunctional systems affecting the development of innovative solutions. Some intend to stimulate collaboration and ensure the proper functioning of innovative cycles that will enable the development and market introduction of innovation and ensure the European industrial leadership in batteries, hydrogen technologies and built environment. In other sectors, the complexity of the underpinning systems in terms of number and types of actors calls for partnerships to encourage collaboration and avoid unnecessary duplication of research and innovation efforts. This is particularly relevant for initiatives relative to transport technologies and systems, such as road transport, railway, aircraft, air traffic management systems, and shipping. Main actors in those sectors often differ, reducing the likelihood of synergies.

Figure 17: Main problem drivers for the envisaged partnerships

In accordance with the European Green Deal, further efforts are required to accelerate the transition of energy and mobility systems to reduce their CO2-emissions and achieve climate neutrality and other related goals. Systems such as rail and road transport and urban systems are composed of a high number of different types of actors. While collaboration is needed to ensure the development and deployment of innovations (and solve network failures), alignment of R&I strategies and activities is crucial to foster the system transformation required to solve the targeted socio-economic challenges. European Partnerships can act as platforms where the relevant stakeholders join their efforts and define together the goals that they want to achieve within a specific timeframe and the directions for system transformation. Such common strategic research and innovation agendas help mitigate the risk of fragmentation of research and innovation efforts and align EU, national and local strategies and policies. The candidate new European Partnerships may need to revise the strategic research and innovation agendas already existing (such as the one developed under JPI Urban Europe) to give them further directionality and ensure that they do not merely define the scope for collaborative projects

but set the ambitious goals that these projects and other activities must pursue to stimulate the aimed system transformation.

Both EIT KIC InnoEnergy and the partnerships for Clean Energy Transition intend to develop strategic research and innovation agendas that will give the directions needed to coordinate R&I activities and align EU, national and local policies and strategies. As they will operate in the same domain, synergies may exist between them. This may imply considering mechanisms for ensuring the alignment between both future strategic research and innovation agendas and the goals they respectively pursue. If the partners are the same, a unique agenda could be envisaged if relevant. Similarly, considering the multifaceted dimension of the urban systems and issues, the proposed partnership on Sustainable, smart and inclusive smart and communities may benefit from the actions undertaken in the candidate transport partnerships for the coordination of research and innovation agendas as well as the EIT KIC Climate. These synergies call for coordination at the strategic level: the directions reflected in the goals set in the potentially overlapping strategic research and innovation agendas should be subject of agreement among the concerned partnerships e.g. by their main representatives.

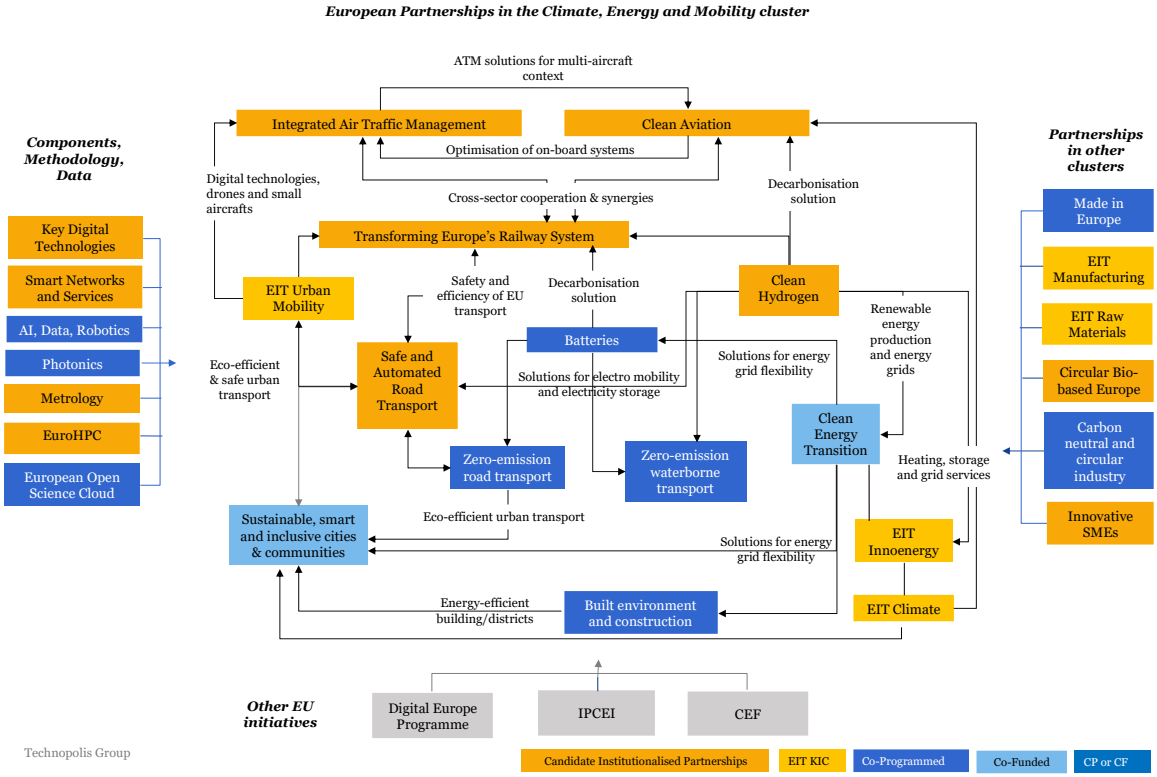
C.4.3 Interconnections between partnerships and initiatives

There are eight candidate Institutional Partnerships (IPs) that fit within the Climate, Energy and Mobility cluster. All except one (Safe and Automated Road Transport) would build on previous Article 187 initiatives or EIT-KICs funded under Horizon 2020.

A detailed analysis of synergies for the envisaged and candidate Partnerships that are related to this cluster is shown in Figure 18, below. The diagram highlights the five possible Article 187 Partnerships and the synergies between them and with other partnerships. Four of these can be considered as 'application' sector partnerships with the other (clean hydrogen) being more 'technology' orientated. The central position of batteries and hydrogen, as enablers of zero emission transport and the clean energy transition, is also clear from the analysis. Likewise, there are synergies with the other technology-related partnerships, particularly in the digital area, and those that are manufacturing or materials-orientated. This also highlights the twin challenges of digitisation and decarbonisation for the future energy/mobility sectors. Finally, the European Open Science Cloud partnership will provide 'horizontal' (infrastructural) support to collaborative research and innovation within each envisaged partnership in Cluster 5, while also facilitating exchange and re-use of research data for the integration of new technologies into energy and mobility solutions.

It seems, therefore, that there are many areas for collaboration between the candidate partnerships and across clusters. A good example of coordination and consolidation of partnerships from Horizon 2020 is 'Clean Energy Transition', which would build on 10 separate ERA-NET Co-fund actions that have synergy with the SET-Plan. These are primarily related to renewable energy technologies (e.g. solar, wind, geothermal, marine and biotechnology) and also smart grids, which are needed to deal with the increasing proportion of distributed renewables in the energy mix. This is one of only two proposed Co-funded Partnerships (CF) in this cluster (the other is 'sustainable, smart and inclusive cities and communities') that would involve the national R&I funding organisations. The others (A187/CP/EIT-KIC) are primarily driven by industrial and research stakeholders.

Figure 18: Interconnections between the envisaged partnerships in the Climate, Energy and Mobility cluster



There is less evidence of coordination and consolidation amongst the mobility-related partnerships. For example, there is a lack of a cross-modal perspective across the four prospective A187/CP Partnerships as their titles imply different objectives and stakeholders. There are, however, several fairly obvious areas where there is surely scope for collaboration, if not rationalisation. These would include:

- 'Integrated air traffic management' will have an influence on 'clean aviation' but also has wider objectives related to the EU priority of 'an economy that works for people'.
- 'Safe and automated road transport' and zero-emission road transport' have some common industry stakeholders (i.e. vehicles industry) but one is orientated towards the digital industries and the other with the energy industry.
- 'Zero-emission road transport' and 'zero-emission waterborne transport' have supply chain synergies and challenges, particularly in relation to heavier duty applications.

This would suggest the more recent candidate Co-funded Partnership on Sustainable, smart and inclusive cities & communities could play a strategic role in fostering cross-modal activities and encouraging collaboration. Likewise, the three candidate EIT-KICs map precisely with the cluster topics and could also perhaps play a coordinating role by providing a commercialisation link between the European research, innovation and education activities in these three thematic areas.

Another question is the extent to which the national/regional R&I funding agencies would be prepared to participate directly in the mobility-related partnerships, which are predominantly industry-led (i.e. Article 187 or Co-programmed). Otherwise, there will be no opportunity for coordinated R&I activities between national funding organisations in important sustainable transport policy areas.

C.5 Cluster 6 – Food, Bioeconomy, Natural Resources, Agriculture and Environment

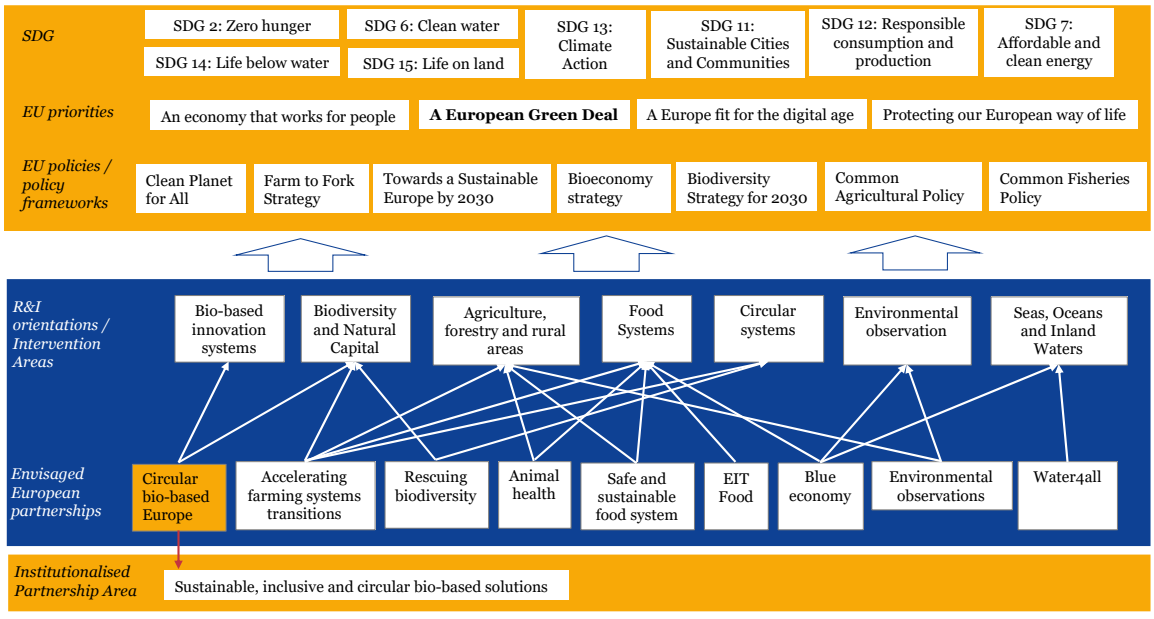
C.5.1 Contribution to the cluster R&I priorities

The key objective of Cluster 6, 'Food, Bioeconomy, Natural Resources, Agriculture and Environment' is to advance knowledge, expand capacities and deliver innovative solutions to accelerate the transition towards the sustainable management of natural resources (such as biodiversity, water and soils). The cluster has a large realm and aims to address a wide range of challenges relating to climate change, biodiversity and ecosystems, natural resources, and the production and consumption patterns that may affect them. It encompasses a single area for possible institutionalised European Partnerships aimed at the development of "sustainable, inclusive and circular, bio-based solutions".

As shown in Figure 19, below, the R&I activities funded under the Pillar II Cluster 6 contribute first and foremost to the 'European Green Deal'. More precisely, they will be instrumental to the announced climate change actions, the Biodiversity Strategy for 2030, the "Farm to Fork Strategy", the zero-pollution ambition, the New Circular Economy Action Plan, and the comprehensive strategy on Africa and trade agreements. However, through cooperation with the other clusters, Cluster 6 may make some contribution to the other EU overarching policy priorities. The R&I activities funded under this cluster therefore aim to contribute to the achievement of several United Nations SDGs including: SDG 2: Zero hunger; SDG 6: Clean water and sanitation; SDG 7: Affordable and clean energy; SDG 11: Sustainable cities and communities; SDG 12: Responsible consumption and production; SDG 13: Climate action; SDF 14: Life below water; and, SDG 15: Life on land.

Cluster 6 is structured around six targeted impacts and seven research and innovation orientations. The R&I activities funded under this cluster aim to (1) develop solutions for mitigation of, and adaptation to, *climate change*; (2) halt the *biodiversity* loss and foster the restoration of *ecosystems*; (3) encourage the sustainable (and circular) management and use of *natural resources*; (4) stimulate inclusive, safe and health *food and bio-based systems*; (5) a better understanding of the determinants of *behavioural, socio-economic and demographic changes* to accelerate system transformation; and, (6) improve solutions for *environmental observations and monitoring systems*.

Figure 19: R&I priorities and higher-level objectives of the Horizon Europe Cluster 6 – Food, Bioeconomy, Natural Resources, Agriculture and Environment



Technopolis Group

The European Commission envisages nine partnerships under Cluster 6, two of which would be institutionalised (Circular bio-based Europe and EIT Food), five would be co-funded (Rescuing biodiversity; Safe and sustainable food systems; A climate-neutral, sustainable and productive Blue Economy; Environmental observation for a sustainable EU agriculture; and Water4All) and two would be either co-programmed or co-funded (Accelerating Farming System Transition and Animal Health).

There is seemingly a good balance between the three types of partnerships. However, industry may have some interest in being involved in the design of the Strategic Research and Innovation Agendas regarding living labs and other research infrastructure ('Towards more sustainable Farming' envisaged partnership) to develop solutions for accelerating the transition of farming systems, and technologies to collect agriculture data.

The proposed portfolio of partnership covers the full range of R&I orientations under Cluster 6. All but one of the proposed partnerships contribute at least to some extent to orienting R&I activities towards the development of food systems that will ensure both sustainable and healthy diets and food and nutrition security for all. The food system has an impact on several challenges. It directly relates to nutrition and diets, access to food, food security, and has an influence on the use of natural resources, water and soil pollution, and climate change. Food waste is a key component of circular systems and biomass has strong potential to offer bio-based energy solutions. Finally, the transformation of food systems should take into consideration demographic changes and the accelerating urbanisation (which reduces lands available for food production but offers opportunities for new types of agriculture such as urban farming).

Two R&I orientations are covered by less than half of the proposed partnerships: Environmental Observations (even though achievement in this area could make significant contribution to the other areas) and Bio-based innovation systems (which is nevertheless at the core of the candidate institutionalised partnership for a circular bio-based Europe).

C.5.2 Functions of the partnerships and stakeholders involved

Figure 20, below, shows that overall, the proposed partnerships under Cluster 6 would only marginally address **market failures**. An exception is the candidate partnership on 'Accelerating farming systems transitions' where the lack of information on the benefits of sustainable farming practices is one of the main rationales. The candidate institutionalised partnership for a circular bio-based Europe, instead, intends to solve a shortage of industry investments in the development of bio-based products whose markets do not yet have certain long-term prospects.

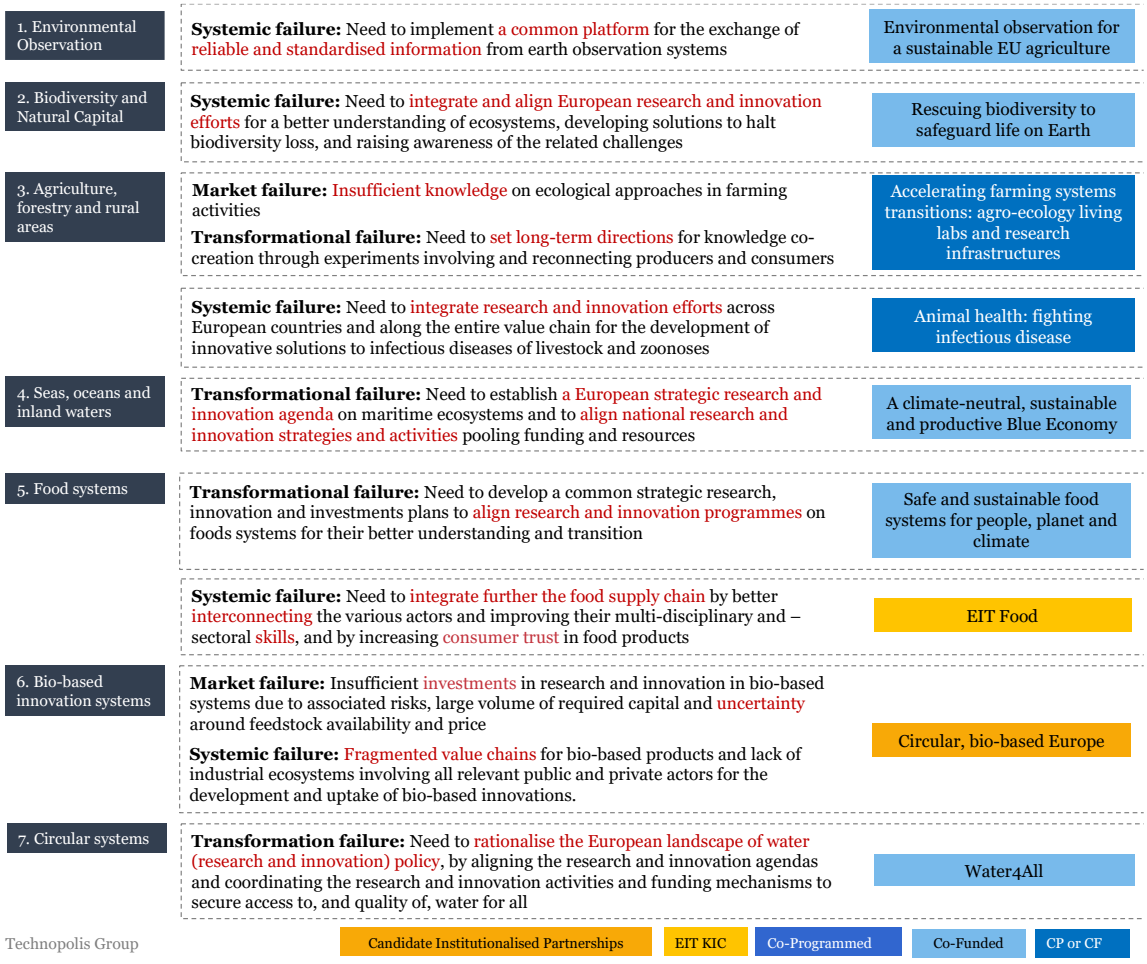
The most common type of **systemic failure** that the candidate partnerships under Cluster 6 aim to solve relates to the fragmentation and potential duplication of research and innovation efforts and the insufficient integration of the value chains. Four partnerships intend to increase collaboration between the different actors in the ecosystems and value chains and pool resources in order to accelerate the development of innovative solutions.

The mitigation of biodiversity loss is a challenge that is common to many partnerships, going beyond the exploitation of natural resources, while one partnership will explicitly focus on integrating European research and innovation efforts that are geared towards rescuing biodiversity to safeguard life on Earth. Synergies may exist and would need to be exploited with other candidate partnerships that aim to contribute to a better understanding of ecosystems and the development of solutions to safeguard biodiversity, such as those on blue economy, agro-ecology, water for all and food systems.

Systemic *infrastructure* failures are the rationales for two of the candidate partnerships under Cluster 6. A very limited potential for synergies exists between these two partnerships, though. While the 'Accelerating farming systems transitions' partnership intends to support the development of experimental platforms for the co-creation of sustainable farming practices, the 'Environmental observation' partnership would

implement a shared infrastructure for the exchange of standardised earth and environmental observation data.

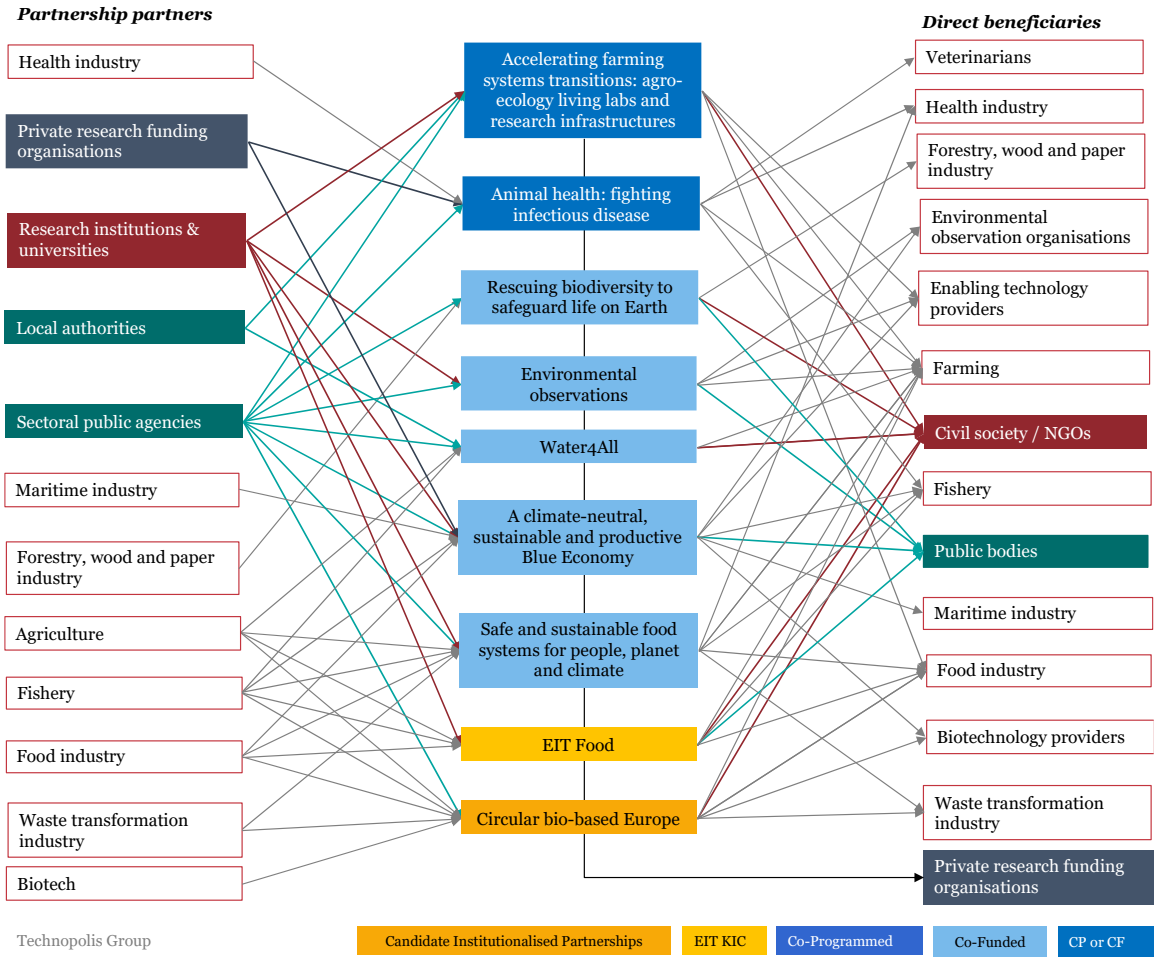
Figure 20: Main problem drivers for the envisaged partnerships



Finally, Figure 20 shows that four candidate European partnerships under Cluster 6 intend to address **transformational** failures. Their direct objective is to coordinate fragmented research and innovation activities towards specific directions and to accelerate the transformation of existing and/or emerging systems. Reflecting the complexity of the underpinning systems and value chains, the candidate partnerships on Blue Economy and 'Safe and sustainable food systems' aim at the development of common research and innovation agendas for further alignment of national programmes.

Despite the similarities in terms of nature of the (transformational) failures, no overlaps are expected for these partnerships, seeing their different sectoral scope – as shown in the mapping of the stakeholders involved in Figure 21, below.

Figure 21: Stakeholders involved and targeted



C.5.3 Interconnections between partnerships and initiatives

Figure 22, below, maps out the landscape of European Partnerships that are currently envisaged for funding under Cluster 6, amongst which the candidate institutionalised Partnership Circular Bio-based Europe in the context of the European Partnership Area 'Sustainable, inclusive and circular, bio-based solutions'.

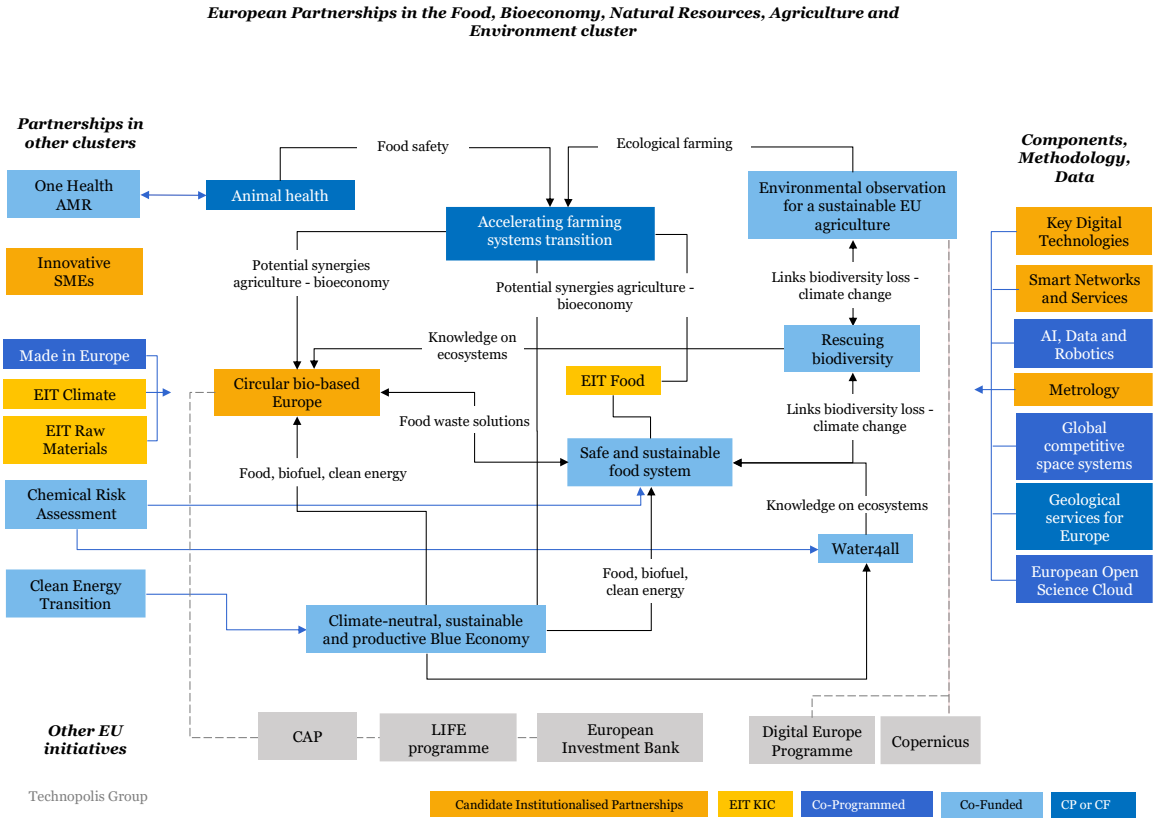
There are strong and multiple interlinkages between the partnerships within Cluster 6, reflecting the **close intertwining of the challenges addressed**.

The partnership for **Safe and sustainable food systems** is seemingly at the core of Cluster 6 and connected with most of the other partnerships. This reflects the centrality of the food system. Food production and consumption rely on, and affect, the agriculture and fishery sectors. It has an indirect impact on the exploitation of natural (including water) resources and biodiversity. Food waste is a strong component in circular systems and could be the basis of bio-based solutions.

In line with the EU overarching priority for a "European Green Deal", linkages should be ensured between all partnerships connected to food production and exploitation of natural resources, and the partnership for rescuing the biodiversity, considering that agriculture and fishery contribute significantly to biodiversity loss (either by overexploiting living stock or degrading the ecosystems).

Changes in consumption habit should be directed towards healthier and more sustainable diets. The partnership 'Accelerating farming systems transitions' aims to help the translation of these changes into transformed production patterns, while also ensuring that the new food systems increase the resilience of rural areas. Similarly, the partnership on the Blue Economy aims to foster new activities based on a more sustainable and climate-neutral exploitation of the water resources which also benefit the economy of coastal areas. Those partnerships therefore contribute to both the European Green Deal and the construction of a people-centred economy, in line with the EU overarching policy priorities.

Figure 22: Interconnections with and among the envisaged partnerships in the cluster 6 - Food, Bioeconomy, Natural Resources, Agriculture and Environment



Cluster 6 does not function in isolation, as its partnerships may exploit synergies with R&I activities and envisaged partnerships in other clusters. Due to the link between epidemies and epizooties, the partnership for animal health has close links to the One-Health AMR envisaged partnership and research in infectious diseases in the Health cluster in general. Reversely, the partnership for Chemicals Risk Assessment (Cluster 1) should ensure the safety of food systems and water resources. The envisaged partnership for an Environmental Observation for a Sustainable Agriculture exploits the FAIR principles also operationalised by the European Open Science Cloud partnership and the space and digital technologies developed in Cluster 4 on Digital, Industry and Space. Beyond the observation and monitoring of the environmental patterns of agriculture, new digital technologies may underpin changes in food production and consumption, e.g. helping shorting food supply chains (via platforms through which final consumer can directly purchase to farmers).

The development of the Blue Economy may accelerate the emergence and development of sustainable energy solution (including hydropower and biofuels). The related partnership may therefore contribute to the objectives of the partnership for a Clean Energy Transition. The bio-based systems that the initiative for a Circular Bio-based Europe aims to develop can contribute to the objectives of EIT Climate (mitigation of climate change) and EIT Raw Materials (curbing the overexploitation of raw materials).

The European Open Science Cloud and Innovative SMEs partnerships may provide valuable 'horizontal' support to the candidate European Partnership in Cluster 6. Both aim to facilitate research and innovation collaboration. The European Open Science Cloud may help the integration of technologies developed in other research and innovation projects into new solutions, such as the use of digital technologies in agriculture and fishery. Similarly, the share of data will be key to ensure smooth cross-sectoral collaboration and foster the development of circular economy. The Innovative SMEs, through the support to cross-border research and innovation projects of SMEs, may accelerate the deployment of solutions across Europe and potentially beyond.

Furthermore, potential synergies may exist between the Cluster 6 partnerships and a number of other EU policy initiatives. The partnership for Environmental Observation for a sustainable agriculture, for example, may benefit from activities funded under the Digital Europe Programme and EU space policy initiatives (e.g. Copernicus and GEOSS).

The envisaged Circular Bio-based Europe initiative may find support for its activities in the Common Agricultural Policy mentioned above (like the other partnerships related to agriculture and food production) and the LIFE Programme for environmental and climate actions. The latter provides grants for pilot and demonstration projects for the environment and resource efficiency, as well as climate change mitigation and adaptation. In particular, it covers innovative technologies, with a preference for implementation in close-to-market conditions, at industrial or commercial scale.

Finally, it is worth noting two potential sources for access to finance for SMEs in the bio-based industries sector, i.e. the European Investment Bank and the Circular Bioeconomy Thematic Investment Platform that is part of the 2018 Bioeconomy Strategy action plan. These initiatives may help support bringing bio-based innovations closer to the market and de-risking private investments in sustainable solutions, even though they may not entirely solve the funding gaps, e.g. for demonstration and flagship projects.

Appendix D Criteria for the selection, implementation, monitoring, evaluation and phasing out of the European Partnerships

D.1 Aggregated view on the criteria as defined in the Horizon Europe regulations

Selection criteria and principles	Article 8	Selection criteria	Implementation / Monitoring / Evaluation & Phasing out criteria
(a) European Partnership is more effective in achieving Programme objectives and delivering clear impacts for the EU and its citizens through involvement and commitment of partners	1 (a, b, c) Specification of objectives of the partnership, key performance and impact indicators, outputs to be delivered (*all partnerships*)	(a,1) delivering on global challenges and research and innovation objectives, securing EU competitiveness, sustainability and contributing to the strengthening of the European Research and Innovation Area and, where relevant, international commitments	**Monitoring** A monitoring system in line with the requirements set out in Article 45 to track progress towards specific policy objectives, deliverables and key performance indicators allowing for an assessment over time of achievements, impacts and potential needs for corrective measures
		(a,2) In the case of institutionalised European Partnerships established in accordance with Article 185 TFEU, the participation of at least 40% of the EU Member States is mandatory	**Evaluation** Evaluation of impacts achieved at Union and national level in relation to defined targets and key performance indicators, feeding into the Programme evaluation set out in Article 47 **Phasing out** • An assessment of the most effective policy intervention mode for any future action; and • The positioning of any possible renewal of a European Partnership in the overall European Partnerships landscape and its policy priorities
(b) Coherence and synergies of the European Partnership		within the EU research and innovation landscape, following the Horizon Europe rules to the largest extent possible	**Implementation** Coordination and/or joint activities with other relevant R&I initiatives • To secure optimum level of interconnections and • Ensure effective synergies, inter alia to overcome potential implementation barriers at national level and increase cost-effectiveness
(c) Transparency and openness of the European Partnership	(1,a) Specification of reporting modalities (*Co-programmed*)	(c,1) as regards the identification of priorities and objectives in terms of expected results and impacts	**Implementation** Appropriate measures ensuring continuous openness of the initiative and transparency during implementation, notably for • priority setting and for • dissemination and exploitation of results, including clear

Selection criteria and principles	Article 8	Selection criteria	Implementation / Monitoring / Evaluation & Phasing out criteria
			open access/user strategy along the value chain In the case of institutionalised European Partnership access to the results and other action related information for the Commission for the purpose of developing, implementing and monitoring of Union policies or programmes
		(c,2) as regards the involvement of partners and stakeholders from across the entire value chain, from different sectors, backgrounds and disciplines, including international ones when relevant and not interfering with European competitiveness	**Implementation** Appropriate measures ensuring continuous openness of the initiative and transparency during implementation, notably for • information on the functioning of the governance, • visibility of the Union, • communication and outreach measures
		(c,3) clear modalities for promoting participation of SMEs and for disseminating and exploiting results, notably by SMEs, including through intermediary organisations	**Implementation** Appropriate measures ensuring continuous openness of the initiative and transparency during implementation, notably for • participation in calls for proposals • appropriate measures for informing SMEs and promoting their participation **Monitoring** Detailed information on the evaluation process and results from all calls for proposals within partnerships, to be made available timely and accessible in a common e-database
(d) Ex-ante demonstration of additionality and directionality of the European Partnership, including a common strategic vision of the		(d,1/3) approaches to ensure flexibility of implementation and to adjust to changing policy, societal and/or market needs, or scientific advances, to increase policy coherence between regional, national and EU level	**Implementation** Systemic approach: ensuring active and early involvement of Member States and achievement of the expected impacts of the European Partnership through the flexible implementation of joint actions of high European added value also going beyond joint calls for research and innovation activities, including those related to market, regulatory or policy uptake

Selection criteria and principles	Article 8	Selection criteria	Implementation / Monitoring / Evaluation & Phasing out criteria
purpose of the European Partnership		(d,2) demonstration of expected qualitative and significant quantitative leverage effects, including a method for the measurement of key performance indicators	**Monitoring** Periodic dedicated reporting on quantitative and qualitative leverage effects, including on committed and actually provided financial and in-kind contributions, visibility and positioning in the international context, impact on research and innovation related risks of private sector investments
		(d,4) exit-strategy and measures for phasing-out from the Programme	**Evaluation / Phasing out** In the absence of renewal, appropriate measures ensuring phasing-out of Framework Programme funding according to the conditions and timeline agreed with the legally committed partners ex-ante, without prejudice to possible continued transnational funding by national or other Union programmes, and without prejudice to private investment and on-going projects
(e) Ex-ante demonstration of the partners' long term commitment, including a minimum share of public and/or private investments	1 (a, c) Commitments from all involved sides for financial and/or in-kind contributions of the partners (*Co-programmed, Institutionalised*) 1(b) commitment of the partners for financial and/or in-kind contributions and integration of their relevant activities using a Programme co-fund action (*Co-funded*)	(e) In the case of institutionalised European Partnerships, established in accordance with article 185 or 187 TFEU, the financial and/or in-kind, contributions from partners other than the Union, will at least be equal to 50% and may reach up to 75% of the aggregated European Partnership budgetary commitments	**Implementation** Commitments, for financial and/or in-kind contributions, from each partner in accordance with national provisions throughout the lifetime of the initiative

D.2 Matrix of the criteria for the selection, implementation, monitoring, evaluation and phasing out of the European Partnerships

Selection (Art 8 & Annex III)		Implementation / Monitoring / Evaluation & Phasing out (Annex III)	Aggregated criteria classification	Timing
WHAT	**SPECIFICS**	**WHAT**	**WHAT**	**WHEN**
(a) More effectiveness of the European Partnership				
More effectiveness in achieving Programme objectives	Partnerships objectives		Policy - Policy design : Partnership objectives tree	Selection
	FP objectives • Global challenges • R&I objectives • EU competitiveness • Sustainability • Strengthening ERIA International commitments where relevant		Policy - Policy analysis : Partnership alignment with FP objectives	Selection
			Policy - Policy analysis ; Comparative analysis of potential effectiveness versus Horizon Europe calls & other EU initiatives	Selection
More effectiveness in delivering clear impacts	Key performance and impact indicators, Outputs		Policy - Policy design : Partnership intervention logic (impact pathways)	Selection
			Policy - Policy design : Partnership targets & KPI definition	Selection
		Monitoring system - Progress towards specific policy objectives, deliverables and key performance indicators	Policy - Monitoring & Evaluation System : Progress towards objectives, KPIs	Implementation
			Programme - Programme design : Action lines intervention logics / Contribution to partnership objectives & KPIs	Implementation
			Programme - Monitoring & Evaluation System : Action lines intervention logics, KPIs, deliverables, outputs	Implementation
		Assessment over time of achievements, impacts and	Programme - Monitoring & Evaluation System : Mid-term evaluation at action lines level / achievements, impacts and potential needs for corrective measures	Implementation

Selection (Art 8 & Annex III)		Implementation / Monitoring / Evaluation & Phasing out (Annex III)	Aggregated criteria classification	Timing
WHAT	**SPECIFICS**	**WHAT**	**WHAT**	**WHEN**
		potential needs for corrective measures	Policy - Monitoring & Evaluation System : Mid-term evaluation at partnership level / achievements, impacts and potential needs for corrective measures	Implementation
		Evaluation of impacts achieved at EU & national level - targets & KPIs	Policy - Monitoring & Evaluation System : Final evaluation at action lines level - results & impact at EU & national levels	Implementation
			Policy - Monitoring & Evaluation System : Final evaluation at partnership level - results & impact at EU & national levels	Implementation
More effectiveness thanks to involvement and commitment of partners	Article 185 TFEU: at least 40% of EU MS		Policy - Policy analysis : • Stakeholder analysis of value chain in the research area versus profile partners • Art 185: geographical reach of partnership	Selection
(b) Coherence and synergies of the European Partnership				
Positioning within the EU R&I landscape			Policy - Policy analysis : Assessment of positioning in EU R&I landscape	Selection
		Coordination and/or joint activities with other relevant R&I initiatives - Optimum level of interconnections	Policy - Policy intelligence : Rationale for co-operation with other R&I initiatives	Implementation
			Policy - Policy design : Co-operation measures with other R&I initiatives	Implementation
		Coordination and/or joint activities with other relevant R&I initiatives - Effective synergies	Programme - Monitoring & Evaluation System : Effectiveness of co-operation measures with other R&I initiatives - action lines level	Implementation
			Policy - Monitoring & Evaluation System : Effectiveness of co-operation measures with other R&I initiatives - partnership level	Implementation
			EC Evaluation strategy : Meta-evaluation at cross-partnership, partnership area and/or cluster level - complementarities, synergies, overlaps	Implementation

Selection (Art 8 & Annex III)		Implementation / Monitoring / Evaluation & Phasing out (Annex III)	Aggregated criteria classification	Timing
WHAT	**SPECIFICS**	**WHAT**	**WHAT**	**WHEN**
		Coordination and/or joint activities with other relevant R&I initiatives - Overcoming potential implementation barriers at national level	Policy - Policy intelligence : Analysis of potential implementation barriers at national level	Implementation
			Policy - Policy design : Measures to overcome implementation barriers at national level	Implementation
			Programme - Monitoring & Evaluation System : Effectiveness of measures to overcome implementation barriers at national level - action lines level	Implementation
			Policy - Monitoring & Evaluation System : Effectiveness of measures to overcome implementation barriers at national level - partnership level	Implementation
(c) Transparency and openness of the European Partnership				
Openness of internal processes	Openness for identification of priorities and objectives in terms of expected results and impacts	Appropriate measures ensuring openness and transparency for priority setting	Policy - Rules & procedures : Processes for involvement of all stakeholders in priority setting	Selection
			Policy - Information & Communication : Communication on priority setting rationale	Implementation
	Clear modalities for disseminating and exploiting results, notably by SMEs, including through intermediary organisations	Appropriate measures ensuring openness and transparency for dissemination and exploitation of results	Policy - Rules & procedures : Modalities for dissemination & exploitation of results	Selection
	Involvement of partners and stakeholders from	Clear open access/user strategy along the value chain	Policy - Rules & procedures : • Open access/user strategy, along value chain • Involvement of international organisations	Selection

Selection (Art 8 & Annex III)		Implementation / Monitoring / Evaluation & Phasing out (Annex III)	Aggregated criteria classification	Timing
WHAT	**SPECIFICS**	**WHAT**	**WHAT**	**WHEN**
	across the entire value chain / sectors / backgrounds and disciplines, including international ones when relevant	Appropriate measures ensuring continuous openness and transparency for participation in calls for proposals	Programme - Rules & procedures : Measures ensuring continuous openness for participation in calls for proposals	Implementation
			Programme - Information & Communication : Communication on measures ensuring openness for participation in calls for proposals	Implementation
			Programme - Monitoring & Evaluation System : Effectiveness of measures ensuring openness for participation in calls for proposals	Implementation
	Clear modalities for promoting participation of SMEs	Appropriate measures ensuring openness and transparency for informing SMEs and promoting their participation	Programme - Rules & procedures : Measures ensuring information to SMEs and promotion of their participation	Selection
			Programme - Information & Communication : Information to SMEs promoting their participation	Implementation
			Programme - Monitoring & Evaluation System : Effectiveness of measures promoting SME participation - action lines level	Implementation
			Policy - Monitoring & Evaluation System : Effectiveness of measures promoting SME participation - partnership level	Implementation
Accountability	• Access to results and other action related information for the EC (Institutionalised)	Detailed information on the evaluation process and results from all calls for proposals within partnerships, to be made	Programme - Rules & procedures : Measures ensuring detailed information on the evaluation process and results from all calls for proposals within partnerships, to be made available timely and accessible in a common e-database	Selection

Selection (Art 8 & Annex III)		Implementation / Monitoring / Evaluation & Phasing out (Annex III)	Aggregated criteria classification	Timing
WHAT	**SPECIFICS**	**WHAT**	**WHAT**	**WHEN**
	• Specification of reporting modalities (Co-programmed)	available timely and accessible in a common e-database	Programme – Reporting : Detailed information on the evaluation process and results from all calls for proposals within partnerships, to be made available timely and accessible in a common e-database	Implementation
		Appropriate measures ensuring continuous openness of the initiative and transparency during implementation, notably for • information on the functioning of the governance, • visibility of the Union • communication and outreach measures	Programme - Information & Communication : Approach for ensuring • Information on the functioning of the governance • Visibility of the Union • Communication and outreach measures	Selection
			Programme - Operational intelligence : Target audience for communication and outreach measures	Implementation
			Programme - Reporting : • Information on the functioning of the governance • Visibility of the Union • Communication and outreach measures	Implementation
(d) (Ex-ante) Demonstration of additionality and directionality of the European Partnership				
Common strategic vision of the purpose of the European Partnership			Policy - Policy design : Common strategic vision of the purpose of the partnership	Selection
		Systemic approach ensuring active and early involvement of Member States and achievement of the expected impacts through the flexible implementation of joint actions of high European added value - also going beyond joint calls for research and innovation	Policy - Rules & procedures : Measures for active and early involvement of Member States	Implementation
			Policy - Policy intelligence : Identification of priority Member States to involve	Implementation
			Programme - Operational intelligence : Identification of need/focus for joint actions with MS beyond R&I	Implementation
			Programme - Programme design : Joint actions with MS also beyond R&I	Implementation

Selection (Art 8 & Annex III)		Implementation / Monitoring / Evaluation & Phasing out (Annex III)	Aggregated criteria classification	Timing
WHAT	**SPECIFICS**	**WHAT**	**WHAT**	**WHEN**
		activities, including those related to market, regulatory or policy uptake		
Flexibility	Approaches to ensure flexibility of implementation • To adjust to changing policy, societal and/or market needs, or scientific advances • To increase policy coherence between regional, national and EU level		Programme - Rules & procedures : Approach to ensure flexibility in action lines definition & implementation measures to adjust to changing policy, societal and/or market needs, or scientific advances, and/or to increase policy coherence between regional, national and EU level	Selection
			Programme - Operational intelligence : • Changing policy, societal and/or market needs, or scientific advances • Needs for enhanced policy coherence between regional, national and EU level	Implementation
Long-term leverage effects	• Demonstration of expected qualitative and significant quantitative leverage effects A method for the measurement of key performance indicators	Periodic dedicated reporting on quantitative and qualitative leverage effects, including on committed and actually provided financial and in-kind contributions, visibility and positioning in the international context, impact on research and innovation related risks of private sector investments	Policy - Policy analysis : Demonstration of expected long-term qualitative and significant quantitative leverage effects	Selection
			Policy - Monitoring & Evaluation System : Definition of a method for the measurement of key performance indicators	Selection
			Policy - Monitoring & Evaluation System : • Quantitative and qualitative leverage effects, including on committed and actually provided financial and in-kind contributions • Visibility and positioning in the international context • Impact on R&I related risks of private sector investments	Implementation
Exit strategy / phasing out	Exit-strategy and measures for phasing-out from the Programme		Policy - Rules & procedures : Ex-ante agreement with the legally committed partners on exit strategy & measures (conditions and timeline)	Selection

Selection (Art 8 & Annex III)		Implementation / Monitoring / Evaluation & Phasing out (Annex III)	Aggregated criteria classification	Timing
WHAT	**SPECIFICS**	**WHAT**	**WHAT**	**WHEN**
		If renewal deemed relevant • Most effective policy intervention mode for any future action • Positioning European Partnership in European Partnerships landscape and its policy priorities	Policy - Policy analysis : • In the absence of renewal, appropriateness of measures ensuring phasing-out of FP funding (possible continued transnational funding by national or other Union programmes, private investment etc) • If renewal deemed relevant: most effective policy intervention mode for any future action • If renewal deemed relevant: positioning European Partnership in European Partnerships landscape and its policy priorities	Implementation
(e) (Ex-ante) Demonstration of the partners' long term commitment				
Minimum share of public and/or private investments	• Commitments from all involved sides for financial and/or in-kind contributions of the partners (*Co-programmed, Institutionalised*) • Commitment of the partners for financial and/or in-kind contributions and integration of their relevant activities using a Programme co-fund action (*Co-funded*) • Financial and/or in-kind contributions from partners other than the Union at least equal to 50% and may reach up to	Commitments, for financial and/or in-kind contributions, from each partner in accordance with national provisions throughout the lifetime of the initiative	Policy - Rules & procedures : • Co-programmed & Institutionalised: Commitments from all involved sides for financial and/or in-kind contributions of the partners • Co-funded: Commitment of the partners for financial and/or in-kind contributions and integration of their relevant activities using a Programme co-fund action • Institutionalised: Financial and/or in-kind contributions from partners other than the Union at least equal to 50% and may reach up to 75% of the aggregated European Partnership budgetary commitments	Selection

Selection (Art 8 & Annex III)		Implementation / Monitoring / Evaluation & Phasing out (Annex III)	Aggregated criteria classification	Timing
WHAT	**SPECIFICS**	**WHAT**	**WHAT**	**WHEN**
	75% of the aggregated European Partnership budgetary commitments (Institutionalised)			

Appendix E Methodological framework for the impact assessment of the candidate Institutionalised Partnerships

The Impact Assessment studies for all 13 candidate institutionalised European Partnerships mobilised a mix of qualitative and quantitative data collection and analysis methods. These methods range from desk research and interviews to the analysis of the responses to the Open Consultation, stakeholder analysis and composition/portfolio analysis, bibliometrics/patent analysis and social network analysis, and a cost-effectiveness analysis.

The first step in the impact assessment studies consisted in the definition of the context and the problems that the candidate partnerships are expected to solve in the medium term or long run. The main data source in this respect was desk research. The Impact Assessment Study Teams went through grey and academic literature to identify the main challenges in the scientific and technologic fields and in the economic sectors relevant for their candidate partnerships. The review of official documentations, especially from the European Commission, additionally helped understand the main EU policy proprieties that the initiatives under assessment could contribute to achieve.

Almost no candidate institutionalised European Partnership is intended to emerge ex nihilo. Partnerships already existed under Horizon 2020 and will precede those proposed by the European Commission. In the assessment of the problems to address, the Impact Assessment Study Teams therefore considered the achievements of these ongoing partnerships, their challenges and the lessons that should be drawn for the future ones. For that purpose, they reviewed carefully the documents in relation to the preceding partnerships, especially their (midterm) evaluations conducted.

Finally, the description of the context of the candidate institutionalised European Partnerships required a good understanding of the corresponding research and innovation systems and their outputs already measured. The European Commission services and, where needed the ongoing Joint Undertakings or implementation bodies of the partnerships under Article 185 of the TFEU, provided data on the projects that they funded and their participants. These data served as basis for descriptive statistic of the numbers of projects and their respective levels of funding, the type of organisations participating (e.g. universities, RTOs, large enterprises, SMEs, public administrations, NGOs, etc.) and how the funding was distributed across them. Special attention was given to the countries (and groups of countries, such as EU, Associated Countries, EU13 or EU15) and to the industrial sectors, where relevant. The sectoral analysis required enriching the eCORDA data received from the European Commission services with sector information extracted from ORBIS. We used the NACE codification up to level 2. These data enabled identified the main and, where possible, emerging actors in the relevant systems, i.e. the organisations, countries and sectors that will need to be involved (further) in the future partnerships.

The horizontal teams also conducted a Social Network Analysis using the same data. It consisted in mapping the collaboration between the participants in the projects funded under the ongoing European partnerships. This analysis revealed which actors – broken down per type of stakeholders or per industrial sector – collaborate the most often together, and those that are therefore the most central to the relevant research and innovation systems.

The data provided by the European Commission finally served a bibliometric analysis aimed at measuring the outputs (patents and scientific publications) of the currently EU-funded research and innovation projects. A complementary analysis of the Scopus data enabled to determine the position and excellence of the European Union on the international scene, and identify who its main competitors are, and whether the European research and innovation is leading, following or lagging behind.

All together, these statistical analyses will complement the desk research for a comprehensive definition of the context in which the candidate institutionalised European

Partnerships are intended to be implemented. The conclusions drawn on their basis will be confronted to the views of experts and stakeholders collected via three means:

- The comments to the inception impact assessments of the individual candidate institutionalised European partnerships received in August 2019
- The open public consultation organised by the European Commission from September to November 2019
- The interviews (up to 50) conducted by each impact assessment study team conducted between August 2019 and January 2020.

For instance, in all three exercises, the respondents were asked to reflect on the main challenges that the candidate institutionalised European Partnerships should address. In the open public consultations, they mainly reacted to proposals from the European Commission like when they were given to opportunity to give feedback to the inception impact assessment.

The views of stakeholders (and experts) were particularly important for determining the basic functionalities that the future partnerships need to demonstrate to achieve their objectives as well as their most anticipated scientific, economic and technological, and societal impacts. The interviews allowed more flexibility to ask the respondents to reflect about the different types of European Partnerships. Furthermore, as a method for targeted consultation, it was used to get insights from the actors that both the Study Teams and the European Commission were deemed the most relevant. For the comparative assessment of impacts, the Study Teams confronted the outcomes of the different stakeholder consultation exercises to each other with a view of increasing the validity of their conclusions, in line with the principles of triangulation.

The comparison of different options for European partnerships additionally relied on a cost-effectiveness analysis. When it comes to research and innovation programmes, the identification of costs and benefits should primarily be aimed at identifying the "value for money" of devoting resources from the EU (and Member States) budget to specific initiatives. Based on desk research and consultation with the European Commission services, the horizontal study team produced financial estimates for different types of costs (preparation and setup costs, running costs and winding down costs) and per partnership option. The costs were common to all candidate European Partnerships. The results of the cost model were displayed in a table, where each cost was translated on a scale using "+" in order to ease the comparison between the partnership options.

A scorecard analysis, which allocated each option a score between 1 and 3 against selected variables, was used to highlight those options that stand out as not being dominated by any of the other options in the group: such options are then retained as the preferential ones in the remainder of our analysis. It also allowed for easy visualisation of the pros and cons of alternative options.

Publications Office
of the European Union