European Commission

From Foresight for smart specialisation to engagement in EU research programmes, missions and partnerships

Fifth Thematic Report

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Independent Expert Report

Research and Innovation

From Foresight for smart specialisation to engagement in EU research programmes, missions and partnerships

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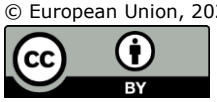

EUROPEAN COMMISSION

From foresight for smart specialisation to engagement in EU research programmes, missions and partnerships

Fifth Thematic Report

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2023

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Table of contents

List of Figures and Tables

INTRODUCTION

This report is the fifth thematic report of the Mutual Learning Exercise (MLE) on Research and Innovation (R&I) foresight with a focus on "Foresight for smart specialisation to engagement in EU research programmes, missions and partnerships". The aim of this thematic report is to outline selected issues related to the application of foresight in the design and implementation of Smart Specialisation Strategies (S3) and Mission-Oriented Innovation Policies (MOIP), to present selected inspiring examples of practical foresight in these policies, and to summarise the results of the discussions held on this topic during the MLE workshop in Prague on 25-26 May 2023.

The timeliness of this discussion is underlined by the fact that the societal relevance of R&I and the link between R&I policies and Sustainable Development Goals (SDGs) have recently gained importance. In this context, a stronger link between the concept of smart specialisation and the concept of MOIP is also discussed. The thematic report is structured in three parts as outlined below.

The first part discusses issues related to the integration of foresight into the smart specialisation process. The focus here is mainly on the changing concept of smart specialisation and its shift towards challenge (or mission) oriented smart specialisation. It is also this shift that highlights the importance of foresight for the effective implementation of S3.

The second part focuses on MOIP and the role of foresight in mission design and governance. MOIP has experienced a renaissance in recent years, in the context of a growing emphasis in R&I policy on addressing important societal needs and strengthening the coordination between R&I policy and other public policies. With increasing complexity and uncertainty, foresight has the potential to provide important insights for the design and implementation of missions.

The third section summarises selected key aspects related to the effective integration of foresight into the R&I policy cycle in the areas of smart specialisation and missions. The following aspects are highlighted: (i) challenges related to combining top-down and bottom-up approaches, (ii) importance of and ways to involve stakeholders in foresight exercises, (iii) importance and benefits of involving citizens in discussions on the future of R&I, and (iv) common challenges for the integration of foresight into R&I policy making.

1. Future perspectives in smart specialization

1.1. Underlying principles of smart specialisation

Smart specialisation is a concept introduced by the European Commission (EC) in 2010 as a key approach to regional development. It emphasises the need for regions to focus their resources and efforts on specific areas of technological or economic specialisation, in order to achieve higher levels of productivity, competitiveness and innovation. The smart specialisation approach is based on the idea that regions should build on their existing strengths and assets and use these as a foundation for developing new and innovative products and services that can meet global demand.

As defined by the S3 Platform[1] hosted by the EC's Joint Research Centre's Growth and Innovation Directorate, smart specialisation is a "place-based approach characterised by the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement. It is outward-looking and embraces a broad view of innovation including, but certainly not limited to, technology-driven approaches, supported by effective monitoring mechanisms."

Although the concept of smart specialisation is not anchored in theory it further develops or draws on ideas, insights and research from a range of economic and regional development theories. For example, the influence of evolutionary economics is evident in terms of achieving the necessary 'critical mass', agglomeration economics in considerations of knowledge spillovers, and the use of insights from other concepts such as economic clusters, regional innovation systems, production clusters and flexible specialisation, etc. is also evident (OECD, 2013; Detterbeck, 2018).

The theoretical foundations of the S3 were developed between 2005 and 2009, inter alia, in the framework of the activities of the Knowledge for Growth (K4G) expert group initiated by the then European Commissioner for Science and Research, J. Potočnik (Foray, 2015). The initial ideas and the term smart specialisation appeared in European Commission publications as early as 2008 in the report "Knowledge for Growth - European Issues and Policy Challenges" resulting from the work of this group. The expert group highlighted, among others, two significant limiting factors that characterised the European innovation system and significantly influenced the formulation of the concept of smart specialisation. Firstly, the high fragmentation of European public research, which has largely constrained the growth and expansion of the knowledge economy. Secondly, the report refers to the tendency of European regions and states to follow very similarly targeted strategies in innovation policy. This has led to regions and states focusing on the same research areas and innovation activities, regardless of whether they were able to reach the necessary critical level in these activities to achieve the desired growth and multiplier effect (European Commission, 2009).

The K4G report stressed that the principle of smart specialisation does not consist of a top-down approach to planning nor a strict definition of sectors and industries. It rather focuses on finding a unique path and potential for a qualitative shift and differentiation of activities within a region's existing core competences and knowledge. The role of policy, according to the K4G report, should therefore mainly be to coordinate and support a process that will

[1] https://s3platform.jrc.ec.europa.eu/

contribute to uncovering and developing the capacity to innovate in a particular area (or several areas) of specialisation.

The economic crisis further reinforced the need to rethink the approach to (regional) innovation strategies. The concept of smart specialisation and S3 have thus become key elements in the implementation of European Cohesion Policy. In applying the principles of smart specialisation, it is expected that the implementation of S3 will bring about a greater diversification between regional innovation strategies and implemented activities that take into account the true potential of the innovation system. This contrasts with the approaches of so-called neutral or purely horizontal policies[2] commonly implemented in the past, which often led to inefficient duplication of R&I policies (Foray, 2018).

At the **core of the concept of smart specialisation is a process aimed at transforming the economic structures of a given region or country with the active participation of the key actors of the innovation system**. Foray (2015, 2018) emphasises that the S3 is characterized by transformation activities stimulating and accelerating structural changes in the economy. The priority areas of smart specialisation are therefore descriptions of the most important sectors, actors or activities present in the innovation system, with a focus on the direction of and approach to their transformation.[3]

Each priority should also express a **vision and, in particular, the desired direction of change of existing structures** (Foray, 2019). The basis of S3 must therefore consist primarily of a reflection on the context of the region (country) – a so-called place-based approach that will facilitate the mobilisation of the present capacity. S3 must be based on the socio-economic, institutional, environmental, as well as cultural specificities shaping a given innovation system. The purpose of S3 is to uncover the specific strengths of a region (country) and promote its innovation potential and build its own unique (new) competitive advantages through transformative activities (Foray, 2019). It is the concentration on carefully identified priority areas that aims at creating a critical mass of actors and a mix of activities that are best positioned to unlock innovation and transformation potential.

The prioritisation and focus of S3 on a limited number of the most promising areas of activity focuses on two important aspects of innovation strategies in the context of setting more effective European innovation, regional and cohesion policies. This approach **helps to concentrate limited public resources** sufficiently on the most promising areas of activity that have the transformative capacity to generate high added value. In effect, it helps boost economic growth and employment and, secondly, it **helps to eliminate the often-inefficient fragmentation of R&I support** (Ciampi Stancova, 2020).

The **selectivity of public interventions is therefore at the heart of S3**, but the selected areas of intervention cannot be based on the knowledge and will of policymakers alone, nor on the simple results of quantitative analyses, but rather on an **interactive design process between the public and private sectors that allows for the exploration and evaluation of opportunities, needs and potential impacts and benefits of the selected activities**

[2] Here, neutral or purely horizontal innovation policy refers to a policy that aims to promote innovation across all sectors and industries without favouring specific technologies or industries. It aims to create an environment that is conducive to innovation, for example by supporting research and development activities, cooperation between different actors in the innovation system (academia, industry, government or non-profit organisations), knowledge transfer activities, the development of a skilled workforce, etc.

[3] However, it should be emphasised that the S3 approach has been developed on the basis of regional innovation policy with an emphasis on changes in the economic structure and without a direct link to broader societal challenges. In this respect, it also differs from transformative innovation policy thinking.

(Foray, 2015; Gianelle et al., 2020). In practice, however, it is often very difficult to achieve real selectivity (see also the discussion in section 1.2).

By its nature, the process of identifying new opportunities for economic diversification is relatively uncertain for all stakeholders and must be seen by all parties as a joint and mutual learning process (Foray et al., 2009). Smart specialisation uses the term EDP for this process. Significant emphasis is placed on the ability of actors to think beyond individual interests, and beyond their region (country) as well as the usual production and knowledge networks, highlighting the real transformative power of the S3 (Radosevic, Ciampi Stancova, 2018).

The concept of smart specialisation is therefore **characterised by a combination of two logics of policy making and implementation,** namely, both **the emphasis on a highly strategic and planning approach and the considerable involvement of different key actors in the innovation discovery process** (Foray, 2019). The authors of the concept themselves therefore stress that **while S3 avoids a top-down approach to strategy development and implementation, it is not a pure bottom-up approach either**.

1.2. The role of the Entrepreneurial Discovery Process (EDP)

EDP is a central principle for S3 without which it cannot really work. The concept is commonly used in business theories and describes the **process of continuously searching for, identifying and evaluating entrepreneurial opportunities** (Virkkala and Mariussen, 2019). However, EDP in the context of S3 is viewed from a much broader perspective and is a **combination of an individual and collective search for opportunities to achieve structural changes in the economy of a given territory.** In this respect, there has been a significant shift in the role of EDP in S3 since the introduction of the concept of smart specialisation into EU regional and cohesion policy (Foray, 2019).

A key role of EDP is to define and prioritise the vertical domains that form one of the pillars of the concept of smart specialisation. This is a very complex task that entails the need to accept a certain degree of uncertainty and risk as it seeks to look into the future (Foray, 2015). In this context, the concept of related variety (or technology relatedness) emphasises that knowledge spillovers and innovations resulting from the recombination of existing knowledge can occur more effectively between firms and sectors that are characterised by a certain technological proximity (see for example Boschma and Frenken, 2010). At the same time, however, these should not be too closely related firms and sectors where competition may arise and thus create barriers to knowledge transfer and mutual learning. For smart specialisation, it is therefore important to exploit the potential of the region's existing sectoral composition and technology base, and to identify opportunities for effectively combining existing knowledge and skills for innovation activities. Therefore, the joint process of discovering opportunities and potential innovation activities (with a strong role of bottom-up approach) that a region or country should focus on to strengthen the knowledge economy is an integral part of the S3 strategic framework itself.

If smart specialisation is created and implemented with the help of EDP, it should help identify those opportunities where new R&I activities will **complement existing resources and help create a future strong comparative advantage for the region** (or country). EDP has been introduced as a place-based approach to decentralised dynamics of strategy formulation and decision-making and implementation to ensure continuous transformation of production structures through R&I and to provide a desirable combination of top-down planning logic and bottom-up approach (Foray, 2019).

However, the concept of smart specialisation, with a key role for EDP, presumes a certain degree of overall institutional maturity of the system. It requires a fairly well-developed collaborative culture of the actors involved, both on the public sector side and on the side of other key actors involved, who must be able to look beyond their own specific interests. (Marques, Morgan, 2018; Blažek, Morgan, 2019). S3 with its emphasis on priority area oriented EDP has often been criticised for paying little attention to institutional capacity (Virkkala, Mariussen, 2019). In fact, during the over hasty implementation of the first generation of S3, it became apparent that, in an attempt to fulfil the basic requirements for S3 through the introduction of EDP, the less developed regions, particularly in Central and Eastern Europe, were slipping into a kind of formal consultation process in which EDP was rather declarative and served more or less only to verify previously defined priorities and interventions. Blažek and Morgan or 2019, Ciampi Stancova, 2020, among others argue that the primary goal in EDP in institutionally weaker systems should be a process aimed at building mutual understanding and trust among key actors in all sectors (the so-called quadruple helix), while obtaining consensus on the needs for R&I (Cvijanović et al., 2020, Panori et al., 2021).

In the case of underdeveloped regions, it is the initial identification of cross-cutting priorities of a horizontal nature that should aim at strengthening the institutional environment and innovation system that may be essential for the successful launch of EDP. Many authors confirm in their research that the implementation of S3 has a positive effect on the governance of innovation policy itself, cultivating a culture of cooperation among key actors and further strengthening it through a continuous and long-term learning process (Marinelli, Perianez Forte, 2017).

Reflecting on the function of the concept of smart specialisation and the role of EDP, Foray (2019) adds that EDP should enter the smart specialisation process especially at the stage when opportunities for transformation activities are being sought within the top-down identified priority areas. The role of EDP should be in ensuring specific regional differentiation based on a bottom-up approach when the nature and form of transformation activities within the priority areas are developed. As such, EDP must include some flexibility and an evolutionary process based on a learning process requiring active work with monitoring and feedback mechanisms (Virkkala and Mariussen, 2019).

1.3. From S3 to S4 and mission-oriented smart specialisation

In recent years, there has been a gradual shift in the way we look at innovation and innovation policy. While innovation policy has traditionally been driven by specific technological areas or industries, there is a new emphasis in innovation policy on socio-technical systems, defined as the set of actors and institutions that perform a social function for the end user (Geels, 2002). This approach is at the core of transformative innovation policy, which strengthens the emphasis on, and solutions to, societal challenges such as climate change, demographic change, security, etc. (Schot and Steinmueller, 2016).

In November 2019, the European Commission presented new policy directions that set out Europe's vision to lead the transformation towards a healthy planet, a digital economy and sustainable development. In this context, EU innovation policy approaches such as S3 and MOIP are expected to play important roles. To explore these innovation policy approaches, the European Commission set up an expert group "Linking smart specialisation and mission-oriented policy for sustainable development" to discuss conceptual issues aimed at linking the smart specialisation concept and mission-oriented innovation policies. The outcomes of this expert group (McCann & Soete, 2020) provided a basic conceptual framework for

integrating sustainability challenges and the SDGs into the smart specialisation approach towards the concept of smart specialisation strategies for sustainability (S4).

This concept was further developed by Miedzinski et al., 2021 who presented a preliminary set of reflection questions as well as a self-assessment framework for regions and countries wishing to strengthen the sustainability dimension in their S3. Subsequently, the JRC developed a guidance tool designed to help policymakers, practitioners and analysts locate and integrate sustainability challenges and objectives into S3 at regional and national level (Miedzinski, Matusiak et al., 2022). This report was a result of a direct collaboration and co-creation process involving more than 30 regional and national policymakers and smart specialisation practitioners from 12 regions and countries in Europe and beyond.

In line with Europe's long-term strategic policy objectives, it is envisaged that S3 can significantly foster transformative innovation in response to societal challenges and sustainable development objectives. As Miedzinski, Matusiak et al., 2022 has shown, the orientation of innovation policy towards addressing sustainability objectives is now widely accepted by policy experts involved in smart specialisation across different territories. This is partly due to the overall strategic direction given by EU policies (especially the European Green Deal), but also due to a growing understanding of the need and urgency to act to address sustainability challenges at national, regional and local levels.

The new S3 framework is therefore broadening its focus from supporting mainly technological innovation to the different types of innovation that drive the wider economic, environmental and social changes needed to achieve the SDGs. In this context, S3 can act as a test bed for systemic innovation and experimentation to develop, demonstrate and scale up SDG-oriented approaches at regional and national levels.

1.4. The role of foresight in the S3 process

Foresight should play a very important role in the smart specialisation process by helping regions to identify new trends, challenges and opportunities that are likely to shape the future economic and technological environment. Through foresight, regions can better understand potential pathways of change and how they may affect their existing strengths and capabilities. These insights can then be used to develop strategies that are more responsive to future needs and demands of the global marketplace and that helps regions to take the lead in their chosen areas of specialisation. The role of foresight in exploring possible scenarios and future opportunities is also becoming stronger in the context of the growing importance of S3 in supporting transformative innovations that respond to societal challenges and SDGs.

In the regional context, however, the use of foresight has certain specificities. As Miles and Keenan, 2003 point out, the main feature that distinguishes regions from other spatial scales is the geographical proximity of actors. On the one hand, geographical proximity can facilitate cooperation and networking between actors in a region, but, on the other hand, it may limit the space for new knowledge and perspectives that can enrich the foresight process.

As noted by Piirainen et al., 2017, regional foresight is predominantly linked to the policymaking processes, and is thus increasingly less concerned with accurate anticipation of the future or forecasting, and rather used for goal-setting, negotiation, and obtaining commitment. In this respect, regional foresight and smart specialisation have a strong connection and can mutually benefit each other in several ways, as follows:

- Regional foresight exercises help identify a region's unique strengths, assets and capabilities, as well as emerging trends, technologies and societal challenges, which can inform the identification of **smart specialisation priorities**.

- Both regional foresight and smart specialisation emphasise stakeholder engagement and collaboration. Foresight exercises engage stakeholders from various sectors, fostering collaboration and building shared visions for regional development. This **participatory approach** can be leveraged in smart specialisation to engage stakeholders in the design, implementation and evaluation of S3.

- Regional foresight exercises stimulate knowledge exchange and learning between different regions. **Sharing experiences**, lessons and good practices can enhance the implementation of S3. Regions can learn from each other's foresight outcomes, policy approaches and implementation experiences to improve their own strategies.

- By connecting regional foresight with smart specialisation, regions can leverage insights and knowledge gained from foresight exercises to inform their strategies, foster collaboration and **create dynamic and adaptive R&I ecosystems**.

One of the key benefits of foresight in the context of smart specialisation is its ability to **inform policy making and investment decisions**. Using foresight tools, regions can assess the potential outcomes and risks of different policy options and identify the most effective and sustainable development pathways. This will help to ensure that policies and programmes are better aligned with the needs and priorities of the region, and that public investment occurs where it can have the greatest impact.

Another important aspect of foresight in the context of smart specialisation is its ability to **facilitate collaboration and partnerships between stakeholders**. By involving a wide range of actors in the foresight process, including universities, businesses, public institutions and civil society organisations, regions can develop a shared vision of the future and a common understanding of the opportunities and challenges ahead. This will help overcome fragmented approaches to regional development that have often hindered progress in the past and create a more coherent and inclusive approach to innovation and economic growth moving forward.

By anticipating and responding to potential challenges and opportunities, foresight aims to **create a more adaptable and resilient regional economy**. Regions can develop a more flexible and adaptable approach to economic development, helping them to cope with economic shocks and take advantage of emerging trends, by anticipating and responding to potential challenges and opportunities. This can be particularly important in today's rapidly changing global economy, where disruptive technologies, demographic changes and global events can have a significant impact on regional economies.

The role of foresight in the different phases of the smart specialisation process include the analysis of the regional or national context, creating a shared vision, strategic orientation towards new or refined priorities, the implementation of a particular policy mix, as well as its continuous monitoring and evaluation.

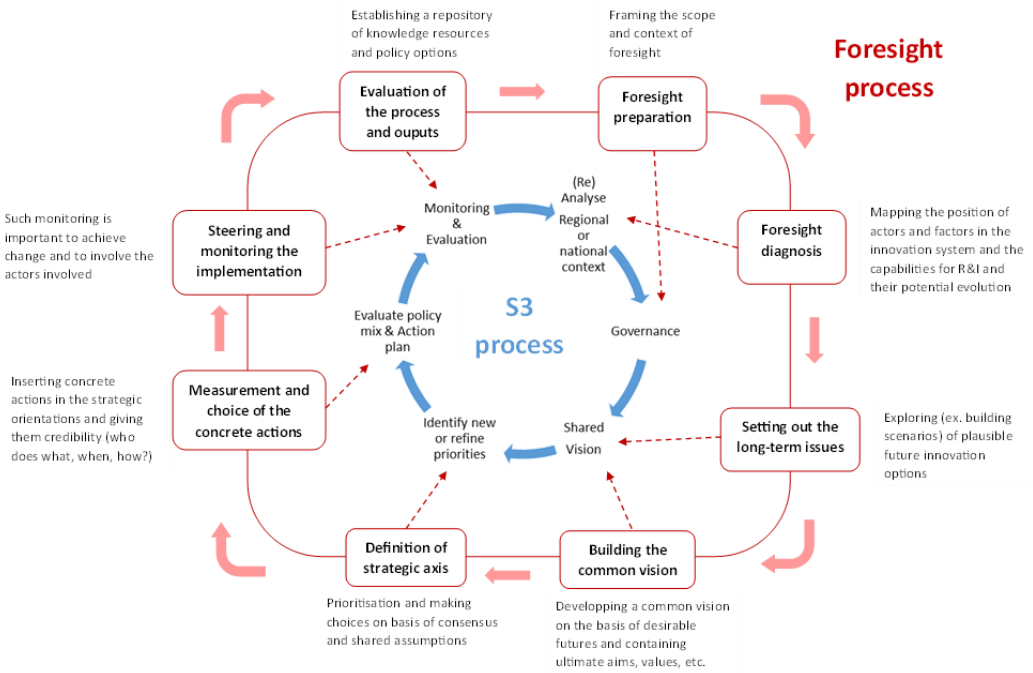

Figure 1: Role of foresight in the different phases of the smart specialisation process.
Source: Own Illustration made by Michal Pazour and Philippe Destatte based on Pace, L. A. & Drago, A. (2020) and Clar, G. & Destatte,P. (2006).

The first phase of the smart specialisation process is the **analysis of regional or national context**. In this stage, stakeholders conduct an analysis of the region's strengths, weaknesses, opportunities and threats (SWOT) to identify the areas where they can achieve a competitive advantage. Foresight can play a critical role in this phase by providing insights into the emerging trends, technologies and markets that may have a significant impact on the region's economic development. Through foresight, stakeholders can identify the gaps in the market, potential areas of growth and the future needs of customers.

The second phase of the smart specialisation process is **creating a shared vision**. In this stage, stakeholders explore the potential industries that can contribute to the region's economic growth. Foresight can play a crucial role in this phase by providing insights into the technological innovations, emerging markets and consumer trends that may impact the viability of these industries. Foresight enables stakeholders to identify the areas of convergence between the region's strengths and the emerging opportunities. During this phase, foresight can also help to explore the system, going beyond the technological and socio-economic issues. It can analyse the possible impact of variables that are not considered necessary by the actors and anticipate the possible emerging issues in these areas.

The third phase of the smart specialisation process is **strategic orientation towards new or refined priorities**. In this stage, stakeholders develop a strategy to prioritise areas that have the highest potential for growth and competitiveness. Foresight can play a critical role in this phase by providing insights on the future needs of society and customers, the market opportunities and the emerging technologies that can enhance competitiveness. Foresight

may also help stakeholders to anticipate the potential challenges and risks that may arise in the implementation phase and develop contingency plans accordingly.

The final phase of the smart specialisation process is the **implementation of a particular policy mix and its continuous monitoring and evaluation**, where stakeholders execute the strategic plans by investing in the prioritised industries, enhancing the region's innovation ecosystem and creating an environment that fosters economic growth. In this phase, foresight can play a significant role in monitoring and continuous evaluation by providing insights into the future trends, technologies and markets that may impact the implementation process. Foresight also helps stakeholders to adapt their strategies in response to changes in the market or any emerging trends.

The basis of S3 is the place-based approach that will facilitate the mobilisation of existing capacities. To be realistic, smart specialisation must be based on the socio-economic, institutional, environmental, as well as cultural specificities shaping a given innovation ecosystem. In this respect, decision-making bodies often miss the medium to long-term perspective on processes of change in society and the environment that is needed to promote smart, sustainable and inclusive growth. Formal evidence is frequently not sufficient and does not give trustworthy clues on what kind of new technologies, new business models, new markets or new societal trends have the potential to trigger structural changes (such as modernisation, diversification, transition or the establishment of a new industry) in pre-determined priority areas. In this context, foresight can support both the decision-making process itself and the system actors implementing experimental transformative activities.

To overcome these deficiencies foresight and specifically **horizon (or environmental) scanning** have considerable potential to inform entrepreneurial dialogue based on evidence related to future trends and weak signals of future developments. Horizon scanning is a process that systematically monitors trends in technology and society and detects signals of potentially significant events and changes. Horizon scanning seeks to better understand development trends and their drivers and thus support the strategic planning process with information about possible future developments. Future trends and weak signal analysis help broaden the horizon of stakeholders' thinking beyond business as usual and identify a greater variety of future opportunities. In addition, outputs of horizon scanning play an important role in structuring entrepreneurial dialogue around different topics by categorizing future trends and weak signals.[4]

Another attribute of the S3 approach is the prioritisation and selectivity of public interventions. The concept of smart specialisation is characterised by the combination of two logics of policy making and implementation, namely, the emphasis on a highly strategic and planning approach and the considerable involvement of different key actors in EDP (Foray, 2019).

In practice, several barriers limit the effectivity of EDP. The most important challenge EDP faces is to engage relevant actors and mobilise all appropriate capacities in innovation ecosystems.[5] This impacts the ability to develop common visions that combine different needs, agendas and expectations of all actors in the innovation ecosystem. Insufficient inclusiveness of EDP can lead to decisions where formulated transformation activities are not defined as a combination of existing capacities and future opportunities foreseen by the innovation ecosystem. Practical experiences with EDP also show that involved actors

[4] The concept of horizon scanning and related approaches and applications in R&I policy are discussed in more detail in the fourth thematic report of the MLE on R&I Foresight (see Carvalho, 2023).

[5] Particularly as the full range of relevant capacities (knowledge) will rarely be in a territorial innovation system - so openness and connections to other systems is critical.

struggle to build a consensus based on a limited set of transformation activities within pre-determined priority areas.

In this respect, foresight aims to facilitate EDP by using different **participatory methods** to mobilise relevant actors, explore possible futures and create shared visions. There are plenty of participatory techniques frequently used in foresight such as Delphi, scenario planning and visioning. Delphi is widely used in qualitative risk analysis, but also in the management of development projects and a variety of other areas where a group of experts is needed to estimate future developments or status. Delphi is used to generate new ideas and build consensus among stakeholders on future developments.

Scenario planning is one of the best known and most used methods of foresight. Scenarios are stories that describe variations of future developments. The aim of scenario development is to enable variant simulation of future developments and to identify long term issues and challenges through a formal process. The scenarios provide a means for strategic decision-making that takes into account possible future discontinuities and uncertainties. Thanks to the openness and inclusiveness of the approach, foresight facilitates the employment of various perspectives on future developments and related opportunities for research, innovation and other relevant transformation activities. In addition, the inclusive spirit of the foresight process creates ground for future collective actions.

EDP is a continuous process consisting of the collection of inputs from different actors in the innovation ecosystem, through their structured discussion, assessment, prioritisation, and the resulting the proposal of concrete steps to integrate these inputs into smart specialisation policy measures and actions. It is the successful implementation of transformation activities that develops the region's innovation ecosystem towards greater competitiveness, sustainability and quality of life. The successful implementation of transformation activities relies on the feasibility of action plans in terms of the involvement of relevant funding bodies, the availability of funding, an appropriate timeframe, as well as the proper consideration of trade-offs between smart, sustainable and inclusive growth. In this respect it is also necessary to foresee a sufficient degree of flexibility and space for experimentation and mutual learning from innovative initiatives.

The **action-oriented nature** of foresight activities can be an aid to development of transformation activities into action plans. So-called roadmapping is a proven method in this respect. Roadmapping is a planning method based on the need to identify, select and develop various alternatives for future development that will enable the desired targets to be achieved. The output is a roadmap that graphically depicts the individual milestones and actions that need to be implemented to meet the defined goals. Roadmapping is a relatively flexible method that can be used to address the strategic needs of companies and public organisations. Roadmapping is an ideal tool for collaborative planning of future technology developments. The roadmaps identify the critical system requirements, performance targets and milestones for meeting those targets. The collective nature of creating roadmaps strengthens their ownership by the stakeholders and increases the potential for resulting collective actions. This approach was used, for example, in the Wallonia (Belgium) S3, where stakeholders developed a roadmap for the five strategic innovation areas, and then the 20 selected strategic innovation initiatives (partnerships) developed their own specific roadmaps showing how they contribute to the overall objectives of the strategic innovation areas.[6]

[6] See https://www.wallonia.be/en/news/wallonia-launching-20-new-strategic-innovation-projects

1.5. Use of foresight in smart specialisation in practice

In the past different approaches to the application of foresight in the smart specialisation process have been observed. In some cases, it has been a systematically planned comprehensive foresight exercise that has led to the identification of specific areas of smart specialisation (e.g., in Romania), while in other cases elements of foresight have been used at different stages of the smart specialisation process (e.g., in Czechia or Portugal). This chapter provides references to selected examples that can provide inspiration for integrating foresight into the smart specialisation process and briefly describes the experiences of using foresight in the three selected countries.

Foresight related exercise	Links
Entrepreneurial discovery as a foresight tool for smart specialisation in Romania	Gheorghiu et al., 2016, Gheorghiu et al., 2017
Foresight for mission-oriented smart specialisation in Czechia	https://www.ris3.cz/en/priorities/missions-and-societal-challenges/general-about-missions-in-ris3
Co-creation and prospective design of S3 in Portugal	https://www.fct.pt/en/sobre/politicas-e-estrategias/estrategia-de-ii-para-uma-especializacao-inteligente/ https://former.fct.pt/esp_inteligente/jornadas
Foresight for identifying smart specialisation priorities in Lithuania	Paliokaitė et al., 2015, Paliokaitė et al., 2016
Strategic Research and Innovation Partnerships (SRIP) in Slovenia	https://s3platform.jrc.ec.europa.eu/en/w/strategic-research-and-innovation-partnership-on-circular-economy
Strategic foresight in the Western Balkans: Recovery on the horizon	https://www.rcc.int/download/docs/KI0121246ENN.pdf/7378fccd1a733ee6531afba3abe1c7fa.pdf
Roadmapping for strategic innovation project in Wallonia	https://www.wallonia.be/en/news/wallonia-launching-20-new-strategic-innovation-projects
R&I foresight for S3 in Flanders	https://www.vlaanderen.be/publicaties/vrwi-toekomstverkenningen-2025

Table 1: Selected country examples of foresight related activities in S3
Source: Own compilation.

1.1.1. Entrepreneurial Discovery as a Foresight for Smart Specialisation in Romania

The process of discovering and selecting S3 priorities in Romania took place between 2013 and early 2014 to develop the National Strategy for Research, Development and Innovation 2014-2020. This example demonstrates how foresight was integrated into the exploratory and priority-setting phases of the EDP (see Gheorghiu et al., 2016, 2017). The purpose of foresight throughout the process was primarily to (1) provide an inclusive evidence base, (2)

allow for an argumentative exploration of prioritisation options and (3) reach consensus on the selection of priorities based on shared assumptions about the R&I system. The resulting process included the following phases, as described below.

1.1.1.1. Evidence base development

Data on Romanian R&I (publicly funded projects, publications, patents, and data on the business environment) were collected and analysed. In a next step the relationships between the different actors were investigated through social network analysis, resulting in so-called "knowledge maps". Finally, horizon scanning was used as a tool to identify weak signals of future significant challenges.

1.1.1.2. Exploring current research interests and strengths in the Romanian R&I environment

The knowledge maps and related analyses served to identify experts and stakeholders for the consultation process and acted as inputs for the development of a long list of candidate areas of smart specialisation in R&I in Romania. The next step was to narrow the list down to a smaller number of smart specialisation priorities. This selection process involved several phases as well as several types of consultation, ranging from panel work to online Delphi. The aim of the online Delphi with experts, business stakeholders and other innovators was to complement the candidate areas with suggestions on specific R&I programmes that were considered promising in the 2014-2020 period. A key element of this round of online consultation was to provide arguments to support the selection of each programme in terms of its economic and/or societal relevance.

1.1.1.3. Consolidation of the online Delphi survey results

The survey generated a significant number of proposals for R&I programmes within the candidate priority areas as well as many accompanying arguments. The subsequent aim was therefore to consolidate all of the information within the expert panels and then narrow it down to six to eight particularly promising sub-areas of R&I for each candidate smart specialisation area. The consolidation involved grouping together similar proposals, assessing the support for each programme from online respondents, as well as some general cleaning up of the qualitative data collected during the exploratory consultation. The main task of each panel was to develop, based on the above materials and in particular the results of the exploratory consultation, six to eight so-called "micro-visions" for the most promising R&I programmes in their candidate area.

1.1.1.4. Selection of RIS3 priorities for the upcoming programming cycle

The final list of R&I programmes for smart specialisation was selected through a very extensive online consultation (more than 4,000 people participated), involving most of the Romanian organisational and individual R&I actors and stakeholders. At this stage, participants were asked to assess as many micro-visions as possible in their main area(s) of activity. During this phase, the emphasis was on building consensus based on arguments about the selection, as opposed to just a broad consensus resulting from the ranking of the proposed R&I programmes in terms of their relevance. To this end, the online consultation was guided by a Dynamic Argumentation Delphi exercise. Given its objectives, the online Delphi was designed to provide both a quantitative assessment of the R&I programmes enabling ranking and prioritisation and a set of arguments for and/or against prioritisation of these programmes. The resulting smart specialisation priorities were selected based on an assessment of 90 R&I programmes against three criteria: (i) the opportunities presented by the sub-area, (ii) the contribution of the sub-area's R&I to addressing the challenges and (iii)

the economic impact. The final list included 30 R&I programmes. These final programmes were grouped according to their inter-relatedness into four broad areas of smart specialisation (bioeconomy, ICT, energy and environment and eco-technology) and three other areas of national interest responding to pressing societal challenges rather than the goal of economic competitiveness (health, space and security and national heritage).

1.1.2. Foresight for mission-oriented smart specialisation in Czechia

The Czech R&I Strategy for Smart Specialisation is an example of an effort to integrate a mission-oriented innovation policy approach into the concept of smart specialisation. The motivation for this integration was the effort to focus S3 on addressing societal challenges, the SDGs and strengthening the resilience of Czech society to future threats. It was an experimental approach and a pioneering effort in the field of R&I policy, where foresight played an important role[7]. The preparation of the national S3 started in 2018 has been carried out in several phases. Although a comprehensive foresight for the S3 has not been implemented, elements of foresight have been applied in the different phases as outlined below.

1.1.2.1. Preparation and formulation of fields of specialisation (2020)

In this phase, comprehensive background analyses were developed for EDP to prepare the framework for the design of the specialisation domains. In addition to the standard indicators and evidence-based analysis of existing strengths, the analyses for each prospective domain highlighted the driving forces influencing the future development of the sector. The analyses of the R&I landscape, together with the results of the horizon scanning aimed at identifying future opportunities, were used as input to the discussions of EDP. As a result, nine themes were proposed, which formed the basic structure for the subsequent elaboration into strategic objectives for R&I.

1.1.2.2. Development of the S3 within the fields of specialisation (2021)

The new S3 was approved by the Czech Government in January 2021, setting the stage for the next phase of EDP, which aimed to advance the specification of the strategic focus areas. This specification involved the national innovation platforms as well as innovation platforms in the 14 Czech regions. The platforms were given identical instructions and templates to ensure compatible results that could be incorporated into documents at the national level. The platforms discussed the strategic direction of the domains based on pre-defined questions about trends and opportunities in different time horizons (5-10-15 years) and ways to support the transformation of selected sectors. For this purpose, the results of the technology scans were used in the area of Key Enabling Technologies (KETs), which are cross-cutting in nature with applications in different sectors of the economy. This facilitated the development of domains of specialisation into specific strategic objectives for R&I. Each domain contains a set of strategic themes selected to support the potential of the domain towards higher added value and sustainability. The discussions also highlighted the role of the social sciences and humanities in strengthening the disciplines' response to societal challenges. As a result, the social and human sciences were given a specific strategic space within the focus of the domains, providing the basis for the further development of S3 towards a mission-oriented innovation policy.

[7] See https://www.ris3.cz/en/priorities/missions-and-societal-challenges/general-about-missions-in-ris3.

1.1.2.3. Development of S3 missions (2022)

Following the approval of the S3 in 2020, it was envisaged to develop S3 missions. The basis for the development of the missions was the foresight project Future-Pro, which aimed to identify the major societal challenges that Czechia should respond to in the future. The project used World Café and Delphi group discussion methods to prioritise megatrends and societal challenges in terms of their relevance to the future developments in the Czech Republic. In addition to standard methods, an experimental forecasting tournament approach was used to involve citizens. In addition to the prioritisation, the project generated a comprehensive set of information on each of the identified challenges used as an input to EDP discussions on how to address the selected challenges under S3. Based on the results of the Future-Pro project and other analyses and policy documents, two pilot areas were identified for the development of S3 missions (i) improving the material, energy and emissions efficiency of the economy and (ii) strengthening society's resilience to security threats.

The missions have the same status as the domains of specialisation. This is a new element in the implementation of the Czech S3, through which it will be possible to respond to societal challenges and thus contribute to the implementation of, among others, the SDGs, to which Czechia has committed at the UN. This approach is further explored in a JRC study (Reid et al., forthcoming) that explicitly addresses mission-oriented approaches to sustainability challenges in S3. These new societal challenges cannot be tackled by isolated measures in the form of interventions in a specific area, but rather through a coordinated approach, with well-designed activities that use synergies and funding from multiple sources to achieve the goal.

1.1.3. Co-creation and the prospective design of S3 in Portugal

Foresight techniques were used in the design of national and regional S3 for the period 2014-2020. The national strategy relied on a detailed SWOT analysis of the R&I system across specialisation areas with research knowledge and patents and a series of organised co-creation events with stakeholders and policymakers. The strategy crossed existing and potential strengths at national, regional and thematic levels, creating a multi-level priority matrix to allow for flexibility. The following is a brief description of the steps taken to develop the national and regional smart specialisation strategies.

1.1.3.1. Workshop with experts, practitioners, national and regional authorities

A workshop with experts, practitioners and national and regional authorities was organised to launch the study and a national conference was held to present it[8]. The report "An Analysis of the Portuguese Research and Innovation System: Challenges, Strengths and Weaknesses towards 2020"[9] served as a solid basis for the identification of the country's priority areas and, in particular, the emerging ones.

1.1.3.2. Structured brainstorming sessions

The pre-selected areas were then explored in a series of structured brainstorming sessions, bringing together topics with common logics or societal challenges, stimulating creative thinking and exploiting new relationships between the topics, allowing for the construction and consolidation of shared visions and scenarios. The sessions involved a structured

[8] All details can be found at https://former.fct.pt/esp_inteligente/diagnostico.phtml.en.
[9] See: https://former.fct.pt/esp_inteligente/docs/SWOT_FCT_2013_En.pdf

sample of stakeholders, combining all four components of the innovation system and taking into account the need to involve both younger and older generations of actors[10].

1.1.3.3. Stakeholders consultations

Following the selection of priorities through the SWOT analysis, prospective scenarios were developed through stakeholder consultation to support the identification of anchor themes for the selection of S3 priorities. The national strategy[11] and the regional strategies[12] have been designed and formally approved and were part of the Portuguese Partnership Agreement for 2014-2020. These were used to develop instruments and calls for proposals by the various funders. The strategy for the 2021-2027 programming period has been revised through 43 workshops organised with focus groups at national and regional level.

2. Future perspectives in Mission oriented innovation policies (MOIP)

2.1. Mission-oriented innovation policy (MOIP)

In recent years, there has been growing interest in the concept of MOIP which represents a departure from traditional innovation policies that focus on promoting general R&I or technologies. Instead, MOIP emphasises the pursuit of specific societal goals or missions through innovation (see for example Weber and Rohracher, 2012 or Schot, Steinmueller, 2016). MOIP is a policy approach that addresses societal challenges through the promotion of innovation. It involves setting specific missions or goals that are deemed important for the public good and using innovation to achieve them. These missions are usually focused on addressing global challenges such as climate change, public health, energy and social inequality. MOIP encourages innovation that is both profitable and serves the public interest.

According to the OECD[13], mission-oriented innovation policy is a:

“co-ordinated package of policy and regulatory measures specifically tailored to mobilise innovation to address well-defined societal objectives in a defined timeframe. These measures can span across different stages of the innovation cycle, from research to demonstration and market deployment, mix supply-push and demand-pull instruments and cut across various policy fields, sectors and disciplines.”

This definition includes three main dimensions of MOIP, namely (see the illustration below):

1. strategic orientation,
2. policy coordination and
3. policy implementation.

[10] The list of events and reports can be found at the following link (in Portuguese only): https://former.fct.pt/esp_inteligente/jornadas.
[11] See: https://www.fct.pt/en/sobre/politicas-e-estrategias/estrategia-de-ii-para-uma-especializacao-inteligente/
[12] At the regional level, some of the regional strategies have developed SWOT analyses and prospective exercises, such as the Lisbon and Tagus Valley region, as mentioned in the report https://lisboa.portugal2020.pt/np4/%7B$clientServletPath%7D/?newsId=19&fileName=EREI_Lisboa_2014_20_vfinal_atualizada_ja.pdf. Similar exercises have been carried out for other regions such as the Algarve https://portugal2020.pt/wp-content/uploads/RIS3-pag-simples.pdf
[13] See: https://oecd-opsi.org/work-areas/mission-oriented-innovation/

MOIP dimension	Main task to be achieved	Definition of the MOIP feature
Strategic orientation	Informing and selecting specific societal challenge(s) and strengthening legitimacy of focused policy intervention towards clear and precise objectives	*Legitimacy* • A consensus is found among a wide group of stakeholder (including citizen) regarding the need and relevance of the mission
		Directionality • The policy is guided by clear and well-informed orientations and strategic guidance formalised in a mission
		Intentionality • Specific and well-articulated need-based goals, with clear timeline and milestones, are derived from the mission
		Flexibility • The targets and means of intervention to meet them can be revised at different stages of the process when needed
Policy co-ordination	Coordinating the strategies and activities of the different institutions involved in the policy	*Horizontality* • The plans and activities of policy bodies covering different policy fields are coordinated to achieve the mission
		Verticality • The plans and activities of policy bodies at different levels of government are coordinated to achieve the mission
		Intensity • The decisions regarding the intervention (objectives, modalities, level of resources) are taken collectively by the involved policy bodies and are binding to them
		Novelty • The plans and activities of different policy bodies and stakeholders are co-ordinated (*e.g.* via a portfolio approach) so as to cover and experiment various alternative solutions to achieve the mission
Policy implementation	Ensuring he consistency and effectiveness of the modes of intervention and resources of the public and private partners mobilised to achieve the policy objectives	*Policy mix* consistency • The policy encompasses a diverse and consistent set of policy interventions (technical, financial, regulatory, etc.) to support different disciplines, sectors, areas and markets, across the innovation cycle, as needed to achieve the mission
		Fundability • Public and private stakeholders involved in the different facets of the initiatives (phases of the innovation process, sectors, markets, etc.) are mobilised to commit resources for the achievement of the mission
		Evaluability • The policy is endowed at the outset with input and output indicators as well as evaluation procedures adapted to its systemic nature, in order to assess its results and learn from its implementation in view of continuous improvement
		Reflexivity • Evaluation and monitoring results are used to inform decision-making and reform the initiative (revision of objectives, adaptation of governance and operating procedures, etc.), as needed to achieve the mission

Figure 2: Three MOIP dimensions and related policy features.
Source: Larrue, 2021, p. 17

MOIP has several basic characteristics that set it apart from traditional innovation policies, including:

- **Focus on societal challenges**. MOIP is focused on addressing specific societal challenges rather than just promoting general innovation. This means that the given policies are driven by the public interest as opposed to purely commercial interests. Most mission-oriented R&I policies are initiated by public organisations and designed in a balance between top-down goal setting and bottom-up implementation.

- **Long-term perspective**. MOIP takes a long-term perspective, with missions typically spanning several years or even decades. This means that the policy is less focused on short-term gains and more on sustainable solutions to societal challenges. Public organisations need to set clear, long-term directions to which they are committed. Importantly, MOIP is not about picking winners but about creating the conditions for bringing together, co-developing and competing for the best solutions to meet priorities and societal goals.

- **Collaboration and co-creation**. MOIP often involves collaboration and co-creation between different actors such as government, industry, academia and civil society. This is because achieving the missions requires the expertise, collective intelligence and resources of different actors. The role of citizens should go beyond the mere buy-in. New forms of governance are needed to ensure the vertical and horizontal coordination of stakeholders and the breaking down of existing departmental silos. MOIP also needs coherent policy actions across several policy areas and levels.

- **Risk-taking and experimentation**. MOIP involves taking risks and experimenting with new approaches to innovation. This is because achieving the missions often requires developing new technologies or business models that may be untested or uncertain. In addition to public funding, novel and flexible ways of financing should be explored. MOIP should be sufficiently reflexive and flexible to be re-evaluated and adapted to new developments and challenges.

MOIP is not an innovation policy concept with clearly defined forms of intervention. Rather, it is a coordinated set of different policy actions characterised by the pursuit and stimulation of innovation to address specific time-bound objectives related to major societal challenges. The different approaches to implementing MOIPs differ in their scope, time horizon, and purpose, among others. As the study by Türk et al., 2018 shows, MOIPs exist to varying degrees on a scale between narrowly defined policies and initiatives aimed at single, well-defined and mostly scientific and/or technological objectives (the so-called accelerators), and, the more broadly defined initiatives addressing complex and often societal problems that require the transformation of systems (the so-called transformer). This typology is based on the proposal by Wittmann et al., 2020, 2021 and builds on the distinction between acceleration missions and transformation missions previously introduced by Polt et al., 2019. According to this concept:

- “Accelerator missions can be understood as missions that seek to find an answer to a challenge with a relatively confined scope (e.g. moonshot, research in one particular field), but do not aim for a comprehensive system change”.

- “Transformer missions aim to achieve a comprehensive change affecting a socio-technical system as a whole and are therefore not limited to scientific progress and regulatory changes”.

In reality, the different mission types and their associated MOIPs are intertwined. As the results of the mapping of study mission-oriented initiatives show (Türk et al., 2018), most (if not all) MOIPs consist of a combination of accelerator and transformer components.

2.2. The role of foresight in MOIP

Foresight as a strategic planning approach is becoming increasingly important in MOIP that seeks to anticipate and prepare for future developments by identifying potential challenges and opportunities, developing a common vision of the future, and allocating resources

effectively. There is a growing discussion about the use of foresight in MOIP. As stated for example by Mazzucato

"Systemic mission-oriented policies must be based on a sound and clear diagnosis and prognosis (foresight). This requires not only the identification of missing links, failures and bottlenecks, the weaknesses or challenges of a national system of innovation, but also recognition of the system's strengths. Foresight is necessary in order to scrutinise future opportunities and identify how strengths may be used to overcome weaknesses. This diagnosis should be used to devise strategies, novel institutions and new linkages in the innovation system" (Mazzucato, 2018a).

The importance of foresight has been emphasised by the European Commission in its mission-oriented policy framework of the Horizon Europe programme. In this context, foresight in support of EU missions has provided advice on trends in the fields concerned, developed scenarios of alternative futures, scanned horizons and raised awareness on weak signals and emerging new knowledge and technologies.[14]

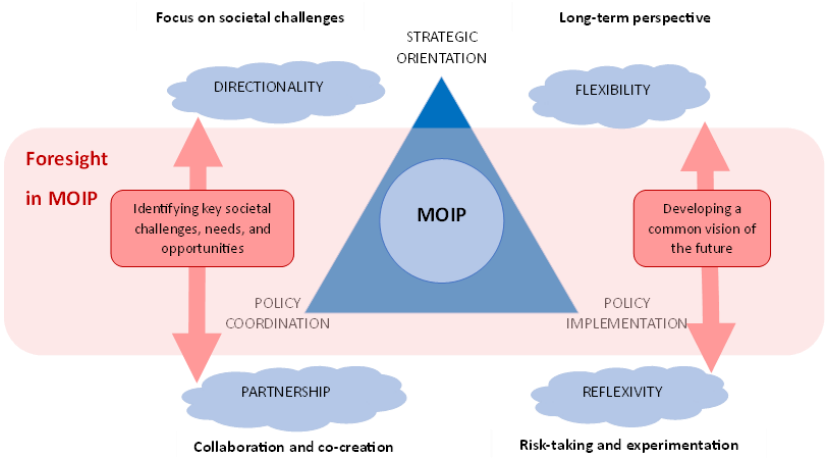

Figure 3: Role of foresight in mission-oriented innovation policy.
Source: own illustration

One of the roles foresight can play in MOIP is to identify key challenges and opportunities. **Horizon scanning, trend analysis or scenario planning** help policymakers to understand the complex and interconnected challenges facing society, and to anticipate how these challenges may evolve in the future. This allows policymakers to develop a better understanding of the context in which they are operating, and to identify the areas where research and innovation are needed most.

Foresight can also help to develop a vision of the future. By using **visioning methods**, policymakers can develop a shared vision of the future that is based on a deep understanding of the challenges and opportunities that lie ahead. This will encourage cooperation and coordination between stakeholders and provide a clear and inspiring goal to work towards.

[14] Foresight reports for Missions in Horizon Europe are available at: https://research-and-innovation.ec.europa.eu/knowledge-publications-tools-and-data/publications/all-publications/foresight-reports-missions-horizon-europe_en

Another appropriate approach is **roadmapping and backcasting**, which are methods for moving from vision to action, identifying key milestones and steps that need to be taken to achieve common goals. This approach involves the use of visual diagrams or maps to provide a clear understanding of the overall strategic plan, including the actions to be taken, the resources required and the expected outcomes.

There are, however, several **challenges associated with the application of foresight in MOIP**. Many societal challenges are complex and multi-dimensional, which can make it challenging to identify the most relevant and impactful trends to focus on. Additionally, the relationships between different trends and their potential impacts can be difficult to understand, making it challenging to develop effective policies and strategies based on foresight.

Foresight activities can be resource-intensive, requiring significant time and expertise to carry out effectively. This can make it challenging for policymakers with limited resources to engage in foresight activities and to use the results of those activities to inform policy development and implementation.

Foresight activities are most effective when they involve a diverse range of stakeholders, including policymakers, industry representatives, academics, and civil society. However, stakeholder engagement can be challenging, particularly if stakeholders have conflicting interests or if there are power imbalances among stakeholders.

Foresight activities are only useful if their results are used to inform policy development and implementation. However, there is a risk that foresight activities can be seen as disconnected from the policymaking process, and their results may not be used effectively. Additionally, there is often a lack of systematic evaluation of foresight activities and their impact on policy development and implementation.

To address these challenges and issues, policymakers may need to invest in capacity building for foresight, engage in more systematic stakeholder engagement, and develop mechanisms for monitoring and evaluating the impact of foresight activities on policy development and implementation. Additionally, policymakers may need to develop more flexible and adaptive policy frameworks that can respond to changing trends and challenges as they emerge.

2.3. Use of foresight in MOIP in practice

Interest in MOIP has experienced a renaissance in recent years. In European and national innovation policy development, there has been an increasing emphasis on addressing important societal needs and on strengthening coordination between innovation policy and other public policies. In a context of increasing complexity and uncertainty, foresight is becoming increasingly important for the design and implementation of these policies. The following overview presents selected examples of foresight used in MOIP. The experiences of Austria and Norway in integrating foresight into MOIP processes are then described in more detail.

Foresight related exercise	Links
Integrating foresight into mission governance in Austria	https://era.gv.at/horizon-europe/missions/missions-in-austria/

Foresight related exercise	Links
Key trends, future scenarios, missions and structural measures to address societal challenges in Norway	https://www.rand.org/pubs/research_reports/RRA966-1.html
Putting Mission-Oriented Innovation Policies to Work: A case study of the German High-Tech Strategy 2025	https://www.isi.fraunhofer.de/content/dam/isi/dokumente/cci/innovation-systems-policy-analysis/2022/discussionpaper_75_2022.pdf
Strategic Foresight for Resilience initiative in Flanders	Strategic Insights & Analyses, Chancellery and Foreign Office
Future perspectives for the National Ocean Strategy and for the National Energy and Climate Plan in Portugal	https://www.dgpm.mm.gov.pt/enm-21-30 https://stip.oecd.org/stip/interactive-dashboards/policy-initiatives/2021%2Fdata%2FpolicyInitiatives%2F99993317 https://stip.oecd.org/stip/interactive-dashboards/policy-initiatives/2021%2Fdata%2FpolicyInitiatives%2F99994362 https://www.dgeg.gov.pt/pt/areas-transversais/investigacao-e-inovacao/modelacao-energetica-prospetiva
Vision and scenario building for 2035 – Fishing and aquaculture in Romania	https://www.prospectiva.ro/vision-and-scenario-building-for-2035-fishing-and-aquaculture-in-romania/
Foresight reports for Missions in Horizon Europe	https://research-and-innovation.ec.europa.eu/knowledge-publications-tools-and-data/publications/all-publications/foresight-reports-missions-horizon-europe_en
Forward-looking R&I agendas to address EU challenges in agriculture, fisheries, food systems, forestry and the wider bio-economy	https://scar-europe.org/foresight/documents

Table 2: Selected country examples of foresight related activities in MOIP
Source: Own compilation

1.1.4. Integrating foresight into mission governance in Austria

Austria has not chosen the route of formulating its own missions for R&I but has set itself the goal of creating the best possible conditions for the implementation of EU missions at national level. All stakeholders are therefore encouraged to contribute to the EU missions and to participate successfully in Horizon Europe. This strategic approach is followed by a funding portfolio that combines interventions from different national funds in a coordinated way. Each

of the five EU missions is thus developed at national level into a specific implementation plan tailored to the needs and capacities of Austrian R&I.[15]

1.1.4.1. Governance structure

Coordinated management of the whole process played an important role in the preparation of the implementation plans. To this end, a working group was set up to coordinate and manage the implementation of the EU measures at national level. The working group was chaired by the Federal Ministry for Education, Science and Research (BMBWF) and the Federal Ministry for Climate, Environment, Energy, Mobility, Innovation and Technology (BMK). For each of the five missions, specialised action groups have been set up with members from R&I and sectoral actors. The mission action groups coordinated action at national level in their respective fields.

Two advisory groups on foresight & citizens and on strategic intelligence have been an important source of information for the work of the action groups. The former focused on (i) foresight activities, trend analysis, scenario development and support for an inclusive approach on communicating with relevant stakeholders, (ii) reflections on the appropriate documentation of outputs stemming from mission activities, (iii) advice on how to build trust and facilitate mutual benefit among diverse mission actors and (iv) suggestions on the involvement of citizens and societal actors in the planning, coordination and implementation of missions, on tailor made interactions, and on expectation management. The strategic intelligence advisory group then focused on the design and establishment of mission implementation processes and the establishment of an evaluation framework to assess missions and provide feedback for effective management.

The results of the work of the action groups were incorporated into the "Implementation framework for the EU missions of Horizon Europe in Austria", which was adopted in March 2023. In addition to the recommendations of the five mission action groups, this implementation framework includes a declaration of intent by the relevant ministries, agencies and other central institutions, which constitutes the first indicative guidance for the specific implementation measures for each EU mission.

1.1.4.2. Governance in the implementation phase

For the implementation phase, the governance structure has been modified to support the effective implementation of the implementation plans in relation to the institutional set-up of Austrian R&I policy. In order to strengthen the management capacity of the mission action groups, a mission management unit (MMU) has been established at the Austrian Research Promotion Agency (FFG), consisting of experts with a high level of management expertise at the interface between research and sectoral issues. An important task of the MMU in close cooperation with the Horizon Europe national contact points is to liaise with relevant research and industry experts.

The mission action groups coordinate the implementation of the individual recommendations of the implementation framework, involve the interested public in further activities and strengthen the cooperation with the local and regional level in Austria.

The advisory groups have been transformed into the "Mission Facility for Policy Learning, Foresight, Monitoring and Evaluation". The central objective of the mission facility is to plan and implement reflection processes on the implementation and future development of the

[15] See https://era.gv.at/horizon-europe/missions/missions-in-austria/

focus of the missions, as well as to create a coherent framework for monitoring and controlling the success of all missions in Austria.

Although little mission-oriented foresight in Austria exists so far, Austria considers the future use of foresight an important element in the cultural shift from top-down policy-making to a more inclusive, forward-looking approach. The EU missions provide an opportunity to mobilise the foresight community around long-term policy initiatives that require constant future scanning and policy learning. In the context of anticipatory governance, Austria would like to strengthen citizen engagement as a policy tool to make political choices more inclusive and democratic. The higher education sector is also starting to promote networking activities that engage experts in thinking about the future of the sector.

1.1.5. Key trends, future scenarios, missions and structural measures to address societal challenges in Norway

In its strategy for 2020-2024, the Research Council of Norway (RCN) identified five strategic areas to promote breakthrough research, radical innovation, sustainable development and the restructuring of the business and public sectors. Specifically, these strategic areas are: (i) oceans; (ii) green transition; (iii) health and well-being; (iv) cohesion and globalisation; and (v) technology and digitalisation. All five areas are based on societal challenges in Norway and aim to focus R&I activities on these areas, which should contribute significantly to increasing the resilience of the Norwegian economy and society.

In an effort to better understand developments in these strategic areas, the RCN commissioned a foresight study from RAND Europe and DAMVAD Analytics in 2022.[16] The specific objectives of the study were to (i) identify a set of potential priority challenges or targeted policies based on challenges within and across (or beyond) the five strategic areas; and (ii) to identify structural measures at a systemic level that would potentially facilitate the development of a resilient R&I environment in Norway.

The foresight study was developed using a combination of analytical and participatory methods, including trend analysis, literature review, stakeholder interviews, focus groups, an online public survey, crowdsourcing of ideas and information from experts, future scenario analysis and workshops.

Each strategic area has been characterised by a set of trends that are shaping developments and driving change in these areas. These trends are based on the analysis of a wide range of evidence and analysis that has enabled the development of a deep understanding of the current state and direction of development in each strategic area. At the same time, the drivers, enablers, barriers and uncertainties that are likely to shape the strategic area over the next decade were identified. The trend analyses also provided a direct basis for indicative priority tasks and structural measures.

The trend analysis was followed by a phase of scenario building describing alternative possible future developments in each strategic area. Within each scenario, the drivers and key factors (according to PESTLE)[17] that will shape the future in each area were identified.

By combining different aspects of the five strategic areas, two sets of scenarios were created: (i) a set of scenarios depicting Norway's future development in a national context, covering domestic agendas such as health, social security, education, work and skills, cohesion and relevant aspects of technology, digitalisation and some aspects related to the green transition

[16] See https://www.rand.org/pubs/research_reports/RRA966-1.html
[17] PESTLE is a tool for analysis of political, economic, social, technological, legal and environmental factors.

and (ii) a set of scenarios depicting Norway's future development in an international or global context, covering issues related to climate, oceans, energy, transport, food, biodiversity, globalisation and international aspects of technology and digitalisation.

The scenarios were then used as a basis for discussion in two foresight workshops with stakeholders. Based on the scenarios, workshop participants explored and validated a set of priority challenges and discussed possible structural measures. This resulted in indicative missions and structural measures, which were further refined and updated based on feedback received through additional document research and interviews.

This effort has resulted in a comprehensive study for each of the strategic areas, helping to inform the strategic direction of the RCN's interventions.

3. Towards the effective integration of foresight into smart specialisation and mission-oriented policies

3.1. Challenges related to the use of foresight in mission-oriented and smart specialisation policies

The use of foresight in the design and implementation of R&I policies as well as smart specialisation and mission-oriented innovation policies poses a number of challenges, including:

- The future is inherently **uncertain and complex**, and it can be difficult to anticipate and prepare for emerging trends and challenges. Foresight helps to mitigate some of this uncertainty, but it is important to recognise that foresight is not a crystal ball and cannot predict the future with certainty.

- Foresight exercises can be **resource intensive**, requiring time, expertise and funding to be carried out effectively. This might be a challenge for policymakers working with limited resources and competing priorities.

- Foresight exercises can identify potential disruptions or changes to existing practices, which can be challenging for stakeholders who may be resistant to change. This can make it difficult to **gain buy-in** for new policies or initiatives based on foresight findings.

- Foresight exercises can generate a wealth of information and insights, but it can be difficult to translate these findings into concrete policy actions that have a real impact. It is important to ensure that foresight exercises are linked to clear policy objectives and that the insights generated are **effectively communicated** to policymakers and other stakeholders.

- Foresight exercises can be vulnerable to **political instability** or changes in government priorities, which can lead to uncertainty and inconsistency in the implementation of R&I policies.

- Foresight exercises rely on data and information to make informed projections about the future, but **data availability** can be a challenge in some areas, particularly in emerging or rapidly evolving fields.

Addressing these challenges requires a concerted effort by policymakers, researchers and other stakeholders. It is important to develop robust and inclusive foresight processes, to build foresight capacity among policymakers and stakeholders, and to ensure that foresight exercises are clearly linked to policy objectives and effectively communicated to relevant stakeholders.

3.2. Connecting top-down and bottom-up approaches

Directionality, as a fundamental feature of MOIP, becomes central in smart specialisation strategies. Directionality here refers to the identification and prioritisation of specific R&I areas or themes that are considered important for achieving broader societal goals, such as economic growth or environmental sustainability. Both top-down and bottom-up approaches are important in shaping an effective directionality.

Combining top-down and bottom-up perspectives creates a more comprehensive and effective foresight exercise for missions and smart specialisation. For example, a foresight exercise could start by identifying key strategic areas or topics (societal challenges) for R&I based on a directional approach. A bottom-up approach could then be used to gather input and insights from stakeholders to refine and prioritise these areas, and to identify emerging issues and opportunities that may not have been considered in a top-down approach. There may also be bottom-up initiatives (pilots, prototypes, etc.) to experiment with different solutions, which then become system demonstrators.

Ultimately, the key to combining top-down and bottom-up approaches is to **ensure that the exercise is inclusive, participatory and responsive to the needs and perspectives of stakeholders at different levels and in different sectors**. This may contribute to making R&I policies more effective in achieving wider societal goals, while reflecting the diversity of stakeholder perspectives and experiences.

3.3. Stakeholders' involvement

Stakeholders provide valuable input into the identification of key R&I challenges, as well as potential solutions and strategies. By involving stakeholders in the foresight process, policymakers can build consensus around policy goals and ensure that the resulting policies are grounded in the needs and priorities of relevant stakeholders. There are some specificities related to stakeholder involvement in foresight exercises for smart specialisation or mission-oriented innovation policies.

S3 typically aim to identify and prioritise areas of R&I that build on regional strengths and assets, with the aim of promoting economic growth and competitiveness. As such, stakeholder involvement in these exercises often focuses on engaging with regional stakeholders such as industry associations, research organisations and local government officials. MOIP, on the other hand, aims to address specific societal challenges, such as climate change or health care, through the promotion of R&I. In these cases, stakeholder involvement often focuses on engaging with a wide range of stakeholders who have an interest in the issue or challenge being addressed, such as patient groups, environmental organisations or social enterprises.

The broadening of the scope of the S3 and MOIP makes it difficult to involve a wide range of stakeholders. **It also blurs the boundaries between foresight for R&I policy and foresight for other public policies**.

To ensure effective stakeholder involvement in foresight exercises for S3 and MOIP, it is important to **engage with a wide range of stakeholders** from industry, research organisations and local governments, as well as stakeholders with an interest in the specific societal challenges being addressed, such as patient groups, environmental organisations or social enterprises.

Foresight has an important role to play in **opening up the debate, mediating between different stakeholders** (especially those who are not easily able to communicate their interests and concerns) **and ensuring a systematic approach**. Foresight provides an element of discovery, and while in theory it is sequential, in practice it encourages non-linear approaches to R&I policy making.

Effective stakeholder involvement requires a **participatory and collaborative approach**, where stakeholders are involved throughout the process and their feedback is incorporated into the resulting strategies. This helps to ensure that the resulting strategies are more effective in achieving their intended goals and reflect the diversity of stakeholder perspectives and experiences.

3.4. Citizen's engagement

Engaging citizens in foresight is of growing significance, as it contributes to R&I policies that align with the needs and priorities of society as a whole.[18] Involving citizens in the foresight process fosters **trust and legitimacy in policy decisions**, while enhancing inclusivity and responsiveness to the needs of diverse groups.

There are many different approaches to involving citizens in foresight exercises, depending on the specific context and objectives of the exercise discussed, as presented in the MLE topic on "Citizen's engagement approaches and methods in R&I foresight" (Destatte, P., 2023). These include citizen panels, bringing together diverse groups of citizens to provide insight into the foresight exercise, online platforms and social media used for gathering more general input on R&I issues, citizen science, involving citizens in scientific research and data collection activities as part of the foresight exercise or co-creation and participatory design of R&I policies.

Whatever approach is used, it is important to ensure that citizen involvement is meaningful and effective. This requires clear communication, effective facilitation, and a **commitment to incorporate citizens' feedback into the policy development process**. The challenge is how to effectively engage citizens in foresight and how to ensure that no major societal group is left out.

3.5. Connecting futures intelligence to R&I policy making

Linking futures intelligence to R&I policymaking poses several challenges. One of the main challenges is the inherent uncertainty of futures intelligence, which makes it difficult for policymakers to make decisions based on a portfolio of ideas about future developments. Another challenge is the influence of politics on policymaking, which can make it difficult for

[18] See also the MLE on Citizen Science Initiatives- Policy and Practice that focuses on identifying the good practices, policies and programmes of the various approaches at local, regional and national level, towards supporting and scaling up citizen science https://ec.europa.eu/research-and-innovation/en/statistics/policy-support-facility/psf-challenge/mutual-learning-exercise-citizen-science-initiatives-policy-and-practice.

policymakers to accept futures intelligence that may be perceived as politically biased or favouring particular policy options.

The implementation of policy changes based on futures intelligence is also challenging, as it can be hampered by resource constraints, bureaucratic obstacles, or stakeholder resistance. In addition, there is a need for transparency and accountability in the process of linking futures intelligence to policymaking, combined with clear communication about the assumptions and limitations of futures intelligence and the decision-making processes used to translate it into policy. To address these challenges, it is important to ensure that foresight results are both based on a rigorous methodology and well communicated in a way that is accessible and understandable to policymakers. This will help with accepting the inherent uncertainty and complexity in the decision-making process and to open it up to new ideas and perspectives.

For foresight to be effective, it is important to **involve policymakers throughout the foresight process** in order to stimulate a process of shared learning. The results and new insights from foresight cannot be expected to be taken up by policymakers unless they are actively involved in generating them.

At the same time, however, foresight can become too close to policymakers and risks to be instrumentalised. There is still a need to **preserve the freedom and openness of foresight** by working with alternative futures and opening perspectives to potential disruptions and challenging assumptions about the future, while building confidence that foresight evidence can provide valuable support for decision making and addressing challenges in policy making in the present.

Therefore, **futures literacy** is an important element in enhancing the role of foresight in guiding smart specialisation and missions to areas of high societal relevance.

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This report has been prepared in the context of the Mutual Learning Exercise (MLE) on research and innovation foresight (R&I foresight), a process led by the European Commission DG RTD. The report aims to identify and discuss good practices in the use of foresight for smart specialisation, missions and European partnerships.

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