

# Assessment of smart specialisation

as a strategic framework for enhancing research and innovation capacities and for driving innovative and smart economic transformation in EU regions

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## ABSTRACT

This study examines the changing function of Smart Specialisation Strategies (S3) as a strategic framework for regional innovation and economic transformation across EU regions. Initially introduced as ex ante conditionality, S3 now functions as enabling conditionality for the 2021–2027 period, with an increased focus on governance quality, monitoring and alignment with EU priorities. Commissioned by DG REGIO, the study examines the effectiveness of S3 in guiding ERDF investments, drawing on an online survey of around 240 S3 authorities and stakeholders across the EU, AI-supported analysis of approximately 340 documents (S3 strategies and ERDF programmes), around 30 interviews and 14 case studies.

The key findings highlight a shift towards more cross-sectoral and transformation-oriented priorities, as well as a greater integration of S3 in ERDF programming that extends beyond the traditional focus on R&I. However, implementation remains uneven across regions, particularly with regard to aligning investments, sustaining stakeholder engagement and operationalising interregional cooperation. While the use of S3 to inform reforms is emerging, it remains limited in terms of depth and strategic clarity. Monitoring and evaluation systems are gradually improving, but stronger links to performance-based management are required.

Overall, the report concludes that the S3 remains the central policy tool for place-based innovation with the potential to play a central role in future EU competitiveness and cohesion strategies. Recommended policy options include reinforcing prioritisation methods, strengthening governance, linking reforms to strategy and advancing performance-oriented monitoring frameworks. The continued evolution of S3 is vital to Europe's long-term resilience and innovation capacity.

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## Glossary

|   |  |
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| <b>Capacity Building</b>                                    | Efforts to enhance the skills, knowledge, and resources of stakeholders—particularly in regions with institutional constraints—to effectively design, implement, and evaluate S3 strategies.   |
| <b>Cohesion Policy</b>                                      | EU policy aimed at reducing regional disparities and promoting economic, social, and territorial cohesion across Member States.  |
| <b>Enabling Condition</b>                                   | A requirement in the 2021-2027 Cohesion Policy period that mandates the presence a smart specialisation strategy to access certain ERDF funds.   |
| <b>Entrepreneurial Discovery Process (EDP)</b>              | A participatory process involving stakeholders from public, private, academic, and civil society sectors to identify and validate regional innovation priorities for S3.   |
| <b>European Regional Development Fund (ERDF)</b>            | One of the primary financial instruments of the EU aiming to strengthen economic and social cohesion by correcting regional imbalances, particularly through support to innovation, SMEs, and sustainable development.   |
| <b>European Social Fund Plus (ESF+)</b>                     | EU fund designed to invest in people and support social inclusion, jobs, and the development of skills across Member States. It combines several previously separate funds and programs, aiming to simplify and coordinate efforts to address social and economic challenges within the EU.                                |
| <b>Ex-Ante Conditionality (ExAC)</b>                        | Requirements set for the 2014-2020 Cohesion Policy period, including the existence of an S3, to ensure effective use of EU funds   |
| <b>Interregional Innovation Investments (I3) Instrument</b> | An EU funding instrument designed to support interregional innovation projects. The I3 Instrument aims to strengthen the innovation ecosystem across various EU regions by promoting collaboration and investment in shared projects that have the potential to enhance regional competitiveness and economic integration. |
| <b>Interreg</b>   | EU program fostering cross-border, transnational, and interregional cooperation, often linked to S3 for innovation collaboration.  |
| <b>Interregional Cooperation</b>                            | Collaboration between Member States or regions to align S3 priorities, share resources, or develop joint innovation projects, often supported by programs like Interreg or I3.   |
| <b>Just Transition Fund (JTF)</b>                           | EU fund supporting regions transitioning to a climate-neutral economy, with alignment to S3 priorities in some Territorial Just Transition Plans (TJTPs).  |
| <b>Milestones and Targets (M&amp;T)</b>                     | Predefined administrative steps (milestones) and quantitative outcomes (targets) used to measure the progress and effectiveness of policy interventions, often linked to funding disbursement.   |
| <b>Monitoring and Evaluation (M&amp;E)</b>                  | Systems to track S3 performance and assess outcomes, critical for evidence-based policy adjustments in the 2021-2027 period.   |
| <b>NACE</b>   | Statistical classification of economic activities in the EU, used to map S3 priorities to specific sectors.  |

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| <b>Nomenclature of Territorial Units for Statistics (NUTS)</b>      | <p>EU hierarchical classification system for dividing the economic territory of its Member States into regions at three different levels of granularity (NUTS 1, 2, 3).</p> <p><b>NUTS 1:</b> Major socio-economic regions within a country.</p> <p><b>NUTS 2:</b> Basic regions for the application of regional policies.</p> <p><b>NUTS 3:</b> Small regions for specific diagnoses.</p>                |
| <b>Quadruple Helix</b>  | <p>A model of stakeholder engagement in S3 involving public authorities, academia, industry, and civil society.</p>   |
| <b>Regional Innovation Strategy for Smart Specialisation (RIS3)</b> | <p>Alternative term for S3.</p>   |
| <b>Regional Innovation Scoreboard (RIS)</b>                         | <p>Analytical tool developed by the European Commission to assess and compare the innovation performance of regions across Europe. The RIS evaluates regions based on various indicators related to innovation, such as research and development activity, public and private sector investment in innovation, and the educational and technological infrastructure supporting innovative activities.</p> |
| <b>Smart Specialisation Strategy (S3)</b>                           | <p>A strategic place-based innovation policy framework to stimulate regional economic growth by identifying strengths within regions. It is mandatory to access ERDF funding in 2021-2027.</p>  |
| <b>S3 Priority</b>  | <p>Specific areas of focus within an S3 strategy, identified through the Entrepreneurial Discovery Process, targeting regional competitive advantages or potential in sectors, technologies, or cross-cutting themes like digital or green transitions.</p>   |
| <b>Strategic Technologies for Europe Platform (STEP)</b>            | <p>EU initiative to support critical technologies, with S3 alignment in areas like digital and green transitions.</p>   |
| <b>Technology Readiness Level (TRL)</b>                             | <p>A scale (1-9) assessing technology maturity, from basic principles (TRL 1) to proven systems in operational environments (TRL 9), used to evaluate S3 technology priorities.</p>   |
| <b>Territorial Just Transition Plan (TJTP)</b>                      | <p>Plans outlining regional strategies for just transition, sometimes aligned with S3 priorities.</p>   |
| <b>Twin Transitions</b>   | <p>The simultaneous pursuit of digital and green transitions.</p>   |

## EXECUTIVE SUMMARY

### Background of the Study and Core Objectives

Smart Specialisation Strategies (S3) were introduced as a **strategic policy concept for enhancing place-based innovation and supporting structural economic transformation at regional level**. Starting in the 2014-2020 programming period, S3 became a requirement (“ex ante conditionality” and the “enabling condition”) for ERDF funding as an ex-ante conditionality under Cohesion Policy. Key features of S3 are that they are developed in close cooperation between public authorities, higher education and research institutions, the private sector, and civil society. S3 are geared towards enhancing local (i.e. national and regional) research and innovation capacities in a targeted way and leveraging them towards smart and sustainable economic transformation.

In 2025, the European Commission, Directorate-General for Regional and Urban Policy (DG REGIO), launched a **study** that would yield an overview of S3 design and implementation in the current funding period. The study draws on a comprehensive methodology which combines stakeholder survey with over 240 responses from S3 authorities and stakeholders from across the EU, a review of over 420 documents, including 171 strategies and 183 European Regional Development Fund (ERDF) programmes using artificial intelligence enabled tools; nearly 30 semi-structured interviews; and 14 case studies.

The analytical framework centred around **six topics**:

1. S3 priority setting and R&I investments;
2. The role of S3 in industrial transformation and regional competitiveness;
3. Governance and stakeholder management;
4. Interregional cooperation in S3 design and implementation;
5. Links between S3 and regulatory/administrative reforms;
6. Monitoring and evaluation systems.

### Key Messages

The study identified a number of key findings across the six analytical dimensions. These findings reflect the diversity of regional contexts, the degree of S3 institutionalisation, and the evolving policy landscape of the 2021–2027 programming period. Together, they provide a nuanced picture of how S3 is being implemented across the EU, where progress has been made, and which challenges remain:

- **S3 is the main R&I policy framework in many EU Member States and regions:** S3 are the primary place-based framework for research and innovation support in the EU. In the comprehensive stakeholder survey, 66% of the 150 respondents said that S3 was the main R&I strategy for their Member State or region. These respondents were from 126 national or regional strategies. They were drawn from the bodies responsible for coordinating the S3, ERDF programming and JTF implementation. Remarkably, the perception of the important role for S3 does not vary much across regions of different levels of economic development and innovation performance, confirming that S3 has become a systemic policy instrument. This finding highlights the extent to which the concept of place-based, evidence-driven priority setting has become embedded in regional development practice since its introduction a decade ago (see Section 3.1).
- **S3 fosters an integrated approach to priority setting:** Across 171 S3, authorities build integrated portfolios that combine vertical strengths with cross-cutting ambitions. A semi-automated review identified 1,064 priorities (six per strategy on

average; range 2-15) across four types: (i) Sector- or technology-specific (e.g. automotive, optics, hydrogen); (ii) Multi-sectoral economic transformations (e.g. Industry 4.0, twin transition); (iii) Multi-sectoral societal challenges (e.g., health, security, inclusive mobility); and (iv) Innovation-ecosystem improvements (e.g., skills, infrastructures, collaboration platforms). Most strategies (88%) combine at least two types; the most common configuration fuses vertical sector/technology strengths with transformational and/or mission-oriented themes, coupling endogenous capabilities with wider goals (see Section 3.1).

- **Smart specialisation aligns regional strengths with EU critical technologies:** S3 priorities emerge from a regional assessment of strengths and opportunities but also demonstrate a strong alignment with EU priorities and an awareness of global trends. A systematic mapping of the 1,064 priorities adopted for the period 2021-2027 reveals that 84% of these priorities align with technology areas of the Strategic Technologies for Europe Platform (STEP), demonstrating a high degree of alignment between national, regional and EU priorities even before STEP became operational (see Section 3.2).
- **S3 fosters an integrated approach to industrial transformation in EU regions.** Many S3 go beyond strengthening innovation systems to provide practical support for firms and digitalisation. Consequently, S3s are emerging as the EU's primary place-based instrument for innovation-driven industrial policy. Text analysis of 183 ERDF programmes revealed 1,607 distinct actions linked to S3s. Almost 60% of these fall under objectives that fund R&I capacity and help SMEs adopt innovation. The remaining 40% are spread across other objectives that explicitly refer to S3, most often those relating to advanced technologies (cited by 65% of programmes), business competitiveness (42%), digitalisation (19%), and green technologies and processes (15%). In short, S3 is widely used across funding priorities, not only for R&I systems, but also for business growth, technology adoption and skills development (see Section 3.2).
- **Strong role of regions in S3 governance in most Member States.** Regions play a strong role in S3 governance in most Member States. Out of the 27 Member States, 17 (63%) implement either a mixed or regional model, thereby incorporating a pronounced regional dimension into their innovation policy. Federal and larger countries, such as Germany or France, are classified within the regional-only group. Consequently, out of the 171 total S3 strategies, 150 or 88% are regional strategies. However, stronger coordination mechanisms are required for more effective S3 governance, particularly in mixed national-regional strategies. While most strategies acknowledged multi-level governance, practical instruments for EU-national and regional-national coordination remain scarce (see Section 3.3).
- **Engagement of public authorities and academic institutions in S3 process strong, less engagement of business and citizens.** Regarding stakeholder engagement, the S3 policy cycle and governance structures are characterised by the pivotal roles played by public authorities and academic institutions. Data from the EU-wide stakeholder survey revealed a consistent hierarchy of engagement that extends throughout the entire S3 policy cycle and across all development categories where government and public-sector bodies are found to be the most involved, followed by academia and research institutions. The middle tier of engagement comprises cluster organisations, industry associations and chambers of commerce. In more developed regions, cluster organisations are visibly more engaged. In contrast, civil society actors occupy a marginal position in all types of regions (see Section 3.3).
- **Interregional collaboration is firmly embedded in S3 and holds untapped potential. Regional innovation maturity shapes interregional collaboration within the S3 framework.** Interregional collaboration is almost universally

acknowledged as vital. It is endorsed by 86% of S3 authorities and 90% of other stakeholders and referenced in every 2021–27 S3 and ERDF programme. Yet only about three-quarters of strategies specify funding sources, and only one-third of respondents report regular, structured cooperation. Limited regional budgets, capacity constraints, and low visibility of opportunities, especially in Less Developed and Transition Regions, mean that ad hoc partnerships prevail and S3 measures are judged to be only moderately effective at stimulating interregional partnerships. Supportive tools, such as the S3 Thematic Platforms, are cited by 68% of authorities as very important to bridge the gaps (see Section 3.4).

- **A majority of S3 in the 2021-27 period include a reform element.** Despite the fact that there is no explicit institutional emphasis on reforms in the S3 context, the majority of national and regional authorities consulted (57%) reported some reference to reforms in their S3. However, reforms are mobilised in different ways. In most cases (29%), the S3 includes 'contextual references to reforms', meaning reforms are mentioned as part of the broader background or framework for the strategy, for the purpose of strategic alignment. In other cases, the quoted reforms are planned at other levels of governance or in other policy domains but are expected to support the S3's objectives. In a minority of cases, the S3s explicitly refer to reforms that are specifically planned within their own framework and are a fully-fledged component of it (see Section 3.5).
- **S3 monitoring & evaluation frameworks remain fragmented, with further capacity building needed.** While 70% of S3 strategies for the period 2021–27 track outputs and 77% track results, only 55% record inputs, 13% follow reforms, and just 38% set targets (14% set milestones). Diagnostic tools also differ widely. At the same time, one quarter plan to publish data on open platforms, with 63% still relying on conventional reports. This suggests that a broader use of real-time portals and clearer performance benchmarks could transform M&E from a fulfilment exercise into a strategic asset for place-based innovation (see Section 3.6).

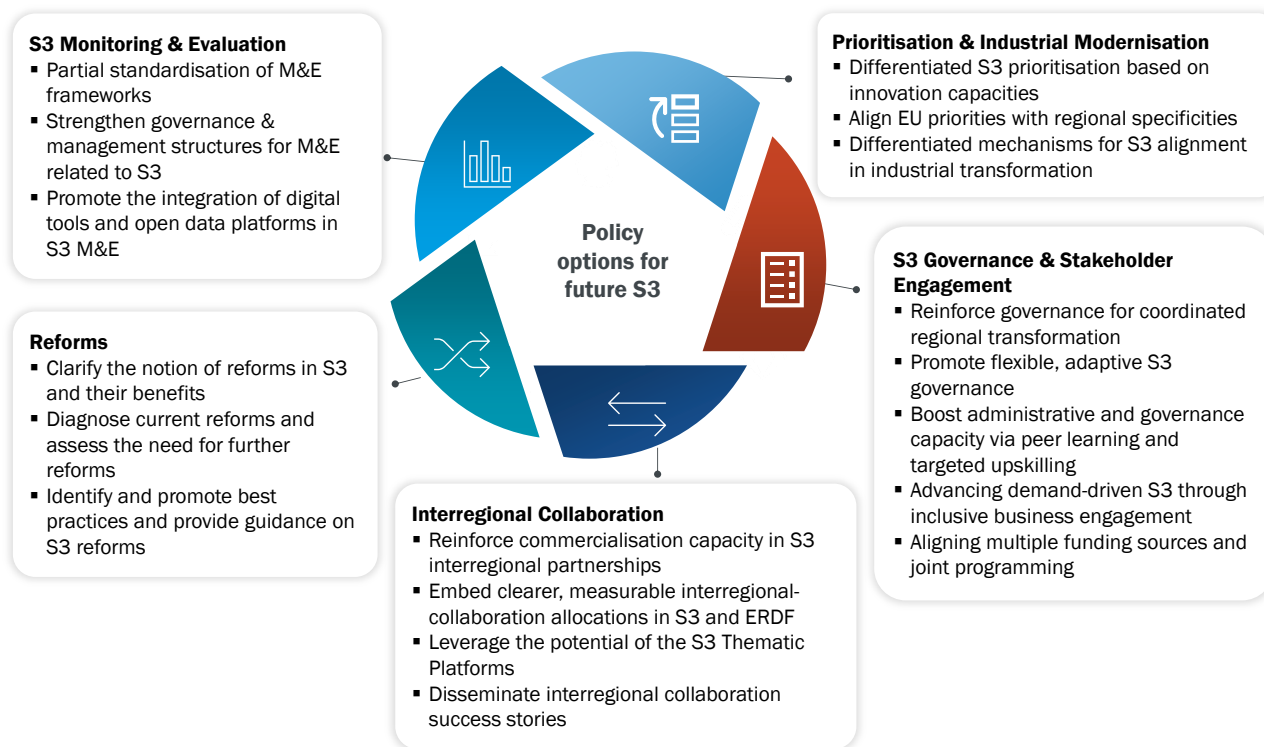
## Conclusions and Policy Options

**The findings from the 2021-27 period of this study emphasise that a balanced combination of vertical depth and horizontal breadth of priorities, underpinned by capable institutions and structured stakeholder engagement, is required for impactful S3.** Interregional initiatives require the presence of orchestrators who are endowed with a certain degree of agency, such as cluster organisations and coherent financing. It is imperative that reforms be context-sensitive and integrated into strategic frameworks. It is essential that M&E evolves into a forward-looking, performance-oriented management tool. The adoption of these principles by Member States and regions will facilitate the further translation of their place-based innovation strategies into resilient, inclusive, green economic transformation. **At the same time, the study demonstrates that the implementation of investments aligned with S3 is impeded by several barriers.** The EU-wide online survey revealed that more than 50% of the participants identified administrative burdens, regulatory constraints, and limited access to funding as the primary impediments to growth. These were followed by low stakeholder capabilities, weak interregional linkages, inefficient governance, and limited entrepreneurial dynamism.

In light of the aforementioned background, **policy options have been formulated according to the key dimensions of the assessment.** While some of these are more strategic in nature, others include operational considerations for both regions and the EU level, including existing EU initiatives such as the S3 Community of Practice. The necessity for capacity building is addressed in a horizontal manner across all policy options, with specific requirements identified in the domains of governance, stakeholder engagement, interregional collaboration, and monitoring and evaluation. These principles are applicable to all types of EU regions, which vary in terms of their specific needs and degrees of

development. This necessitates a demand-driven approach. The overarching objective of this initiative is to enhance the operational excellence of S3 implementation. The following figure provides a **concise overview of the policy options**:

**Figure 1: Overview of Policy Options for future S3**



Source: Prognos AG/CSIL (2025), own elaboration based on the findings and conclusions of the study.

## Outlook

**S3 has evolved into the EU's primary place-based innovation framework, going beyond ERDF investments.** It translates diverse regional assets into competitive strengths that underpin industrial modernisation, the twin green-digital transition, and emerging strategic technologies such as STEP. The 2021–27 cycle demonstrates clearer prioritisation and broader stakeholder involvement, supported by a stronger role for cluster organisations and more structured governance. However, administrative complexity, fragmented funding and uneven human resources continue to hinder implementation. Fully embedding data-driven monitoring, joint planning calendars and dedicated coordination units is essential to achieving operational excellence and converting strategies into tangible regional outcomes.

**Beyond Cohesion Policy, S3 can support the Union's broader competitiveness agenda,** as set out in the *Draghi* and *Letta* reports.<sup>1</sup> These reports advocate the mobilisation of territorial capabilities to scale up deep tech, strengthen value chains, and accelerate the twin transition. Realising this potential will require deeper interregional collaboration through EU-wide platforms that pool talent, pilot lines and demand, coupled with targeted analytical support and finance. Therefore, sustained political commitment, coherent multi-level alignment and adequate resources are indispensable if S3 is to continue driving innovation-led growth, technological sovereignty and an inclusive green economy across all regions.

<sup>1</sup> Draghi, M. (2024). The future of European competitiveness: A competitiveness strategy for Europe (Report prepared for the European Commission). [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_24\\_4932](https://ec.europa.eu/commission/presscorner/detail/en/ip_24_4932)

Letta, E. (2024). Much more than a market: A new approach to the single market (Report prepared for the European Council). <https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>

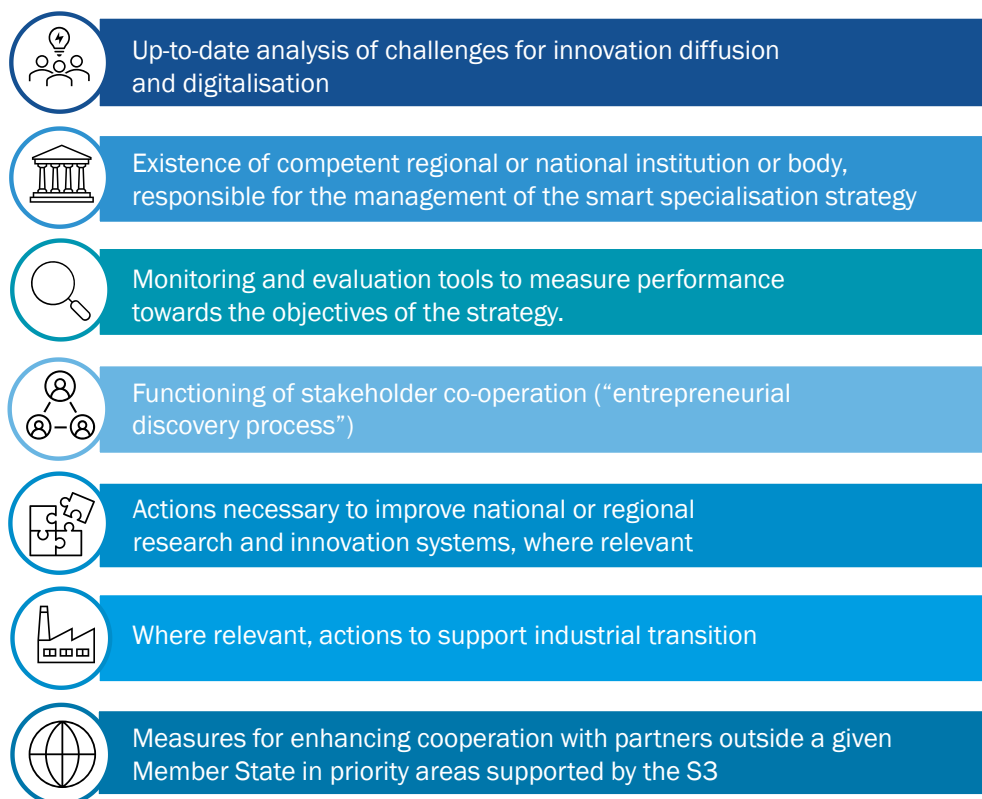
# 1 Introduction

## 1.1 Background

**Smart Specialisation Strategies (S3) in the EU have undergone continuous change and development since their introduction as a condition of Cohesion Policy for the 2014-2020 funding period.** In order to promote a comprehensive innovation policy at both the national and regional levels, the EU established ex-ante conditionality (ExAC) for the 2014-2020 Cohesion Policy period. The existence of a "national or regional research and innovation strategy for smart specialisation" was one such enabling condition (ExAC 1.1) and a prerequisite for the disbursement of funds from the European Regional Development Fund (ERDF) programmes that support investments in enhancing research, technological development, and innovation.

**The ex-ante conditionality that was in place for the 2014-2020 period has been converted into a thematic "enabling condition" related to Smart Specialisation in the 2021-2027 Cohesion Policy period.** This new enabling condition is subject to seven fulfilment criteria (see Figure 2). The 2021-2027 framework emphasises S3 as a continuous process, as well as the need for good governance. This includes the requirement to identify a public authority responsible for S3, as well as the need for enhanced monitoring and evaluation mechanisms. Additionally, the new criteria require addressing aspects such as industrial transition, interregional cooperation, and the diffusion of innovation. These adjustments aim to foster a more dynamic and effective approach to implementing Smart Specialisation Strategies.

**Figure 2: Overview of the enabling condition and the seven fulfilment criteria for Smart Specialisation Strategies in 2021-2027**



Source: Prognos AG/CSIL (2025), own elaboration based on the regulation 2021/1060 of the European Parliament and of the Council of 24 June 2021.

Smart Specialisation was embedded in Cohesion Policy with the aim of increasing the innovation capacity of every EU region and, in turn, strengthening the Union's competitiveness. The policy's fundamental principles – namely, evidence-based priority setting, investment concentration, stakeholder mobilisation through the Entrepreneurial Discovery Process (EDP), and structured interregional collaboration – were conceptualised as interconnected mechanisms to achieve this objective. As the policy has evolved from its initial phase (2014–2020) to the present one (2021–2027), the importance of these levers has increased. The EU now faces intense geoeconomic competition, the urgent need to ensure technological and industrial autonomy, and the simultaneous challenge of promoting a green, productivity-enhancing transition in various territorial contexts.

## 1.2 Objectives and scope of the study

As the Smart Specialisation Strategies for the 2021-2027 period are implemented and discussions on the post-2027 framework are ongoing, it is crucial to assess the current state of S3 implementation across the European Union. Accordingly, the objective of this study is to provide a comprehensive summary of the current status of the aforementioned strategies, with a particular emphasis on the progress achieved in their design, implementation, and governance.

**The overarching question guiding this study, as delineated in the Terms of Reference, was as follows:**

**“Does smart specialisation fulfil its purpose and provide the adequate strategic framework to channel and facilitate ERDF investments in innovation towards the most important areas for regional economic growth and structural transformation?”**

Against this background, the study is tasked to respond to the following **key six questions**:

1. **How are different levels of priorities combined for effectively targeting ERDF investments** for supporting the development of regional innovation and industrial ecosystems?
2. How does smart specialisation and ERDF **support the industrial transformation** of EU regions?
3. **What governance and stakeholder management mechanisms** are deployed in the S3 process? Are there distinct patterns in the adoption of these mechanisms across different regions?
4. How do S3 policy and ERDF programmes design **support interregional cooperation**?
5. What would be the potential of smart specialisation in a **performance-based policy scenario connecting reforms and investments**?
6. How to improve current **S3 monitoring and evaluation mechanisms** towards a performance-based model?

**The research questions also assist in examining the performance of these levers in today's challenging geoeconomic conditions.** The study examines whether multi-level priorities are channelling ERDF funds into dynamic regional ecosystems, how S3 and ERDF together drive industrial transformation, which governance and stakeholder-management models work best, how policy instruments foster interregional value-chain building, how a

performance-based mix of reforms and investments could raise strategic impact, and how monitoring and evaluation systems can evolve toward genuine performance management. In addressing these questions, the study provides the necessary evidence to refine Smart Specialisation, thereby enabling regions to safeguard technological sovereignty, expedite the green transition, and maintain competitiveness in a global economy characterised by intensified global competition.

### Scope of the study

The present study will entail a thorough examination of all Smart Specialisation Strategies from the 2021-2027 funding period. **A total of 171 Smart Specialisation Strategies were adopted for the 2021-2027 period**, including 21 national strategies, 36 regional strategies at NUTS 1 level, 75 at NUTS 2 level, and 39 at NUTS 3 level (in Finland and Sweden). These strategies have been analysed regarding their prioritisation approaches, governance and stakeholder structures, the link between Smart Specialisation Strategies and reforms, S3 and industrial change, interregional cooperation in the context of S3, as well as monitoring and evaluation mechanisms. Furthermore, an investigation has been conducted into the interrelation of S3 and the ERDF programmes. The investigation placed particular emphasis on Specific Objectives 1.1 ("Developing and enhancing research and innovation capacities and the uptake of advanced technologies") and 1.4 ("Developing skills for smart specialisation, industrial transition, and entrepreneurship"). However, the investigation also covered other Specific Objectives of the 2021-2027 period to explore the role of S3 in other policy fields, such as SME support.

## 2 Overall approach and methodology

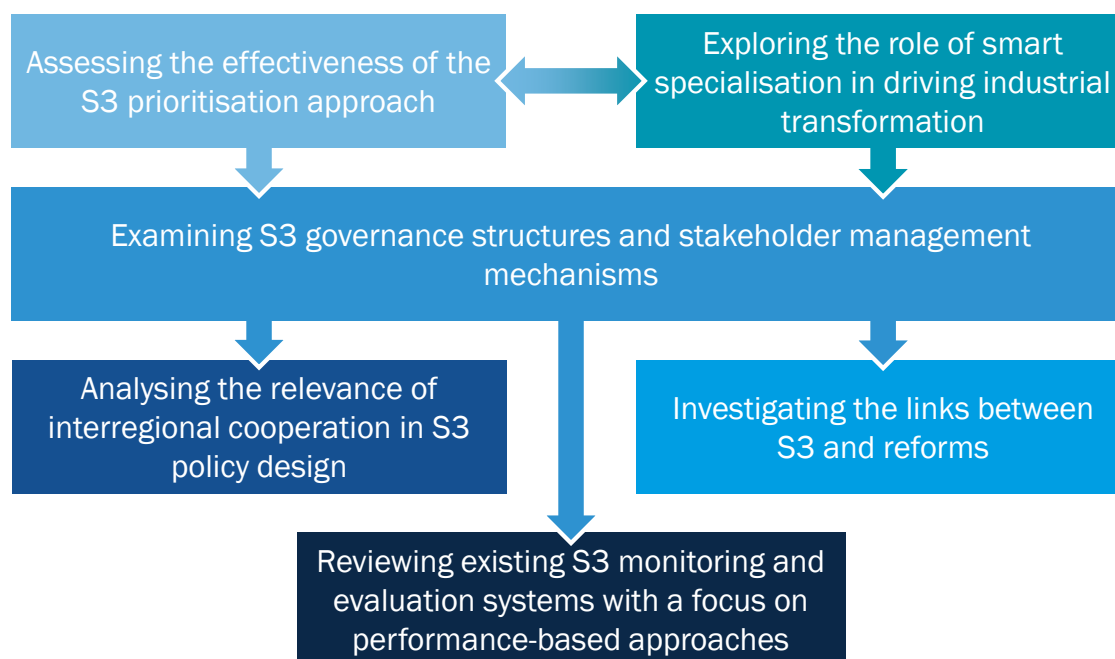
The present study adopted a **comprehensive mixed methods approach**, integrating diverse quantitative and qualitative data collection and analysis methodologies, encompassing numerous AI-enabled techniques. This approach was deemed essential to establish a comprehensive empirical foundation within a constrained timeframe. The investigations were conducted between October 2024 and May 2025. The overarching analytical framework and the underlying methodological toolbox are presented below.

### 2.1 Overarching analytical framework

The following presents the overarching building blocks of the analytical framework, focusing on how the operational tasks relate to each other. The analytical framework for this study is structured around six interrelated dimensions (see Figure below) that reflect the core functions and evolving policy ambitions of S3.

First, it examines the **effectiveness of the prioritisation approach**, assessing how well regions identify and focus on areas with the highest innovation potential. Second, it explores the **contribution of S3 to industrial transformation**, particularly how strategic choices and policy mixes support structural change and regional competitiveness. Third, it analyses the **governance and stakeholder management frameworks**, with a focus on the inclusiveness, continuity, and coordination of the entrepreneurial discovery process. Fourth, the framework considers the role of **interregional cooperation** in S3 design and implementation, as well as the extent to which ERDF and other funding instruments are used to support cross-regional collaboration. Fifth, it investigates the links between **S3 and broader reform agendas**, including regulatory and administrative measures that enable innovation and industrial development. Finally, the framework reviews **current monitoring and evaluation systems**, with particular attention to their capacity to support performance-based learning and strategic steering.

**Figure 3: Overview of the analytical framework**

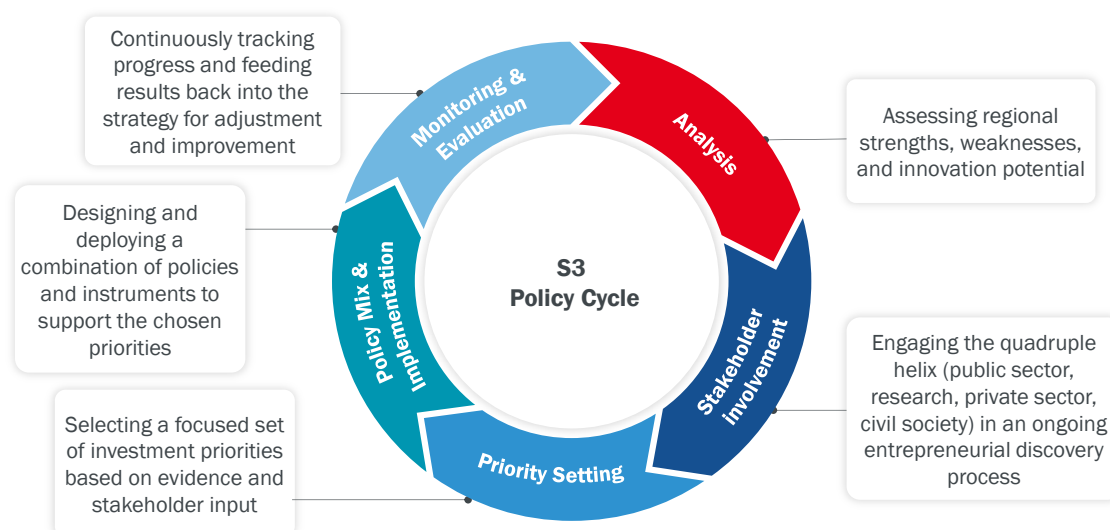


Source: Prognos AG/CSIL (2025), functions and evolving S3 policy ambitions analytical framework.

In addition, the **S3 policy cycle** (see Figure below) had to be considered throughout much of the analysis, as it has fundamental implications for both the practical implementation of S3 and the analytical distinctions needed to fully understand its application. In abstract terms, the S3 policy cycle begins with an **evidence-based analysis of regional assets**, challenges, and innovation potential to inform strategic decision-making. This is followed by the **EDP** involving stakeholders from the public sector, research, business, and civil society to shape and validate strategic priorities.

These participatory processes inform the **selection of investment priorities**, which are expected to be focused, opportunity-driven, and aligned with both regional capabilities and broader EU objectives. An appropriate **policy mix and governance system** is then put in place, combining appropriate instruments, institutional arrangements and sources of funding to operationalise the strategy. The cycle is completed by **monitoring and evaluation**, which provide structured feedback on progress and results, enabling policy learning and strategic adjustment over time. This cyclical approach underpins the analytical framework of the study, linking the assessment of priority setting, governance, cooperation, reforms, and performance to the core functions of the S3 model.

**Figure 4: Core elements of S3 policy cycle**

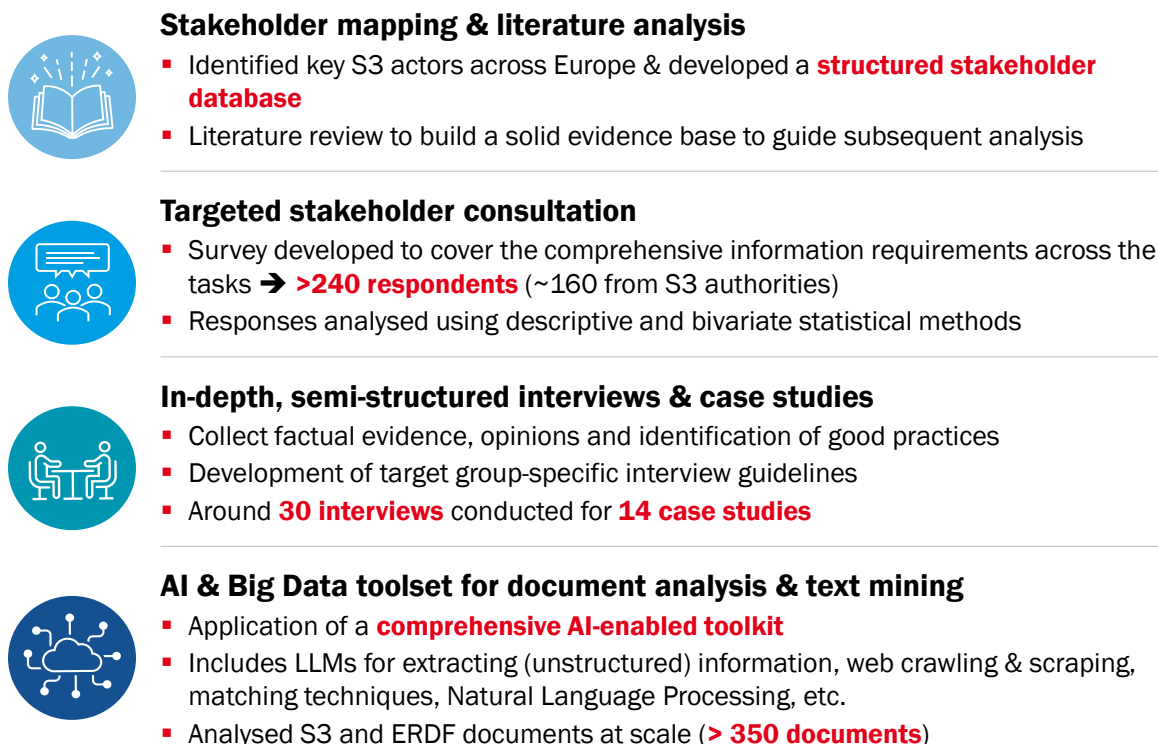


Source: Prognos AG/CSIL (2025).

For analytical purposes, the S3 policy cycle is used in a more consolidated manner throughout the report, differentiating between **priority-setting** (including the analysis of regional strengths and stakeholder involvement), **implementation**, as well as **monitoring and evaluation**.

## 2.2 Methodological toolbox and limitations

As outlined above, this assessment of S3 in the 2021-2027 period required a variety of different tools to address the complex tasks. In the following Figure, we summarise our overarching approach in **four core methods** that have been utilised.

**Figure 5: Key empirical tools and sources used in the study**

Source: Prognos AG/CSIL (2025).

In addition, the study team relied on an **external advisory board**, including recognised academics and practitioners, which was consulted throughout the study. The advisory board included Professor Dominique Foray, Professor Slavo Radosevic, Professor Mari Jose Aranguren, Mateja Dermastia, and Dr Christian Ketels.

### Stakeholder Mapping and Literature Analysis

Stakeholder mapping was carried out to identify key actors involved in the S3 process, classify them by role, and collect contact information. The resulting structured database enabled targeted consultations and the selection of stakeholders for in-depth interviews. The focus of the mapping was on **stakeholders** directly involved in S3 governance and delivery – such as relevant ministry departments in charge of S3, ERDF Managing Authorities, implementing bodies (e.g. Innovation Agencies), coordination structures, and funding entities.

The **private sector**, particularly companies and clusters, was also recognised as a core stakeholder group. These actors were primarily reached through intermediary organisations, including the European Clusters Alliance (ECA), the European Regions Research and Innovation Network (ERRIN), and the European Association of Development Agencies (EURADA). DG REGIO provided an initial contact list of S3 authorities across Member States and regions. The consortium enhanced the reach significantly by activating its networks – over 70% of authorities were covered through direct or representative contacts.

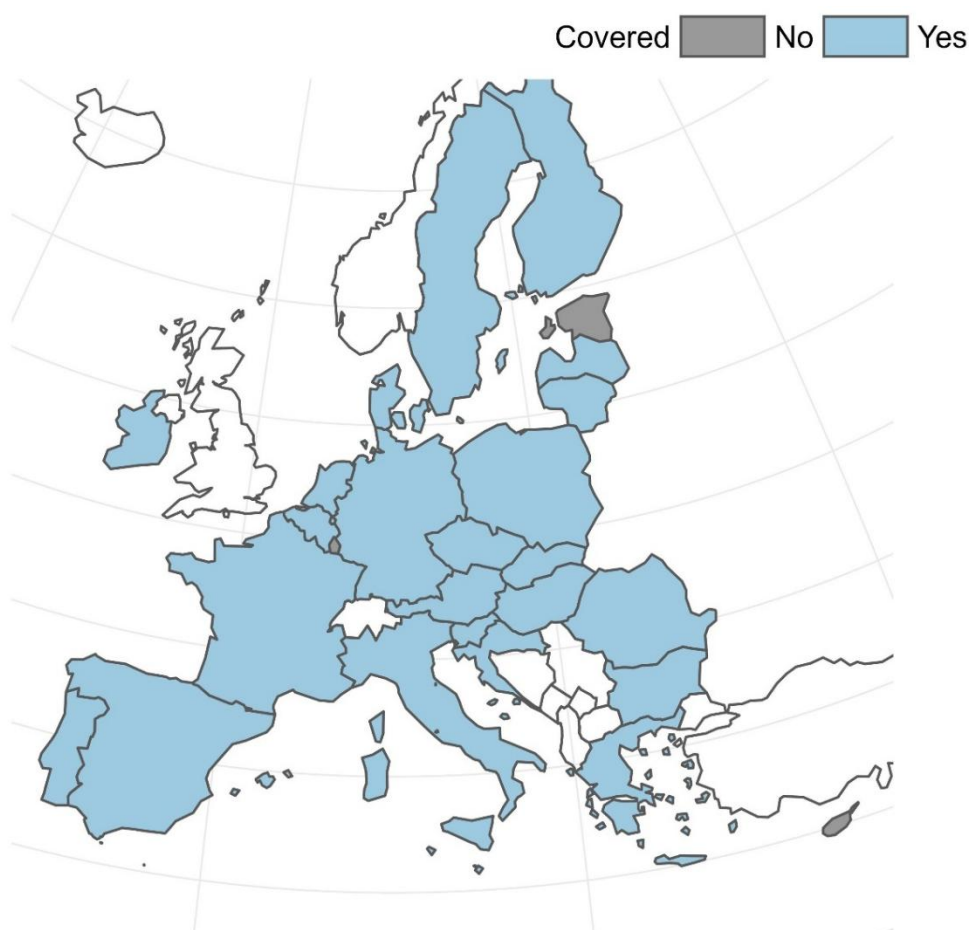
The **literature review** aimed at building solid evidence and a conceptual framework to guide subsequent analysis. It provided a critical overview of current knowledge, informing the design and application of other analytical tools – namely, automated document analysis, an EU-wide stakeholder survey, and selected case studies.

### Targeted Stakeholder Consultation via an online survey

The targeted stakeholder consultation was a key empirical source for various tasks of this project. The purpose of the stakeholder consultation was to gather specific input on the aspects needed for the different tasks directly from the stakeholders. The survey was **shared in two ways**: First, it was directly shared with around 300 national and regional authorities responsible for smart specialisation. Second, it was widely distributed through multipliers such as associations and networks (see above), as well as their newsletters and social media.

The survey was open for five weeks – from end of January to end of February 2025. During this time, it received **a total of 242 responses**, of which 159 belong to the core group of authorities responsible for S3 in their region or country and 83 from other stakeholders. Participation covers 24 out of 27 EU Member States, with only Cyprus, Estonia and Luxembourg missing from the final sample (see map below). Around 42% of respondents are from Less Developed Regions, 23% from Transition Regions, and 34% from More Developed Regions. The targeted stakeholder consultation was conducted via the EU Survey tool.<sup>2</sup> In Annex 2, we provide the survey questionnaire that was used for the Stakeholder Consultation.

**Figure 6: S3 Survey Coverage by Member State**



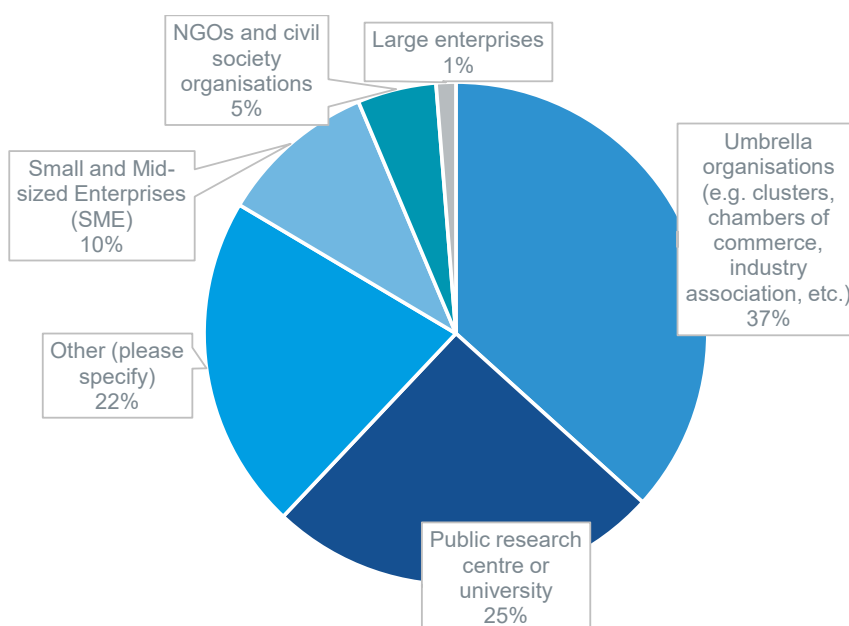
© EuroGeographics for the administrative boundaries

Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders (n = 242).

<sup>2</sup> See [EUSurvey - Welcome](#).

Taking a closer look at the **subgroup of stakeholders**, the figure below shows which types of stakeholders the participants represent. Umbrella organisations make up the largest share of 37%. Notably, over half of them are cluster organisations, complemented by industry associations, chambers of commerce, and other actors like innovation platforms. A quarter of stakeholder participation comes from the public research sector, while 22% represent other types of organisations. These are mostly regional development agencies, innovation or technology transfer agencies, consultancies as well as private and not-for-profit research centres. Direct participation from companies accounts for 10% by SMEs and 1% by larger enterprises. Finally, 5% of stakeholder respondents are NGOs and civil society organisations that work on innovation and development issues.

**Figure 7: Breakdown of stakeholders participating in the online survey, by type of stakeholder**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders (n = 83).

The data generated through the targeted stakeholder consultation was analysed using descriptive and bivariate **statistical methods**. The results are presented in clear, informative tables and charts.

### In-depth, Semi-Structured Interviews and Case Studies

**Semi-structured interviews** were used to explore stakeholder experiences in greater depth, capturing insights not fully accessible through the survey. Interviewees were selected from the S3 stakeholder pool. This was based on the stakeholder mapping and survey, using transparent criteria to ensure balanced representation and avoid bias toward “usual suspects”. Interview guidelines were developed in close consultation with the client before fieldwork began. The interviews formed an integral part of the case studies, with two to three conducted per case. In addition, the targeted stakeholder consultation helped identify actors available for validation interviews to clarify open questions or gather supplementary information. In total, **29<sup>3</sup> in-depth interviews** were conducted.

<sup>3</sup> Including four additional scoping interviews that were carried out beforehand and two in written form.

**Case studies** served to uncover key factors shaping various dimensions of the S3 processes. Their primary objective was to deliver **in-depth analysis of specific aspects** that could not be explored comprehensively across all regions. The studies provided illustrative examples of diverse practices, offering reference points for other regions. In addition, they were used to test the scenarios developed under Task 3. Beyond capturing current practices, the case studies also enabled reflection on how these processes might evolve under alternative governance architectures.

Case studies were selected based on defined criteria ensuring a balance between large and small MS, regional spread of selected MS/regions, balance between different Cohesion Regions, performance of the MS/region on the Regional Competitiveness Index (RCI)<sup>4</sup> and Regional Innovation Scoreboard (RIS)<sup>5</sup>, institutional quality (European Quality of Governance Index)<sup>6</sup>, and insights from the analysis and survey. Each case study was informed by evidence from stakeholder interviews and supporting documentation. To minimise respondent burden, interview planning ensured each stakeholder was interviewed only once, across a total of **14 case studies** conducted.

**Table 1: Case study topics and Member States/Regions per topic**

| Topics  | Member States/Regions per topic                                |
|---|--|
| Priority focused on ecosystem needs   | Austria and Czechia  |
| Balancing EU and regional objectives  | Lombardy, Austria, and Lower Silesia                           |
| S3 as a framework to support investments for SME support, digitisation, and STEP                | Lombardy, Portugal (including Norte), and Campania             |
| Links between S3 and TJTPs  | Lower Silesia and Wallonia                                     |
| S3 linked to transition pathways  | Campania   |
| S3 multi-level governance   | Austria (including Upper Austria) and Greece (including Crete) |
| Coordination of multiple funding sources  | Baden Württemberg  |
| Capacity building measures  | Basque Country, Portugal (including Norte), and Catalonia      |
| Use of national/regional ERDF funding to support interregional innovation investments (advanced | Innovation Express Scheme and Brandenburg                      |
| S3 fostering interregional investments  | Joint Investment Plan 2021-2027 Galicia-Norte                  |
| S3 covering reforms (e.g., regulatory, administrative...) in national context                   | Croatia and Slovakia   |
| S3 covering reforms (e.g., regulatory, administrative...) in regional context                   | Wallonia and Emilia-Romagna                                    |
| S3 M&E with Open Platforms  | Emilia-Romagna, Extremadura, and Northern Netherlands          |
| S3 M&E models that monitor/evaluate the progress/achievement of measurable & agreed T&M         | Croatia, Hungary, and Slovakia                                 |

Source: Prognos AG/CSIL (2025), own elaboration based on the selected case studies, set by topic and correspondent region.

<sup>4</sup> See [Inforegio - EU Regional Competitiveness Index 2.0 - 2022 edition](#).

<sup>5</sup> See [Regional innovation scoreboard - European Commission](#).

<sup>6</sup> See [European Quality of Government Index | University of Gothenburg](#).

## AI and Big Data Toolset for Document Analysis and Text Mining

The consortium has extensive experience developing and applying **advanced big data and AI tools**. In this study, in addition to the classical Natural Language Processing (NLP), various LLM-powered text mining techniques were used, including information extraction, topic detection, as well as semantic mapping.

**Information extraction and topic detection** with large language models (LLMs) enable the identification of structured elements – such as key themes – from unstructured text (mainly ERDF programmes and S3 documents). LLMs can be prompted to extract specific attributes or detect latent topics by leveraging their contextual understanding. This ability was utilised under various tasks in the study, namely for the extraction of the S3 priorities, identification of governance mechanisms, extraction of interregional collaboration measures as well as locating, monitoring, and evaluation of the S3 strategies.

**Semantic mapping** uses text embeddings<sup>7</sup> to represent the meaning of words or phrases as numerical vectors. This makes it possible to compare and group similar categories based on their semantic similarity, which enabled the mapping of S3 priorities to NACE, Fields of Research (FOR) and Technology Fields categories. A more classical **keyword-based classification** was further used to categorise S3 priorities into innovation-ecosystems, multi-sectoral transformations, and multi-sectoral societal categories (see Annex III for more details).

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<sup>7</sup> See [Introducing text and code embeddings | OpenAI](#) for a visual explanation.

## 3 Smart specialisation as a strategic framework in the 2021-2027 period

**Chapter 3 presents the study's findings in response to six closely related fields of investigation.** Firstly, an examination is conducted of the prevailing configuration of S3 priorities, the underlying rationales for prioritisation methodologies, and the mechanisms by which the alignment of investments is guaranteed. In the subsequent section, an examination is conducted of the joint contribution of S3 and the ERDF to industrial transformation, including STEP. The third section of this text identifies the governance and stakeholder engagement arrangements that are central to the successful implementation of S3. In the ensuing discourse, the subject under discussion is the policy instruments that serve to translate S3 objectives into cross-regional value-chain collaboration. This is followed by an assessment of the potential for linking structural reforms and investments within a performance-oriented framework. Finally, the chapter reviews existing monitoring and evaluation arrangements to determine how far they move beyond compliance reporting towards genuine performance management.

### 3.1 S3 prioritisation approaches across EU regions in the 2021-2027 period

#### KEY FINDINGS ON PRIORITISATION APPROACHES

- **More than 65% of survey respondents view the S3 as the primary strategic framework for R&I policy, rather than merely an ERDF tool.** This view is held by the majority in all types of Regions – Less Developed, Transition, and More Developed, as well as more and less innovative ones. (see Section 3.1.4)
- **The 171 S3 strategies adopted for the 2021–27 period identify a total of 1,064 priority areas.** The number of priorities per S3 strategy varies significantly, with an average of six priorities per strategy, ranging from two to a maximum of 15. Some national S3 strategies (Ireland, Greece, Croatia, Czechia, and Austria) are also complemented by regional plans that include an additional set of regional priorities (see Section 3.1.1).
- **Different types of priorities coexist within the S3 for the period 2021–2027.** Priority setting reflects a variety of approaches rather than a uniform model. National and regional authorities interpret and combine priorities relating to ecosystem improvements, industrial transformation, societal challenges and sector-specific value chains in various ways. This highlights the flexible and context-driven nature of prioritisation (see Section 3.1.1):
  - **Sectoral/technological priorities:** Almost half (45%) of the S3 priorities identified in 74% of the S3 focus on specific sectors or technologies. This fosters specialisation and targeted value chain development within defined industries or technological domains. The most widely adopted sectoral priorities relate to the agri-food sector, tourism, the creative industries, energy technologies, materials, chemicals, electronics, mechanical engineering and ICT (see Section 3.1.1).

- **Societal challenge priorities:** Approximately 26% of the priorities identified in 79% of the S3 address broad societal challenges by integrating multiple sectors to address issues such as health, inclusive societies, mobility and sustainability. These topics reflect the main themes of the European research framework programme (see Section 3.1.1).
  - **Multi-sectoral transformation priorities:** A further 26% of priorities, found in 81% of S3s, target cross-industry transformations such as greening, digitalisation and Industry 4.0. These have horizontal impacts across entire regional economies and could affect all sectors (see Section 3.1.1).
  - **Innovation ecosystem priorities:** A smaller proportion of priorities (4%), found in 8% of S3s, emphasise the strengthening of innovation ecosystems, particularly through improvements in education, skills, infrastructure and collaboration, with the aim of creating a supportive environment for innovation across sectors (see Section 3.1.1).
- **Hybrid prioritisation approaches dominate the landscape:** Only 12% of strategies rely on a single predominant type of priority; the remaining 88% combine two or more approaches. The most common pattern (42% of strategies) is to combine transformational and societal-challenge themes with sectoral niches. This flexibility allows regions to address location-specific opportunities while contributing to shared European missions (see Section 3.1.2).
  - **Regional differences in S3 prioritisation approaches are shaped by structural characteristics such as economic diversification and development status** (see Section 3.1.3). Statistical analysis revealed that more diversified regions are more likely to adopt cross-sectoral priorities (e.g. transformational or societal challenge-oriented), whereas less diversified regions tend to select sector-specific or technological priorities. Transition Regions demonstrate a stronger propensity for adopting transformational priorities, whereas ecosystem-oriented priorities, albeit limited in number, are present across all types of regions and governance levels.
  - **Effective translation of broad S3 strategies into concrete R&I investments requires flexible planning tools and targeted alignment mechanisms:** Based on several cases identified through interviews, biennial or triennial action plans and work programmes are considered a good practice for this purpose. These tools allow for continuous improvement based on stakeholder input and evolving regional requirements. Moreover, a range of mechanisms are applied to ensure that ERDF-funded projects align with S3 priorities. The most widely used of these, as mentioned by 88% of survey respondents from 44 Member States/regions, are preferential selection criteria. Respondents from the remaining 10–21 Member States/regions also mentioned dedicated calls for proposals and mandatory eligibility criteria (see Section 3.1.4).
  - **Implementing investments aligned with S3 faces several barriers:** Over half of survey respondents cited administrative burdens, regulatory constraints and limited access to funding as the main obstacles, followed by low stakeholder capabilities, weak interregional links, inefficient governance and limited entrepreneurial dynamism. This highlights the ongoing need for targeted capacity-building and support measures. Our analysis of 2021–2027

ERDF budgets reveals that the proportion of funding allocated to activities that build skills and capacity aligned with S3 priorities varies significantly between regions and does not consistently reflect their level of innovation or development. This suggests that decisions on ERDF allocations for such measures are shaped by a range of strategic and institutional considerations, including complementarities with national or ESF programmes (see Section 3.1.4).

**Smart specialisation has encouraged regions to identify and develop their unique strengths by prioritising innovation investments that align with local capacities and potential.** The concept of smart specialisation was developed in the context of the increasing attention dedicated to place-based approaches that complement centralised top-down approaches to industrial and innovation policy.<sup>8</sup> This approach advocates for concentrating resources in carefully defined priority areas that both leverage a region's existing assets and exploit current and emerging innovation opportunities. While defining and selecting these priority areas is essential, there remains no precise standard for how priorities should be defined.

**Previous literature has explored how regions define priority areas within S3, highlighting a range of approaches.** Regions may set priorities based on economic sectors, scientific domains, or technological fields that align with their unique environment, knowledge assets, and innovation potential.<sup>9</sup> A study by Prognos and CSIL (2021)<sup>10</sup> found that S3 prioritisation in the 2014-2020 period was often linked to economic sectors (64%) and scientific domains (60%), with a somewhat lower focus on specific technology fields (48%).<sup>11</sup> Furthermore, regions commonly adopted a combined approach: 64% of S3 strategies included a mix of economic, scientific, and technological criteria to create a more comprehensive alignment with local capacities.

**When identifying their regional and national priorities, Managing Authorities must recognise the overarching priorities of the EU.** Today, frameworks such as the EU Industrial Strategy, the Strategic Technologies for Europe Platform (STEP) and the Territorial Just Transition Plans (TJTP) emphasise collective objectives such as the green and digital transitions, economic resilience and strategic autonomy. These initiatives encourage regions to focus not only on their existing sectoral strengths, but also on integrating broader EU objectives that address competitiveness, industrial decarbonisation, sustainability and transformational challenges.

**This section presents an analysis of the prioritisation approaches adopted in S3 for the 2021-2027 period.** First, it examines the different prioritisation approaches employed (Section 3.1.1) and the underlying rationales (Section 3.1.2). It then highlights the territorial patterns observed in the types of priorities adopted across various regions (Section 3.1.3). Finally, it discusses how S3 priorities translate into actionable R&I investments and the

<sup>8</sup> Foray D. (2015). *Smart Specialisation: Opportunities and Challenges for Regional Innovation Policy*. Routledge Taylor & Francis Group. London.; Foray D. (2019). In Response to 'Six Critical Questions about Smart Specialisation' European Planning Studies, 27(10), 2066–78; Foray D., David P. A., Hall B. (2009). *Smart Specialization – The Concept*, Knowledge Economists Policy Brief, 9, June 2009.

<sup>9</sup> Balland, P.A., Boschma, R., Crespo, J., Rigby, D. L. (2019). *Smart Specialisation Policy in the European Union: Relatedness, Knowledge Complexity and Regional Diversification*. *Regional Studies* 53 (9): 1252–68; McCann, P., and Ortega-Argilés, R. (2021). *The problem of regional policy design: Policy diversity and economic geography*. *Regional Studies*, 55(9), 1535–1545;

<sup>10</sup> Prognos and CSIL, (2021). *Study on prioritisation in smart specialisation strategies in the EU – Final report*, Publications Office, 2021, <https://data.europa.eu/doi/10.2776/60867>. Directorate-General for Regional and Urban Policy

<sup>11</sup> Defined according to the NACE (economic sectors), FOR (scientific fields) or WIPO technology classes (technology fields)

mechanisms that national and regional authorities have put in place or are planning to implement to this end (Section 3.1.4).

### 3.1.1 Classification of S3 prioritisation approaches

#### Types of S3 priorities

**A semi-automated documentary analysis was conducted on the 171 S3 strategies adopted for the 2021-2027 period, identifying a total of 1,064 priority areas** (for details on the methodology used to identify S3 priority areas, see Annex 3: Methodology to identify and classify S3 priority areas). The number of priorities per S3 strategy varies significantly, ranging from as few as two (i.e., the Orebro region in Sweden) to a maximum of 15 (i.e., the Italian region of Emilia Romagna). The average number of priorities per strategy is 6.2, a slight increase compared to the 2014-2020 with an average of 5.5.

**The definition of S3 priorities has been interpreted in different ways across Member States and regions, reflecting diverse approaches to prioritisation.** The analysis of all S3 strategies revealed four main approaches to prioritisation. A keyword-based classification methodology was used to automatically and consistently attribute each priority to one of these approaches, complemented by manual validation to ensure accuracy and capture nuances in how priorities were formulated in the S3 documents (see methodology in Annex 3: Methodology to identify and classify S3 priority areas).

The **four main types of priorities** are:

- **Sectoral / technological specific priorities:** they focus on specific economic sectors (such as automotive, agrifood, and textile industries) or technological fields (such as optics, robotics, and hydrogen technologies). They are considered “vertical” because they target particular industries or technologies, fostering specialisation and value chain development and transformation within a defined domain. The analysis revealed that the distinction between economic sectors and technological domains is often blurred, as seen in cases where technologies are deeply embedded within sectoral value chains.<sup>12</sup> **We found that 45% of the individual S3 priorities align with this prioritisation approach, and that 74% of the S3 include at least one priority of this kind.**
- **Priorities related to societal challenges:** these priorities span not just specific sectors, but a broader set of sectors, or “systems of activities”, as suggested by Foray et al. (2020).<sup>13</sup> Typically, these priorities are formulated in a way that directly targets broader societal challenges, which closely align with the societal challenges expressed in the European framework programmes, including Horizon 2020 and Horizon Europe. In particular, we found that priorities in this category refer to five broader themes: Health, demographic change and wellbeing; Inclusive and reflective societies; Secure societies, Smart, green and integrated mobility; Food security, sustainable use of natural resources, bioeconomy. A challenge-based approach brings together resources and knowledge across different fields, technologies and disciplines<sup>14</sup>. For example, the priority “City of people” includes

<sup>12</sup> Examples include priorities like “energy,” which may encompass economic activities such as renewable energy production, energy distribution, and energy efficiency, while also being linked to the development of specific technologies, such as hydrogen technologies or smart grids.

<sup>13</sup> Foray D., Eichler M., and Keller M. (2020). Smart Specialization Strategies - Insights Gained from a Unique European Policy Experiment on Innovation and Industrial Policy Design, Review of Evolutionary Political Economy (2021) 2:83–103, <https://doi.org/10.1007/s43253-020-00026-z>.

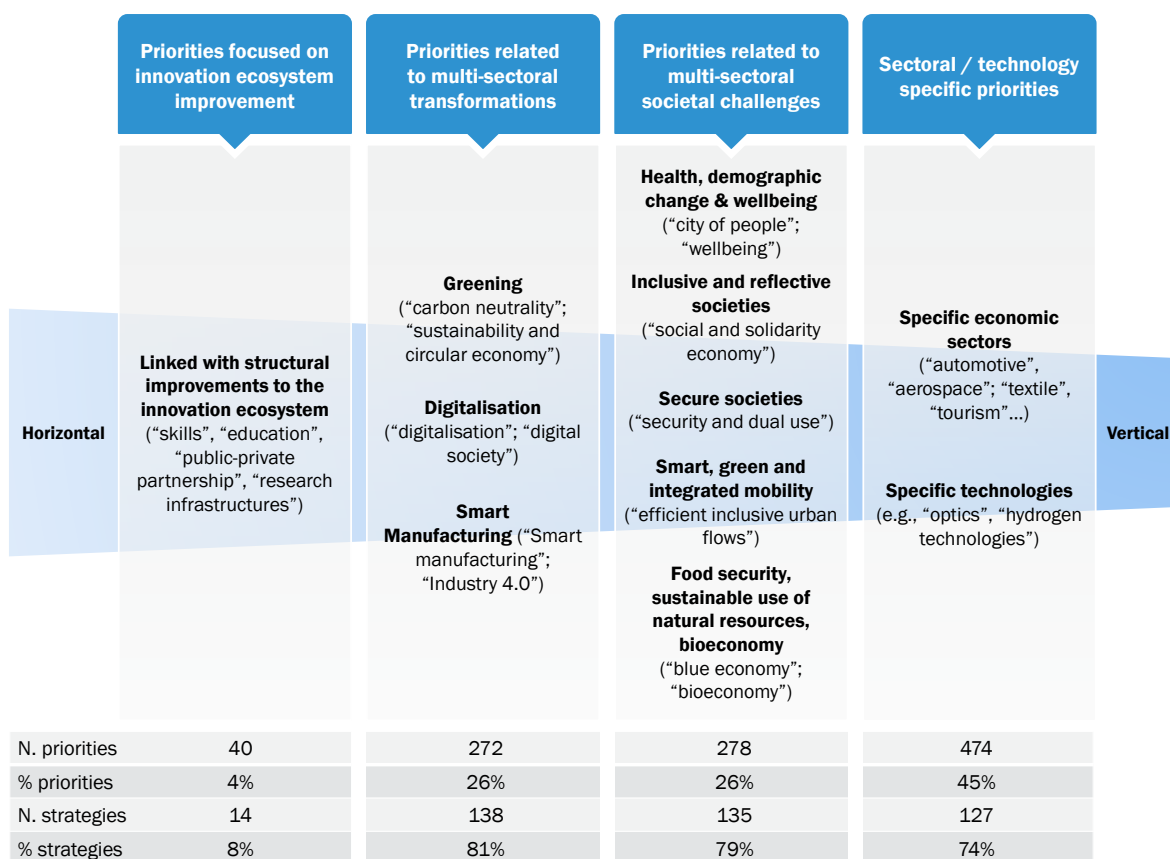
<sup>14</sup> <https://www.h2020.md/en/content/societal-challenges>

activities that support people's general well-being, such as healthcare, housing, social care, healthy nutrition, leisure, sustainable tourism, etc. **This prioritisation approach matches 26% of the individual S3 priorities, and 79% of strategies.**

- **Priorities related to multi-sectoral transformations:** these priorities are also multi-sectoral, meaning they span multiple industries, with a focus on transformational changes such as greening, digitalisation, and manufacturing innovation/transition (e.g., Industry 4.0). Unlike multi-sectoral societal challenges, these priorities are even more horizontal in nature, as they have the potential to impact all industries. For example, the priority "Carbon Neutrality" includes a range of activities aimed at achieving regional climate goals across the entire economy. We identified that **26% of the individual S3 priorities are in line with this prioritisation approach, and that 81% of the strategies include at least one such priority.**
- **Priorities focused on innovation ecosystems improvement:** they emphasise structural improvements to the R&I ecosystem as a whole, aiming to create a favourable environment for innovation across all sectors and activities. These priorities refer to initiatives related to education and skills development, infrastructure enhancement, and fostering collaboration / networking, etc. These priorities are the most horizontal in nature, as they extend beyond economic and technological domains, impacting areas such as labour, education, infrastructure, and relationship between different components of the broader innovation ecosystem. **This prioritisation approach is reflected in 4% of the individual S3 priorities and it appears in 8% of the strategies.**

The following figure illustrates the **main prioritisation approaches** observed.

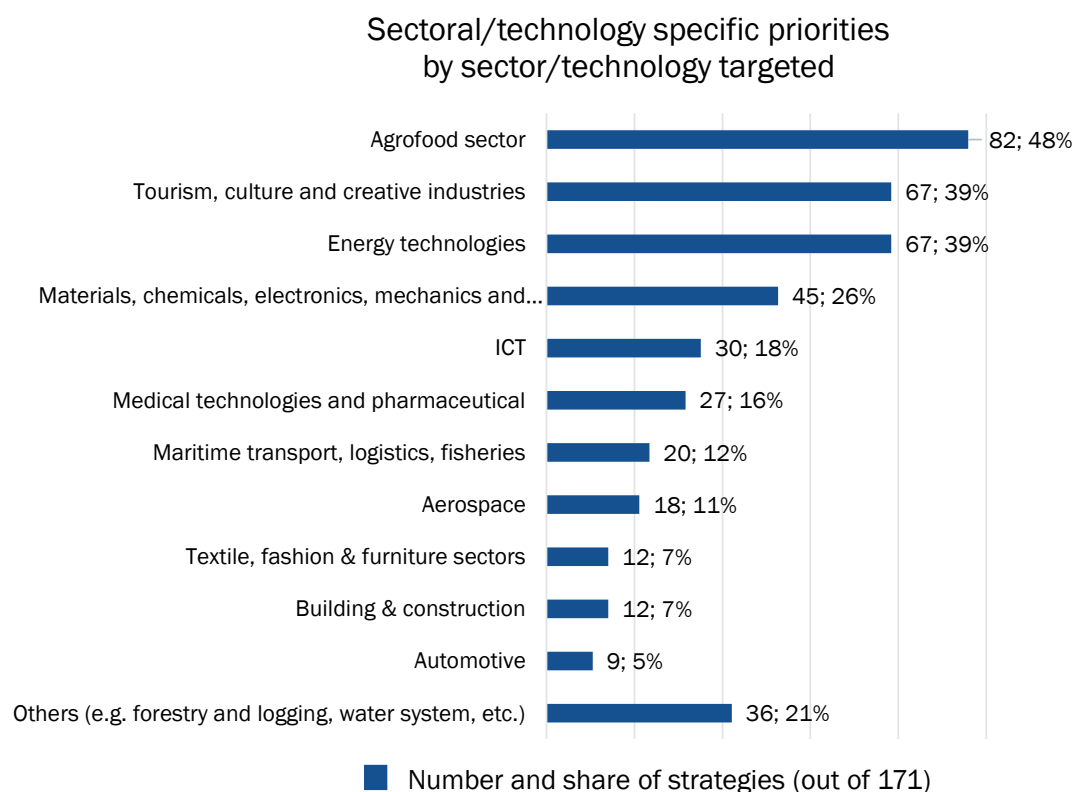
**Figure 8: S3 prioritisation approaches observed in the 2021-2027 period**



Source: Prognos AG/CSIL (2025), based on a semi-automated analysis of S3 documents. Examples of priorities are provided in brackets.

**Overall, the most commonly used prioritisation approach (reflected in 45% of priorities) is the sectoral/technology-specific approach.** The focus is on the transformation of specific economic sectors and/or technologies. Figure 9 shows the most referred to sectors or technologies. Additionally, Table 2 illustrates some examples of strategies that have included specific sector/technology priorities. These can be found across various regions, aiming to reflect either the current strengths or desired areas of future specialisation of those regions. An analysis of the correspondence between the selected S3 priorities and the economic or technological strengths of each region is included in Section 3.1.2.

**It is interesting to note that several regions have selected sectors traditionally considered as low-tech or outside the mainstream of innovation policy,** such as agrifood, tourism, culture and creative industries. While these sectors have often been characterised by low R&I intensity and limited exposure to traditional innovation instruments, their inclusion as S3 priorities suggests a potential broadening of the innovation agenda. Based on the documentary review of S3 strategies, the act of prioritising such sectors often appears to create conditions that could facilitate their transformation, through technology adoption, diffusion of digital tools, skills development, or the emergence of new business models.

**Figure 9: Distribution of sectoral/technology specific priorities by sector or technology targeted**

Source: Prognos AG/CSIL (2025), own elaboration based on the semi-automated analysis of S3 documents. Note that the total number of sector-specific/technology-specific priorities is 474 (45% of the total number of priorities identified across the 171 strategies).

**Table 2: Examples of strategies including specific sector/technology priorities**

| Specific sectors or technology targeted                                    | N. of strategies | Examples of strategies   |
|--|------------------|--|
| Agrofood sector  | 82               | Extremadura (ES), Bretagne (FR), Puglia (IT), Oost Nederland (NL), Lubelskie (PL), North West (RO) |
| Tourism, culture, and creative industries                                  | 67               | Greece, Baleares (ES), Île-de-France (FR), Slovenia  |
| Energy technologies  | 67               | Denmark, Croatia, Berlin (DE), Poland  |
| Materials, chemicals, electronics, mechanics, and engineering technologies | 45               | Flanders (BE), Bayern (DE), Nouvelle-Aquitaine (FR), Lower Silesian (PL), Vasterbotten (SE)        |
| ICT  | 30               | Brandenburg (DE), Greater Poland (PL), West (Romania), Bulgaria                                    |
| Medical technologies and pharmaceutical                                    | 27               | Czechia, Lithuania, Île-de-France (FR)   |
| Maritime transport, logistics, fisheries                                   | 20               | Flanders (BE), Denmark, Sicilia (IT), Cyprus   |
| Aerospace  | 18               | Canarias (ES), Campania (IT), Centru (RO), Provence Alpes-Côte d'Azur (FR)                         |
| Textile, fashion, and furniture sectors                                    | 12               | Marche (IT), Łódzkie, (PL), North East (RO)  |
| Building and construction  | 12               | Czechia, Denmark, Opolskie (PL), Slovenia  |
| Automotive   | 9                | Rheinland-Pfalz (DE), Basilicata (IT), Lower Silesian (PL)   |
| Others (e.g. forestry & logging, water system, etc.)                       | 36               |  |

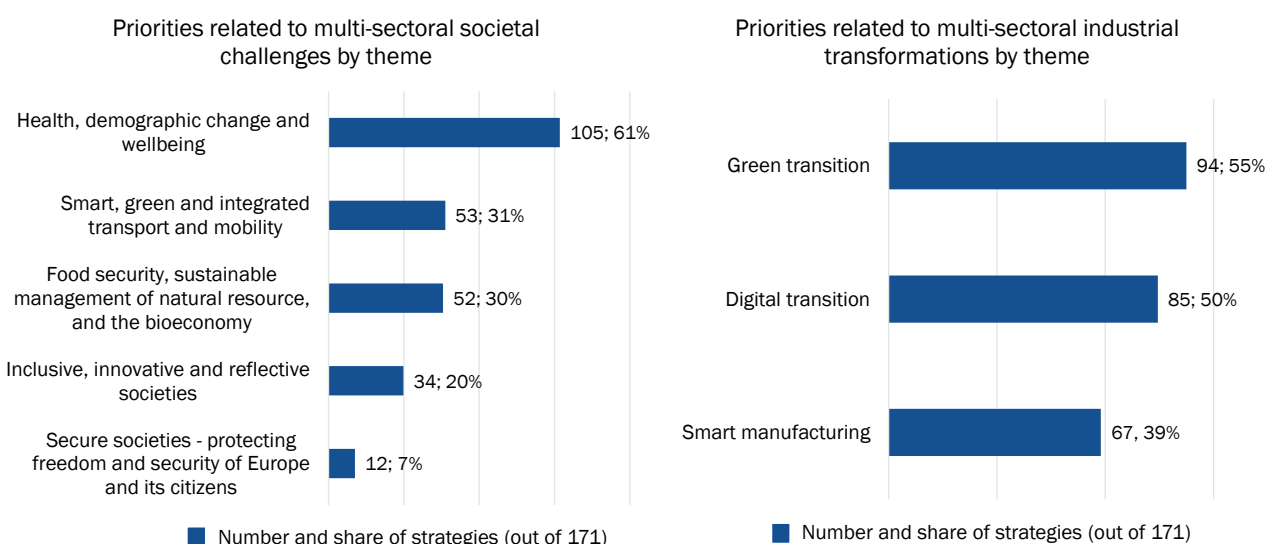
Source: Prognos AG/CSIL (2025), own elaboration based on the analysis of S3 documents.

Two other key groups of priorities represent 26% of the total each: one focuses on transforming economic activities to address societal challenges, while the other targets broader industrial transformation goals, including the green and twin transitions and manufacturing transformation. Both groups represent cross-sectoral priorities that span multiple sectors simultaneously, and together they account for 52% of the priorities. The two figures below illustrate examples of these priorities.

**Notably, 50-55% of S3 strategies include priorities related to goals aligned with the European twin transition agenda**, namely, the green and digital transitions. This includes support for clean technology adoption, smart manufacturing, and the digital transformation of value chains. Furthermore, many other strategies focus on specific technologies linked to these transitions, such as information and communication technologies, environmental technologies, clean and resource efficient technologies.

**Overall, every S3 strategy contains at least one priority area connected to the goals of the twin transition, whether sector- or technology-specific or cross-sectoral**, demonstrating a widespread integration of these European objectives within regional specialisation efforts.

**Figure 10: Distribution of multi-sectoral societal challenges and transformation priorities by theme**



Source: Prognos AG/CSIL (2025), based on a semi-automated analysis of S3 documents. Note that the total number of priorities related to cross-sectoral societal challenges and industrial transformations is respectively 278 and 272 (i.e. 26% of the total number of S3 priorities identified across the 171 strategies).

**Table 3: Examples of priorities related to societal challenges**

| Region        | Priority name         | Priorities as described in the document  | Sub-classification  |
|---------------|-----------------------|--|---|
| Helsinki (FI) | City of People        | The priority includes activities that support <u>people's well-being</u> , including: <ul style="list-style-type: none"> <li>• health care</li> <li>• leisure</li> <li>• housing</li> <li>• urban planning and mobility</li> </ul>   | Priorities related to multi-sectoral societal challenges ( <u>health, wellbeing and demographic changes</u> ) |
| Croatia       | Security and dual use | The priority includes activities that address <u>security challenges</u> , including: <ul style="list-style-type: none"> <li>• dual-use products</li> <li>• cyber security</li> <li>• disaster management systems</li> <li>• use of ICT for integrated security solutions</li> </ul> | Priorities related to multi-sectoral societal challenges ( <u>security societies</u> )                        |

|                     |                                       |  |   |
|---------------------|---------------------------------------|--|---|
| Emilia-Romagna (IT) | Social innovation and participation   | The priority includes activities that support <u>social innovation</u> , including: <ul style="list-style-type: none"> <li>• social impact technologies</li> <li>• use of digital tools for inclusion, citizen empowerment, and public sector transformation</li> <li>• public engagement and citizen science</li> </ul>               | Priorities related to multi-sectoral societal challenges ( <u>social and reflective societies</u> )   |
| Brussels (BE)       | Efficient and sustainable urban flows | This domain includes activities promoting <u>inclusive and sustainable mobility and space management</u> , such as: <ul style="list-style-type: none"> <li>• spatial reorganisation (urban planning)</li> <li>• low-emission transport systems</li> <li>• optimisation of urban logistics</li> </ul>                                   | Priorities related to multi-sectoral societal challenges ( <u>Smart, green and integrated transport</u> )                                   |
| Flanders (BE)       | Blue economy                          | The priority covers various fields linked to the <u>sea</u> : <ul style="list-style-type: none"> <li>• sustainable and healthy food production</li> <li>• coastal protection and mineral resources</li> <li>• renewable energy and water production</li> <li>• ocean pollution</li> <li>• maritime connectivity and tourism</li> </ul> | Priorities related to multi-sectoral societal challenges ( <u>Food security, sustainable use of natural resources, and the Bioeconomy</u> ) |

Source: Prognos AG/CSIL (2025), based on the analysis of S3 documents.

**Table 4: Examples of priorities related to multi-sectoral transformations**

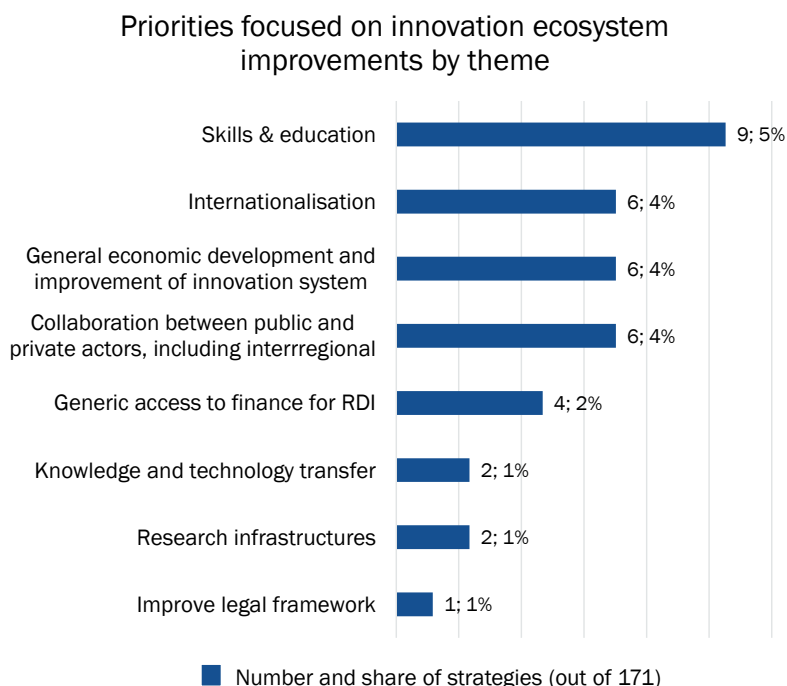
| Region             | Priority name          | Priorities as described in the document   | Classification  |
|--------------------|------------------------|---|---|
| Galicia (ES)       | Sustainability         | This priority aims to advance the <u>decarbonisation of the economy</u> and the sustainable management of natural resources. It includes several economic sectors and technologies such as: <ul style="list-style-type: none"> <li>• Renewable energy</li> <li>• Biotechnologies</li> <li>• Circular economy and materials</li> <li>• Sustainable textile industry</li> <li>• Low-carbon emissions transport industries</li> <li>• Sustainable tourism</li> </ul> | Priorities related to multi-sectoral transformations ( <u>Green transition</u> )    |
| Bremen (DE)        | Digital transformation | This priority aims to the <u>digitalisation</u> of the regional economy. It includes several activities, such as: <ul style="list-style-type: none"> <li>• Expansion of digital infrastructure</li> <li>• ICT sector</li> <li>• Integration of IT and AI solutions into key sectors (logistics, automotive, agriculture, etc.)</li> <li>• Digital competences</li> </ul>  | Priorities related to multi-sectoral transformations ( <u>Digital transition</u> )  |
| Valle d'Aosta (IT) | Industry 4.0           | The priority aims to support the <u>transformation in manufacturing and industrial processes</u> through different technologies and tools, including: <ul style="list-style-type: none"> <li>▪ IoT</li> <li>▪ Big data analytics</li> <li>▪ Cloud computing,</li> <li>▪ Additive manufacturing</li> <li>▪ Robotics</li> </ul>   | Priorities related to multi-sectoral transformations ( <u>smart manufacturing</u> ) |

Source: Prognos AG/CSIL (2025), based on the analysis of S3 documents.

**Out of all S3 priorities analysed, at least 4% focus on enhancing the overall innovation ecosystem**, addressing structural improvements that support innovation across multiple domains. These priorities are identified in 14 S3 documents in Austria, Czechia, Hungary, Ireland, Slovakia, and some regions in Spain, France, Finland, Poland, Portugal and Sweden. Among these, “Skills and education” emerges as the most frequently

cited priority, underscoring the importance placed on human capital development within innovation strategies. A relatively high number of priorities also relate to general economic development and the improvement of the innovation system, as well as to internationalisation. These priorities reflect a broad commitment to strengthening the innovation environment through systemic interventions or by fostering global integration via access to international markets, research networks, and global value chains. The promotion of stronger collaboration and partnerships among ecosystem actors is also a recurring theme, highlighting the role of connectivity and cooperation in driving innovation outcomes.

**Figure 11: Distribution of priorities by type of targets structural improvement of the ecosystem**



Source: Prognos AG/CSIL (2025), based on the analysis of S3 documents. Note: the figure shows the number and share of strategies having priorities related to the ecosystem improvement.

**Priorities focused on innovation ecosystems improvement were particularly challenging to identify**, both manually and through text mining techniques, due to ambiguities in their definition within the S3 documents. In many cases, it was unclear whether they represented actual priorities or broader strategic objectives guiding the prioritisation. The diversity in document structures and terminology further complicated their classification. For example, the national S3 of Croatia identifies three overarching objectives (enhancing scientific excellence; closing the gap between the research and business sectors; increasing innovation efficiency). These are not labelled as “priorities” but rather stated and presented in the document as broader goals supporting the strategy's vision. In some regions in Germany (e.g., Saarland), and also Sweden (e.g., Vastrad Götaland), S3 strategies mentioned some horizontal “measures” or “actions” (including support for the development of skills, research infrastructures, etc.), but these are intended to be applied within the defined vertical specialisation areas. They do not represent systemic efforts to enhance the innovation ecosystem as a whole.

To determine priorities focused on innovation ecosystems improvement, we considered those explicitly labelled as such in the S3 documents, as well as those that, based on a thorough review, appeared to represent a dimension of prioritisation rather than a general strategic goal. We did not classify them as distinct priorities when they appeared as overarching objectives or specific implementation measures integrated within other identified S3 priorities, and thus they were not counted as priorities in any form. Since we

have adopted a cautious approach, we interpret our statistics as the minimum possible number of priorities focused on improving innovation ecosystems.

### Articulation of different types of priorities in S3

**The coexistence of multiple dimensions of prioritisation within the same strategy was then examined** by analysing the mix of approaches adopted by regional and national S3. The table below illustrates the combinations of prioritisation approaches.

**Only a small percentage of strategies (12%) adopt a single prioritisation approach, with most focusing on sectoral/technological specific priorities** (see the table below). This reflects a tendency for strategies to centre around the transformation of specific sectors or technologies. The remaining strategies combine different prioritisation approaches to reflect the multi-dimensional nature of regional and national priorities. In 42% of S3 documents, these mixed approaches often bring together sectoral/technological-specific priorities, societal challenge priorities, and priorities related to broader industrial transformation. Another 20% of S3 documents define priorities in cross-sectoral terms only, combining systems of activities related to societal challenges and industrial transformation goals.

**Ecosystem-related priorities are typically combined with other more sector-specific or cross-sector priorities.** This combination indicates that regional and national strategies often include both elements that target particular sectors and measures aimed at broader innovation system improvements.

**Table 5: Prioritisation approaches adopted by 2021-2027 S3**

| Strategy type<br>(share of strategies)                | Types of priorities in S3 strategies |                  |                           |                         |   | Number of strategies | Share of strategies |
|---|--------------------------------------|------------------|---------------------------|-------------------------|---|----------------------|---------------------|
|   | Innovation ecosystem                 | Transformational | Multi-sectoral challenges | Sectoral/ Technological |   |                      |                     |
| S3 with one predominant prioritisation approach (12%) |                                      |                  |                           | ✓                       |   | 15                   | 9%                  |
|   |                                      | ✓                |                           |                         |   | 3                    | 2%                  |
|   |                                      |                  | ✓                         |                         |   | 1                    | 1%                  |
| S3 with multiple types of priorities (88%)            |                                      | ✓                | ✓                         | ✓                       |   | 73                   | 42%                 |
|   |                                      | ✓                | ✓                         |                         |   | 34                   | 20%                 |
|   |                                      |                  | ✓                         | ✓                       |   | 17                   | 10%                 |
|   |                                      |                  | ✓                         | ✓                       |   | 14                   | 9%                  |
|   | ✓                                    | ✓                | ✓                         | ✓                       |   | 4                    | 4%                  |
|   | ✓                                    |                  | ✓                         | ✓                       |   | 4                    | 2%                  |
|   | ✓                                    |                  | ✓                         |                         |   | 2                    | 1%                  |
|   | ✓                                    | ✓                |                           | ✓                       | 2 | 1%                   |                     |

Source: Prognos AG/CSIL (2025), own elaboration based on the S3 priorities database. Check marks indicate the presence of specific priority types in each strategy. The share of strategies column shows the percentage of total S3 strategies adopting each prioritisation pattern (i.e. combination of specific priority types).

**Understanding the logic behind the combination of different types of prioritisation approaches within the same S3 strategy is a complex task.** The analysis revealed that it is not possible to automatically or fully extract this information from S3 documents. S3 strategies are comprehensive documents designed to address multiple aspects of regional development and innovation. Their structure and level of detail can vary considerably between Member States and regions, making an automated comparative analysis very difficult. Moreover, while priorities may be defined in terms of specific economic sectors, emerging technologies, social challenges, or broader transformational goals, these

distinctions may not always explicitly be recognised by the national and regional authorities that draft the S3.

Another layer of complexity arises from the varying institutional levels at which the strategy is formulated (see also Section 3.3). Specifically, this concerns whether priorities for a given territory are defined by a single (regional or national) strategy or if priorities from multiple strategies intersect. This is the case, for example, in countries like Italy and Spain, where both national and regional S3 strategies coexist. Similarly, in countries such as Ireland, Greece, and Austria, a formal national strategy exists but is complemented by regional plans that also define their own set of priorities. This creates a dynamic where both national and regional plans interact.

**Our in-depth documentary analysis found that some S3 strategies present well-defined approaches for combining various priorities, emerging from a clear strategic vision.** These strategies often include diagrams that represent and visualise the interconnections between different types of priorities (see examples in the figure below). Typically, horizontal priorities – often related to the ecosystem and/or transformative goals – are understood to provide the foundation for the strategy, within which specific vertical priorities (sectors or technologies) are also identified. This is characteristic of strategies where priorities are organised in a hierarchical structure, with different levels of priority defined and interconnected.

**Some examples can illustrate this approach:** The **Irish national strategy** defines high-level national strategic priorities, such as digitalisation and digital transformation, the green transition for enterprises, innovation diffusion, international collaboration on R&I, and enhancing the enterprise research and innovation system. Below this level, specific regional sectoral priorities are defined for different regions by regional strategies (Southern Region, Eastern and Midland Region, Northern and Western Region), which align with and further specify the national priorities based on territorial specificities (e.g., manufacturing / engineering, cultural and creative industries, marine/maritime, agrifood and agritech, ICT, medical sector, energy). A similar approach can be seen in **Greece**, where the national strategy sets out broad themes such as green transition and digitalisation, and the regional strategies (e.g., Thessaly, Central Macedonia) further define specific sectoral focuses, such as agriculture, energy, and information technologies, aligned with regional strengths. In Austria, the national strategy is structured around horizontal priorities, closely tied to EU objectives such as the Green Deal, participation in Important Projects of Common European Interest (IPCEIs), and excellent fundamental research. The national framework sets broad goals, while regions (Länder) align with and integrate these priorities into their own regional strategies, which focus more on sector-oriented priorities that reflect the regional specialisation profiles.

**Prioritisation approaches that clearly combine vertical and horizontal priorities can be also found in some regional strategies.** The S3 of Lower Silesia in Poland encompasses three horizontal specialisations – Green Deal, Industry 4.0, Life assisted by technology – that inform the development of the four main sectoral specialisations (automotive and aerospace, chemistry and medicine, raw materials, as well as machinery and equipment). According to the strategy, the “*three horizontal specialisations provide support not only for R&D and intersectoral implementations but also for the growth and development of four basic specialisations*”. As other examples, the Spanish region of Castilla-La Mancha identifies four horizontal priorities (digital transformation, sustainability and circular economy, skills and education, internationalisation) that cut across a set of six vertical priorities related to specific economic sectors. Similarly, the S3 of South Savo in Finland consists of four horizontal themes (green transition, digitalisation, entrepreneurship, competence) that cut across a set of five priority areas (well-being, tourism, food, water, forest), steering the development of sectoral trajectories.

**Table 6: Examples of diagrams visualising the articulation between different types of S3 priorities**

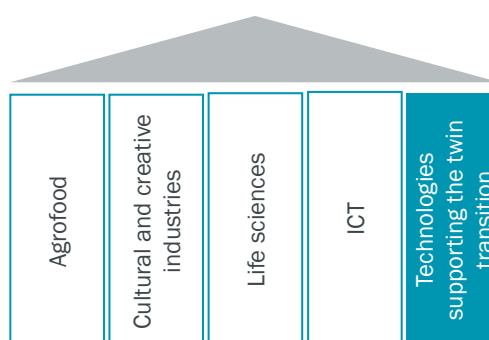
|   |  |
|---|--|
| <p><b>Lower Silesia (Poland)</b></p> <p>The S3 includes three horizontal priorities (Industry 4.0, Green Deal, Life assisted by technology), which are meant to facilitate R&amp;I cross-sectoral investments as well as the development of four sectoral specialisations (machinery, medicine, etc.)</p>   |  |
| <p><b>South Savo (Finland)</b></p> <p>The S3 includes four horizontal themes (green transition, digitalisation, entrepreneurship, competence) that intersect with other five sectoral priority areas (well-being, tourism, food, water, forest). Horizontal themes are meant to steer the development and transformation of sectoral trajectories.</p>          |  |
| <p><b>Castilla-La Mancha (Spain)</b></p> <p>Horizontal priority areas (green and digital) transition, skills and entrepreneurship, internationalisation) are designed to be cross-cutting in nature, and therefore also apply to the region's specialised sectors (e.g. agrifood, aerospace, etc.).</p>   |  |
| <p><b>Ireland National S3</b></p> <p>The Irish national strategy adopts a hierarchical approach. It defines high-level national strategic priorities, such as digitalisation and digital transformation. Below this level, specific regional sectoral priorities align with and further specify the national priorities based on territorial specificities.</p> |  |

Source: Prognos AG/CSIL (2025), own elaboration based on different EU Regions RIS. Note: Lower Silesia extracted from the [Lower Silesian Innovation Strategy 2030](#) (page 9); South Savo extracted from [The Smart](#)

*Specialisation Strategy of South Savo 2022–2027 (page 5); Castilla-La Mancha extracted from the S3 document (page 16); Ireland: own representation based on the national and regional S3 documents.*

**In other instances, strategies combine priorities without providing a clear interlink or articulation between the different types of priorities**, which are rather placed alongside one another. For example, the S3 Molise identifies an additional “vertical intervention” defined as “technologies supporting the transition” that more explicitly clarifies Molise’s stance and contribution to critical transition topics (decarbonisation, modernisation of heavy industries, zero-emission mobility, production and distribution of alternative fuels). Accordingly, the S3 was updated to include this new vertical pillar on “technologies supporting the digital transition,” alongside the existing ones, as shown in the figure below.

**Figure 12: S3 Molise in Italy**



Source: Prognos AG/CSIL (2025), based on figure extracted from S3 Molise 2021–2027 and translated in English.

This choice does not necessarily reflect a lack of strategic vision in prioritisation. **Interviews indicate that different types of priorities can coexist within the same strategy to address different needs:** more horizontal priorities serve all types of sectors, while more vertical ones are dedicated to policy support to specific sectors. Examples of such strategies include Czechia (see box below).

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Priorities focused on ecosystem needs: the case of Czechia

### Czechia

**Introduction**  
 Czechia’s 2021–2027 Smart Specialisation Strategy adopted an evolutionary and ecosystem-oriented approach. Instead of targeting only specific technological or economic sectors, the strategy placed a foundational relevance on structural improvements to the national research and innovation ecosystem. This choice reflected the understanding that the Czech innovation environment was still developing and required support in order to pursue sector-specific specialisation effectively.

**Key success factors, challenges and transferability of the learnings**  
 The Czech strategy is characterised by a structured prioritisation framework, where horizontal priorities form the foundation, supporting vertical specialisation domains and mission-oriented goals such as decarbonisation, digitalisation or national security. The focus on horizontal priorities, such as skills development, public-private cooperation, innovation infrastructure and governance,

was seen as both a practical and strategic choice. These priorities provided a clear and accessible entry point for potential beneficiaries, particularly in a context where more complex sectoral targeting might have lacked the necessary groundwork.

This layered approach enabled the gradual engagement of companies, universities, and research institutions. According to the Managing Authority, in the context of a more mature research and innovation ecosystem, the attention can shift effectively toward vertical (sector-based) and mission-oriented calls. Importantly, horizontal priorities also benefitted from a developed monitoring framework supported by a newly established IT system for project tracking. This system facilitated data-driven decision-making and increased transparency in policy implementation.

While this model is particularly suitable for emerging innovation systems, it also offers transferable lessons for other contexts. Its success lies in creating a shared strategic vision, underpinned by strong governance, iterative policy development and a robust monitoring framework.

### Conclusion

By addressing ecosystem needs before moving to sectoral specialisation, Czechia has built a coherent and inclusive innovation strategy. The integration of horizontal, vertical, and mission-based priorities allows for flexible yet targeted support to innovation.

## 3.1.2 Rationale for prioritisation approaches

The formulation of S3 priorities requires a careful balance between regional specificities and broader policy goals. This section provides insights into the rationale behind the prioritisation approaches. Given that this is a complex endeavour, which is difficult to generalise across different countries and regions, we present a set of complementary evidence to support our analysis.

- The first subsection explores the alignment between S3 priorities and the economic and technological profiles of regions. This is assessed through both stakeholder perceptions and by means of statistical analysis.
- The second subsection focuses on how S3 priorities are evolving to integrate broader EU goals, such as the green and digital transitions, while also aligning with regional realities and economic specialisations, offering a more cross-sectoral and transformational approach.

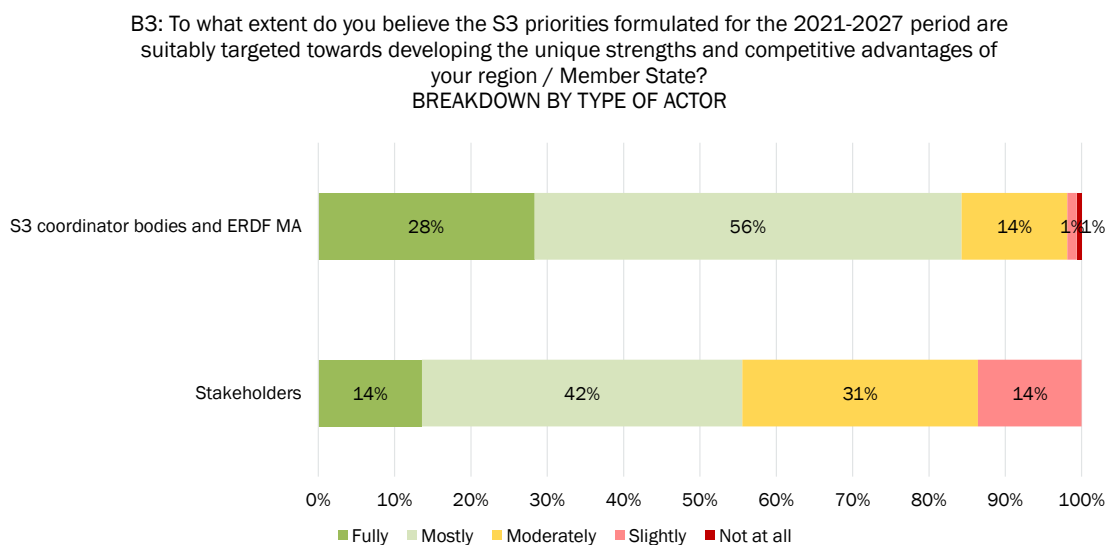
### Assessing the fit between S3 priorities and regional profiles

We first examined the alignment between S3 priorities and the existing economic and technological profiles of EU Member States and regions, assessing how well selected priorities fit the strengths and capabilities of these territories. Understanding this alignment is key to exploring the rationale behind prioritisation, as priorities are expected to reflect and build on existing strengths of countries and regions.

**Survey results show that national/regional authorities generally perceive a good alignment between S3 priorities and regional profiles**, with responses suggesting satisfaction with the current state of alignment (see figure below) for over 80% of S3 coordinator bodies and/or ERDF Managing Authorities. However, responses from other stakeholders, including industry representatives, reveal a more critical view. These stakeholders highlight a perceived misalignment, feeling that the priorities do not clearly connect to specific economic sectors or technologies, reflecting a gap between the regional realities and the strategic goals. This misalignment could be explained by the limited

involvement of industry actors in the priority-setting process, which may lead to strategies that do not fully address the needs of the private sector (see Section 3.3.3).

**Figure 13: Survey results - Alignment between S3 priorities and regional profiles**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all. Number of valid answers: 240 referring to 134 regional/national strategies.

The literature shows that regions with different economic structures, technological capabilities and institutional capacities should adopt distinct prioritisation approaches that best align with their existing strengths and potential for innovation (see Info box 1 below). **We conducted a statistical correspondence analysis to assess the degree of correspondence between S3 priorities and regional economic and technological profiles.** This analysis compared S3 strategies at the time of their formulation (the years between 2019 and 2022) with two sets of indicators:

- **Economic profiles** proxied by employment shares across NACE sectors;
- **Technological profiles** proxied by patent shares across technology fields.

In addition to these shares, we also considered the location quotient (LQ) for both employment and technology fields, which measures the degree of regional specialisation relative to the EU27 average.

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### Info box 1: Theoretical insights from the literature on S3 prioritisation approaches

The identification and selection of S3 priorities are crucial for the effectiveness of regional innovation policies. A key consideration is aligning selected priorities with the region's economic and technological profile, ensuring sufficient capabilities, infrastructure, and human capital to absorb and effectively exploit innovation investments. Without this alignment, even well-funded interventions may fail to generate sustainable outcomes. S3 strategies are most effective when they build upon existing capabilities, fostering future competitiveness and innovation-driven growth (Balland et al. (2019). Foray et al., 2018; Foray, 2019). Lo Conte et al. (2025) found that S3 strategies

boosted labour productivity when priorities aligned with preexisting technological capabilities, emphasising the importance of path dependency in diversification.

Theories on technological and sectoral relatedness provide insights into how regions formulate their priorities. Less developed regions are advised to focus on areas related to existing specialisations, strengthening absorptive capacity and building on available skills (Balland et al., 2019; Boschma, 2021; Pinheiro et al., 2021). Advanced regions, with broader knowledge bases, are encouraged to target innovation-driven domains and expand into adjacent, higher-value sectors (Balland et al., 2019; Boschma et al., 2015; Xiao et al., 2018).

Diversification typically follows a path-dependent trajectory, where regions move into activities that require similar inputs to existing ones, referred to as "related diversification" (Hidalgo et al., 2007; Neffke et al., 2011). Unrelated diversification, while potentially transformative, is riskier and harder to achieve (Coniglio et al., 2021). Less developed regions face the "diversification dilemma", where upgrading into more complex technologies is hindered by insufficient capabilities, resources, and institutional strength (Balland et al., 2019; Rodríguez-Pose et al., 2014). Consequently, related diversification is often the safer but less complex route for these regions (Pinheiro et al., 2021; Boschma, 2021).

Institutional quality is another critical factor. The S3 is by no means an easy policy task as it requires strong leadership, an enabling public administration, vision, and the institutional and administrative capacity to promote an EDP (European Commission, 2017). Weak institutional capacity has therefore been recognised to undermine the potentially positive impact of S3 policies (Hassink and Gong, 2019). Empirical evidence suggests that regions with stronger institutions are better positioned to pursue effective related diversification strategies, while weaker institutional contexts tend to encourage unrelated diversification, which is often associated with higher risk in less developed contexts (Marrocu et al., 2022; Di Cataldo et al., 2020). Weak institutional capacities may undermine the design and execution of S3 strategies, particularly the EDP, exposing regions to risks such as political capture, suboptimal priority selection, and ineffective policy implementation (Rodríguez-Pose et al., 2014; Blažek and Morgan, 2018).

The table below presents the correlation coefficients between the sectors and technological fields targeted by the S3 and the distribution of employment and patents across sectors and technologies. Higher and more positive correlation indexes indicate a stronger alignment between S3 priorities and the corresponding regional economic and technological profiles. The results show a maximum correspondence index of 0.16.

**Given that the correspondence index ranges from 0 (no alignment) to 1 (perfect alignment), the overall level of alignment between S3 priorities and regional profiles remains relatively low** (Table 7). These findings are consistent with earlier research conducted by Prognos and CSIL (2021) on S3 strategies during the 2014-2020 programming period, which found that 25% of the strategies did not achieve any significant correspondence with the economic or technological profile of the Member State or region, and that innovation maturity plays a critical role in shaping the nature and direction of S3 priorities.

The results also reveal the following **trends based on innovation maturity**, as classified by the Regional Innovation Scoreboard (RIS):

- In *less innovative or emerging* regions, S3 priorities tend to align more closely with sectors with high employment shares (e.g. traditional manufacturing) and higher degree of specialisation relative to the EU.

- In *innovation-leading* regions, priorities correlate more strongly with patent-intensive, high-tech fields, such as advanced manufacturing or green technologies, which also exhibit a higher degree of technological specialisation relative to the EU.

**Table 7: Results of the statistical correspondence analysis between S3 priorities and regional, by RIS classification**

| Type of MS/Region by RIS score | Correspondence with the economic profile |                                 | Correspondence with technological profile |                                  |
|--------------------------------|--|---------------------------------|---|----------------------------------|
|                                | Measured by employment share             | Measured by employment LQ vs EU | Measured by tech fields share             | Measured by tech fields LQ vs EU |
| Emerging innovator             | 0.16                                     | 0.12                            | 0.08                                      | 0.03                             |
| Moderate innovator             | 0.05                                     | 0.05                            | 0.08                                      | 0.01                             |
| Strong innovator               | 0.04                                     | 0.07                            | 0.08                                      | 0.04                             |
| Leader innovator               | 0.05                                     | 0.01                            | 0.16                                      | 0.12                             |
| <b>Total average</b>           | 0.08                                     | 0.07                            | 0.08                                      | 0.04                             |

Source: Prognos AG/CSIL (2025), Note: Pearson correlation coefficients are used to measure the degree of correspondence. The coefficient can range from 0 (no correspondence) to 1 (perfect alignment).

The analysis also shows that regions whose S3 strategies contain only vertical (sector/technology specific) priorities often show a relatively stronger alignment with both their economic and technological profiles, particularly in regions with well-established industrial sectors. In contrast, regions with a mix of cross-sectoral priorities (transformational priorities and those addressing societal challenges) show weaker alignment with their regional profiles in terms of both employment and technological specialisation (see Table 8). This may be because vertical priorities, by focusing on specific sectors or technologies, tend to build more directly on existing regional strengths and capabilities, thereby reinforcing alignment with both economic structures and technological specialisations. In contrast, cross-sectoral or transformational priorities, while potentially more forward-looking and oriented towards long-term societal challenges, may not yet be embedded in the current regional profiles. See more on this issue in the next subsection.

**Table 8: Results of the statistical correspondence analysis by prioritisation approach**

| Types of priorities in the S3  | Correspondence with the economic profile |                                 | Correspondence with technological profile |                                 |
|--|--|---------------------------------|---|---------------------------------|
|  | Measured by employment share             | Measured by employment LQ vs EU | Measured by employment share              | Measured by employment LQ vs EU |
| Mix of transformational priorities and priorities related to societal challenges | 0.06                                     | 0.03                            | 0.06                                      | 0.03                            |
| Vertical (sector/technology specific) priorities                                 | 0.10                                     | 0.14                            | 0.11                                      | 0.11                            |
| <b>Total average</b>   | 0.08                                     | 0.07                            | 0.09                                      | 0.04                            |

Source: Prognos AG/CSIL (2025), Note: Pearson correlation coefficients are used to measure the degree of correspondence. The coefficient can range from 0 (no correspondence) to 1 (perfect alignment).

### Forward-looking strategies: integrating EU priorities with regional realities in S3 strategies for long-term transformations

The statistical analysis and feedback from regional stakeholders (other than S3 coordinators and ERDF Managing Authorities) indicate that there is limited alignment between S3 priorities and regional specialisations. Despite this, the rationale behind selecting certain priorities may be driven by strategic considerations, such as the desire to align with broader EU objectives like the green and digital transitions or the need to diversify

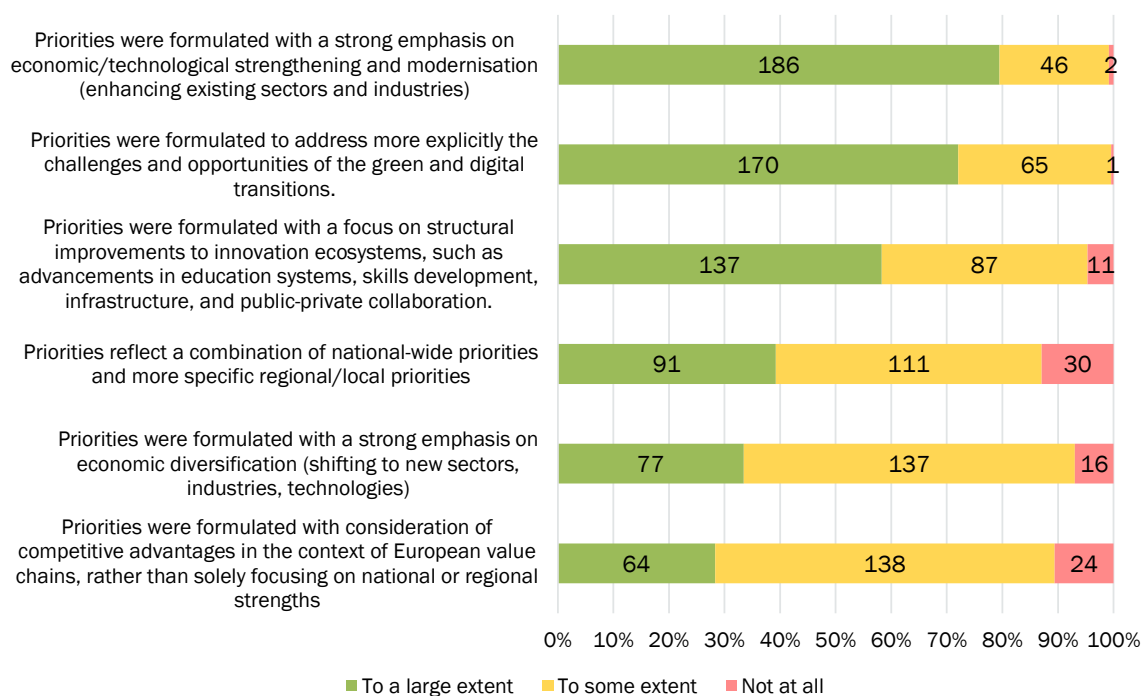
regional economies. These priorities may also reflect a long-term vision for upgrading existing industries or fostering new technological capabilities, rather than focusing solely on current regional strengths. Thus, **while the current alignment is not always strong, it may still be grounded in forward-looking strategies aimed at enhancing regional innovation capacity and resilience.**

According to the survey respondents<sup>15</sup>, the **priorities were primarily selected with a focus on enhancing existing industries and sectors, alongside a strong emphasis on the twin transition and the improvement of the innovation ecosystem** (Figure 14).

These choices may have been influenced by the enabling conditions for S3, which include the fulfilment criteria such as an updated analysis of challenges related to innovation diffusion and digitalisation, as well as actions aimed at improving national or regional research and innovation systems and fostering industrial transitions where relevant. Interviews with S3 coordinators and ERDF regional/national authorities indicated that the alignment with EU priorities such as digital and green transition was deliberately pursued to ensure complementarity and synergy between funding sources (e.g., Horizon Europe).

**Figure 14: Rationale behind the formulation of S3 priorities for the period 2021-2027**

B1: Which strategic approach do you think mainly guided the formulation of S3 priorities for the 2021-2027 period?



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all. Number of valid answers: ranging from 226 to 236 based on the option, referring to a number of national/regional strategies ranging from 132 to 134 based on the option.

In addition, 113 survey participants have provided information about how priorities have evolved compared to the 2014-2020 period, focusing on key factors that have driven these changes.<sup>16</sup> After consolidating and categorising the open-ended responses into coherent thematic groups, **the most significant trend observed in the responses include the**

<sup>15</sup> Question B1.

<sup>16</sup> Open-ended question B2 of the survey.

**increased focus on EU priorities such as the digital, green and industrial transitions.** Open-ended answers reveal that 43 respondents (38% of the total number of respondents) from various countries (Austria, Belgium, Czechia, Germany, Greece, Spain, Finland, France, Ireland, and Italy) explicitly mentioned this shift. Among them, 13 respondents detailed how these EU-level goals have been operationally integrated into the S3, for example, through the introduction of horizontal priorities or by restructuring existing sectoral domains to better contribute to overarching challenges. These changes often reflect efforts to align more closely with EU strategies, incorporate stakeholder input, and support transformative agendas (see Info box 2 below). In addition, three respondents from Czechia and Poland also highlighted the increasing emphasis on improving innovation ecosystems, addressing both national and regional priorities, and leveraging competitive advantages in European value chains.

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### Info box 2: S3 Sicily, evolution from the previous period 2014-2020

In the 2021–2027 programming period, Sicily's Smart Specialisation Strategy (S3) priorities have undergone two main significant updates:

- A seventh area of specialisation – Environment, Natural Resources and Sustainable Development – was added to encompass all the trajectories aimed at supporting the themes of the green transition and fostering new skills, tools, and production methods.
- All technological trajectories of the six existing areas were updated and reorganised to better address current societal and economic challenges.

These changes were driven by several key factors, including the need to respond to the twin green and digital transitions, the adaptation in the aftermath of the COVID-19 pandemic, the alignment with the new European programming framework and Italy's National Recovery and Resilience Plan (PNRR), and insights from the Entrepreneurial Discovery Process involving regional stakeholders.

*Source: Prognos AG/CSIL (2025), Survey results and desk research*

Based on both the documentary analysis of S3 documents and stakeholder consultations, **another common trend observed across many regions is the ongoing shift from a more vertical focus towards broader, cross-sectoral, and transformational priorities.** As previously shown, survey results indicate a growing emphasis on EU-wide priorities, such as the green, digital, and industrial transitions, with many regions introducing new cross-cutting priorities that align with these overarching goals. For example, in Finland, the regional S3 priorities are designed to be thematic in nature to support both economic diversification and the renewal of existing strong industries. In Bremen (Germany), S3 priorities were changed from a sector-based approach to a mission-oriented approach, where the former 11 priorities have been bundled into 5 broader priorities, each of them focusing on a societal challenge (connected and adaptive industry, digital transformation, intelligent services, mobility of the future, sustainable economic activity and resource efficiency). These priorities combine the strengths of several key enabling technologies and sectors, with a strong focus on innovation in cross-clustering. Similarly, Lombardy in Italy has adopted prioritisation approach based on thematic objectives rather than traditional sectors. According to interviews in Lombardy, Lower Silesia (Poland) and Austria, this approach is meant to offer a more flexible framework that can help regions respond more effectively to shifts in industrial competitiveness objectives (see box below).

Additionally, some interviews suggest that even regions with traditionally sector-specific priorities are currently considering adjustments to integrate more cross-sectoral approaches. The Apulia region is one such example. During discussions within the S3 Community of Practice Conference (Rimini, 11 December 2024), regional stakeholders highlighted the intention to define priorities that extend beyond individual sectors and act as overarching innovation drivers. These include so-called “macro-themes” or “macro-areas” that require coordinated, cross-sectoral efforts and have the potential to generate wide-ranging impacts across industries. For instance, *low-energy consumption materials* have been identified as a key area of innovation with relevance to both the automotive and aeronautics/aerospace sectors. These broader priorities are typically limited in number but aim to address strategic challenges that cut across multiple domains, supporting systemic innovation and regional resilience. The shift toward more horizontal and cross-cutting priorities is also viewed as a means of aligning more closely with overarching EU objectives, such as the green and digital transitions. However, **this evolution is not solely driven by EU-level goals. According to interviewees in Apulia, it also responds to feedback from local stakeholders.** During working groups and consultations, participants highlighted that broader, more integrated themes provide a more meaningful framework for businesses, compared to narrowly defined sectoral boundaries.

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**Info box 3: Lombardy shifted from sectoral priorities to broader cross-cutting "innovation ecosystems"**

Lombardy has shifted from a vertical, sector-based prioritisation approach to a more horizontal and dynamic approach built around “innovation ecosystems”. These ecosystems are structured around societal challenges and transformational priorities, such as digitalisation, sustainable mobility, and connectivity, rather than predefined economic sectors. Under this approach, sectors are no longer defined as standalone specialisations but are embedded within multiple ecosystems based on their contribution to societal needs. For example, the aerospace sector now supports both the “Connectivity and Information” ecosystem through satellite technologies enabling secure, high-speed communication, and the “Smart Mobility and Architecture” ecosystem through urban traffic solutions. In this way, the same technological domain contributes to multiple objectives and policy goals. The matrix below shows how the new priorities “Innovation Ecosystems” relate to the previous vertically defined areas of specialisation.

|                          |                                  | Innovation Ecosystems |                          |                       |                              |                                 |                |                    |                        |
|--------------------------|----------------------------------|-----------------------|--------------------------|-----------------------|------------------------------|---------------------------------|----------------|--------------------|------------------------|
|                          |                                  | Nutrition             | Health and Life Sciences | Culture and Knowledge | Connectivity and Information | Smart Mobility and Architecture | Sustainability | Social Development | Advanced Manufacturing |
| Areas of specialisations | Aerospace                        |                       |                          |                       |                              |                                 |                |                    |                        |
|                          | Agri-food                        |                       |                          |                       |                              |                                 |                |                    |                        |
|                          | Eco-industry                     |                       |                          |                       |                              |                                 |                |                    |                        |
|                          | Creative and Cultural Industries |                       |                          |                       |                              |                                 |                |                    |                        |
|                          | Health Industry                  |                       |                          |                       |                              |                                 |                |                    |                        |
|                          | Advanced Manufacturing           |                       |                          |                       |                              |                                 |                |                    |                        |
|                          | Sustainable Mobility             |                       |                          |                       |                              |                                 |                |                    |                        |

This horizontal approach enables stronger cross-sectoral synergies, supports the creation of partnerships (the main target of R&I initiatives in the region), and enhances resource absorption by involving a broader set of actors previously excluded under the vertical prioritisation approach merely based on specific economic sectors (NACE classifications). Moreover, these innovation ecosystems are inherently dynamic and adaptable, as they are organised around emerging and evolving needs. In a context where some sectors may face increasing competitive pressure or disruptions along the value chain, it becomes crucial for the prioritisation strategy to remain adaptable to a rapidly changing environment. By anchoring priorities to thematic objectives rather than sectors, Lombardy's prioritisation approach is more adaptable to disruptions in global value chains or declining industrial competitiveness, allowing for timely realignment with evolving circumstances.

*Source: Prognos AG/CSIL (2025), Interviews with Lombardy's S3 coordination authority and ERDF managing authority, desk research; figure extracted from the S3 document (page 25)*



## Balancing EU and regional objectives in S3 priorities

### Lombardy (Italy), Austria, Lower Silesia (Poland)



#### Introduction

The balance between EU and regional priorities has always shaped the formulation of S3 strategies. While not a new feature, this dual alignment has become more structured in the 2021–2027 programming period, as the European Commission has placed greater emphasis on broader strategic directions such as the green and digital industrial transition. Today, the key question is not whether to balance EU and regional objectives, but how regions can do so effectively within their S3 frameworks. This is the central theme explored in this comparative case studies, which examine the experiences of Lombardy (Italy), Austria, and Lower Silesia (Poland). The selection of these cases allows for a comparison between more and less developed territories, as well as between regional and national S3 approaches.

#### Key success factors, challenges and transferability of the learnings

Evidence from the interviews suggests that alignment with EU-level priorities can facilitate coherence across funding instruments and enhance opportunities for synergies, particularly with centrally managed programmes such as Horizon Europe. For example, in Lombardy, aligning regional priorities with Horizon Europe's "destinations" was well received by industrial stakeholders, who recognised the potential to support the same innovation projects through different funding sources. Similarly, Lower Silesia introduced horizontal priorities, such as the Green Deal and Industry 4.0, to reflect funding opportunities linked to the National Recovery and Resilience Plan and the Just Transition Fund.

The flexible design of S3 strategies supports ongoing alignment with evolving EU priorities. Regular strategy updates and complementary plans (see info boxes included in the next section) allow regions to adjust and better specify their priorities over time. At the same time, maintaining territorial relevance remains a key challenge. Broad EU themes, such as digitalisation and the

green transition, offer sufficient flexibility to be adapted to diverse regional contexts. However, more specific or technically advanced EU initiatives may not always align with local capacities. In Upper Austria, for instance, past efforts to prioritise life sciences — a prominent EU focus at the time — had limited success, due to a lack of critical mass in both industrial and research capabilities. This illustrates the risk of adopting EU priorities in a top-down manner without a strong regional grounding. Similar limitations were also noted in relation to the early uptake of STEP technologies in some regions (see more on this in Section 3.2.1).

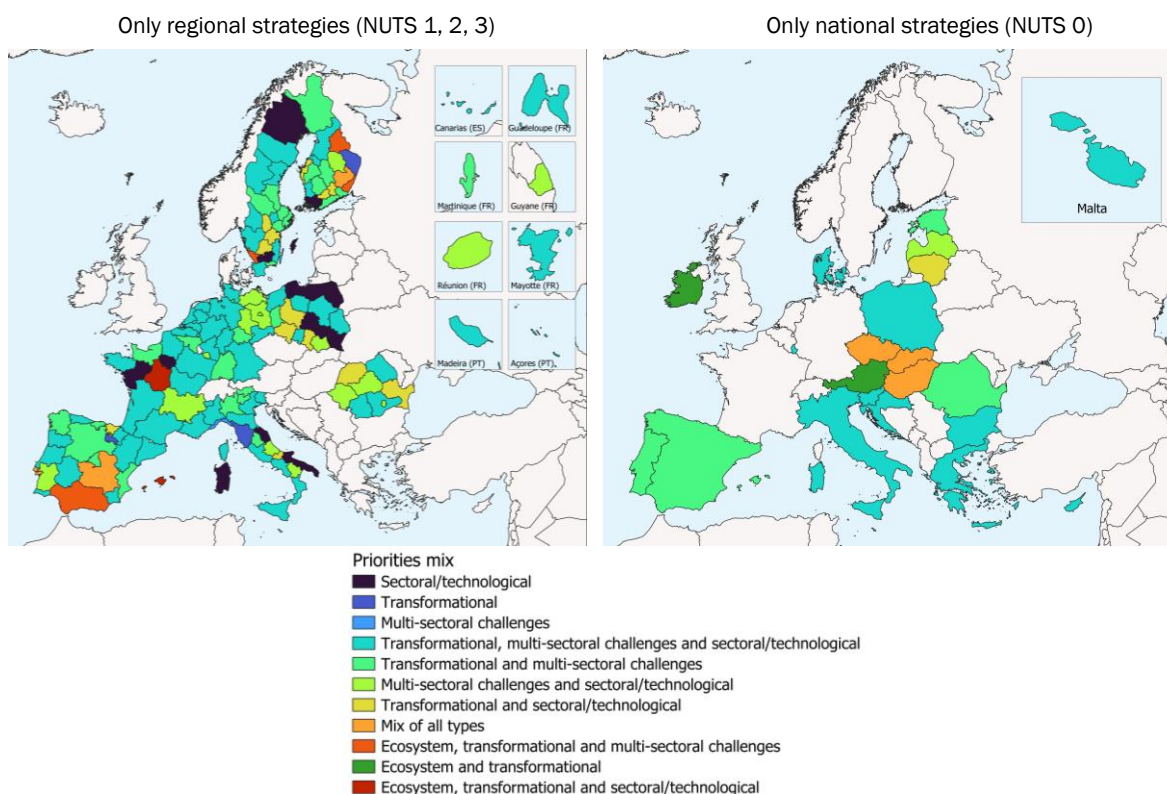
**Conclusion**

Aligning S3 strategies with EU-level priorities can enhance strategic coherence and improve access to complementary funding streams. However, the success of this alignment depends on how well EU priorities resonate with regional capabilities, industrial structures, and R&I ecosystems. A flexible and iterative approach that combines high-level strategic alignment with strong territorial anchoring through the Entrepreneurial Discovery Process is essential to maintain relevance over time. Moreover, selective and context-sensitive integration of EU priorities, rather than their wholesale adoption, allows regions to remain responsive to EU challenges while preserving the place-based character of S3.

**3.1.3 Regional differentiation of S3 prioritisation approaches**

The following maps illustrate the Member States and regions that have adopted each prioritisation approach. Note that the same strategy may include multiple types of priorities, as previously shown in Table 5.

**Figure 15: Geographical distribution of prioritisation approaches across 2021-2027 national and regional S3**



Source: Prognos AG/CSIL (2025), own elaboration based on the analysis of S3 documents. The figure illustrates the prioritisation approach adopted by each regional or national strategy. Each strategy may include different types of priorities: sectoral/technological priorities, multi-sectoral societal challenges, multi-sectoral transformational priorities, and innovation ecosystem priorities. In total, there are 11 different combinations possible, as also illustrated in Table 5.

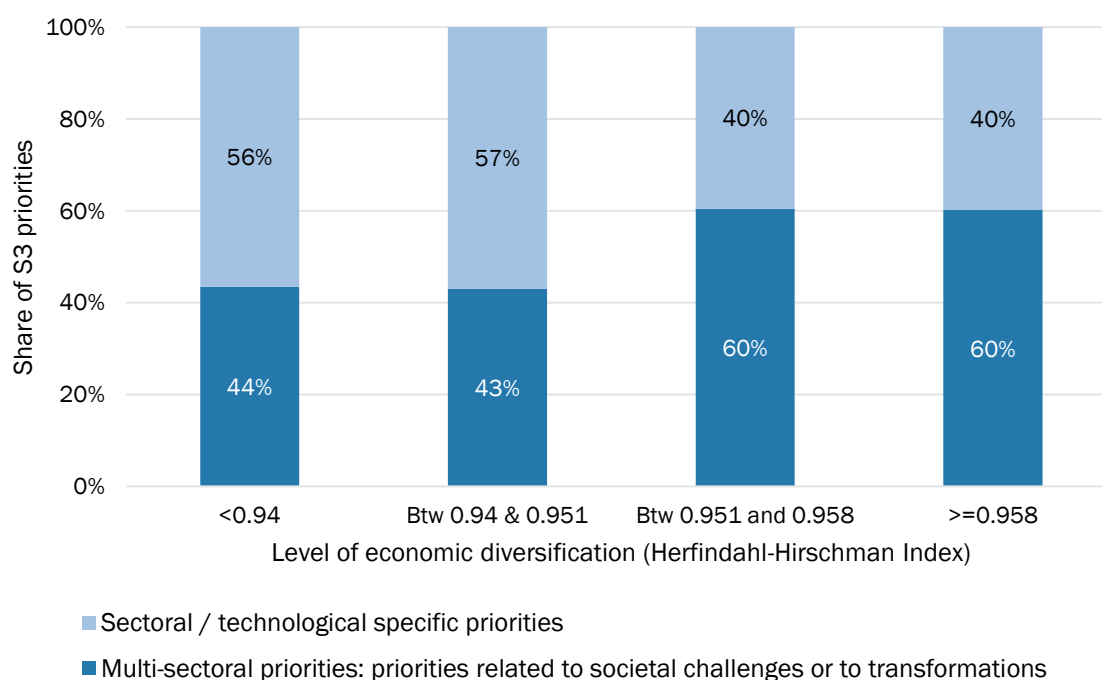
Building on the observed variation in priority types, **we conducted a statistical analysis to examine whether territorial characteristics are associated with specific categories of priorities. The aim was to identify patterns in specialisation choices that are shaped by regional features and may not be immediately apparent from the maps above.**

To investigate whether there are regional patterns in S3 prioritisation approaches, we developed a database of regional statistics, including variables related to economic performance and diversification, R&I performance and capacities, institutional capacity, availability of ERDF support. The data were primarily sourced from official statistical databases (Eurostat) or other sources (e.g. the Regional Innovation Scoreboard). Based on this dataset, we conducted descriptive and statistical analyses aimed at detecting associations between territorial characteristics and types of selected priorities.

To assess economic diversification, we developed an indicator based on the degree of employment concentration, using a Herfindahl-Hirschman Index (HHI) calculated from sectoral employment data. The statistical analysis shows that **regions with higher levels of economic diversification are more likely to select multi-sectoral priorities**, such as transformational or societal challenge-related themes, while less diversified regions tend to focus on sector-specific priorities. When analysing the overall distribution of cross-sectoral versus sector-specific priorities, the data reveals that in less diversified regions, approximately 43% of selected priorities are cross-sectoral, whereas in highly diversified regions, this share exceeds 60%.<sup>17</sup> Put differently, regions with a more diverse productive structure, characterised by activity across a broad range of sectors, tend to define priorities that cut across multiple sectors. In contrast, regions with stronger specialisation in a limited number of sectors are more likely to select narrowly defined, sector-specific priorities. These results suggest a positive correlation between the breadth of the regional economic base and the orientation of S3 priorities (Figure 16).

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<sup>17</sup> The association is statistically significant, as confirmed by a Chi-square test ( $\chi^2 = 25.09$ ,  $p < 0.001$ ), indicating that the variation in prioritisation approaches across diversification levels is not random. The Cramér's V statistic of 0.17 indicates a meaningful but modest effect.

**Figure 16: Type of S3 priorities by level of economic diversification**

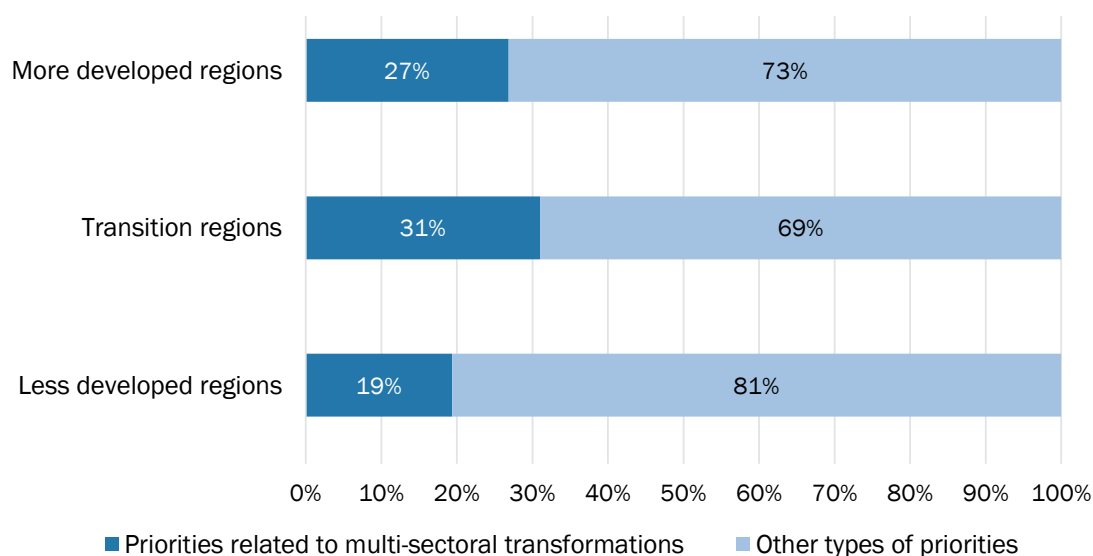
Source: Prognos AG/CSIL (2025), own elaboration based on the S3 priorities database. The economic diversification index is calculated from sectoral employment data (Eurostat).

The analysis also indicates that **regions classified as *in transition* are significantly more likely to select cross-sectoral, transformational S3 priorities** compared to *Less Developed Regions* (Figure 17). This pattern is supported by an econometric analysis, which shows a statistically significant association between transition region status and the selection of transformational priorities.<sup>18</sup> In contrast, *Less Developed Regions* are found to select such priorities less frequently. While the data also suggest that transformational priorities are more common in *More Developed Regions* than in *Less Developed Regions*, this finding is not consistently confirmed across all robustness checks and should therefore be interpreted with caution.

Moreover, no consistent or statistically significant associations were identified between the likelihood of selecting transformational priorities and other territorial characteristics, such as GDP per capita, regional innovation performance, quality of governance, or the level of ERDF funding allocated to research and innovation.<sup>19</sup> These findings suggest that regional development status – particularly being in transition – may play a more distinct role in shaping transformational priority selection than other broader economic or institutional indicators.

<sup>18</sup> Results from logistic regression models indicate that, compared to *Less Developed Regions*, *Transition Regions* have a statistically significant higher probability of selecting transformational priorities.

<sup>19</sup> Here is considered the budget allocation for Specific Objective 1.1 (Regulation (EU) 2021/1058, article 3).

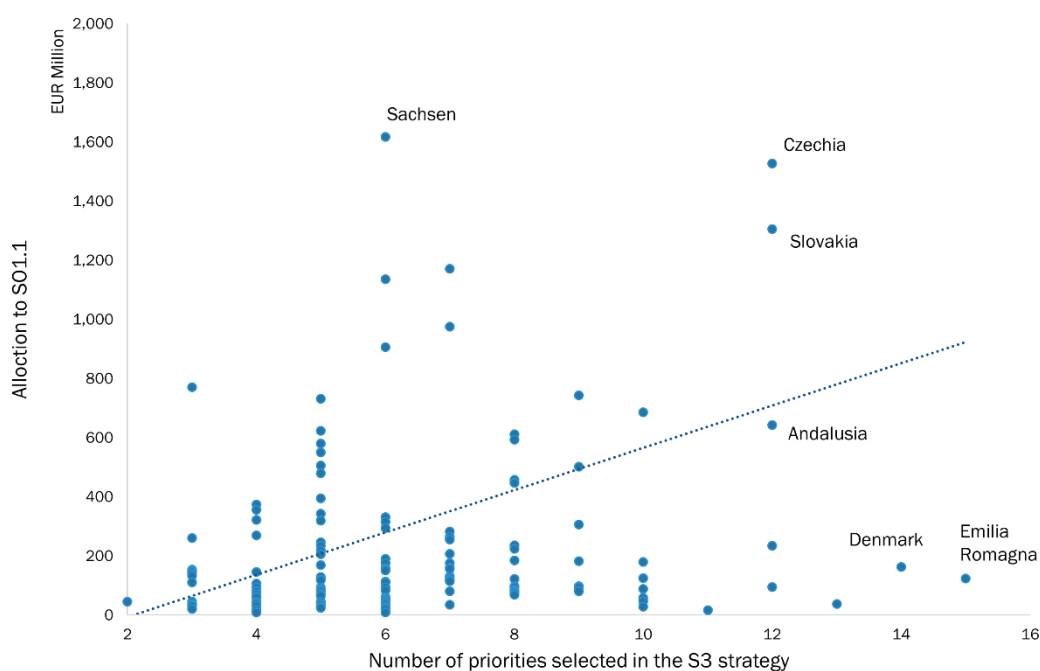
**Figure 17: Share of transformational priorities by type of region**

Source: Prognos AG/CSIL (2025), own elaboration based on the S3 priorities database.

**Ecosystem-oriented priorities represent a relatively small share of the total number of selected priorities, yet their distribution is consistent across all Cohesion Policy development categories.** In each category, these priorities account for a comparable proportion, ranging between 3% and 5% of total priorities. Despite their limited overall weight, the selection of ecosystem-focused priorities is not restricted to any specific type of region. They appear in smart specialisation strategies from both less developed and more developed territories and are present in strategies adopted at both national and regional levels (see Figure above). This suggests that, although not widespread, the orientation towards supporting innovation ecosystems could be shared across a diverse range of regions with varying structural characteristics and governance contexts.

The analysis also considered differences in terms of the allocation of ERDF funding for R&I. We found that the ERDF funding does not appear to correlate with the types of priorities selected, but rather with the total number of priorities chosen. Specifically, **Member States or regions that allocate a larger share of their ERDF budget to Specific Objective 1.1 in their programmes tend to select a greater number of priorities** in their S3. Statistical correlation analysis confirms this pattern, revealing a statistically significant association between the volume of allocated funding and the breadth of the priority mix.<sup>20</sup> As illustrated in Figure 18, however, notable variation exists among regions with similar funding levels. This suggests a significant degree of divergence in how regions structure their priority mix: some, such as Sachsen (Germany), adopt highly focused strategies despite substantial budgets, while others, like Emilia-Romagna (Italy), pursue broader sets of priorities even with more limited resources.

<sup>20</sup> The significance of the correlation is confirmed by Pearson ( $r = 0.24$ ,  $p = 0.003$ ) and Spearman ( $\rho = 0.22$ ,  $p = 0.007$ ) tests, indicating a modest but consistent correlation.

**Figure 18: Correlation between ERDF funding to R&I and number of S3 priorities**

Source: Prognos AG/CSIL (2025), elaboration based on the S3 priorities database. Note: For clarity of graphical representation, two outliers were excluded: Poland's national ERDF Smart Economy programme (13 priorities, EUR 7.3 bn) and Spain's Multiregional programme (6 priorities, EUR 4.8 bn).

In summary, the analysis highlights that regional differences in S3 prioritisation approaches are shaped by a combination of territorial characteristics, such as economic diversification and development status, as well as broader factors like ERDF funding allocations. **While some patterns emerge, significant variations persist that cannot be fully captured by simple indicators.** Additionally, it is important to note that this analysis does not account for the strategic orientation that regions may pursue, which also play a crucial role in shaping their specialisation priorities.

### 3.1.4 Mechanisms to favour S3-aligned ERDF investments in R&I

This section explores how national and regional authorities are translating S3 into tangible R&I investments through the ERDF. Drawing on survey findings and case study insights, the section identifies the range of tools and arrangements that support the operationalisation of S3 priorities.

In particular, the section focuses on three key aspects:

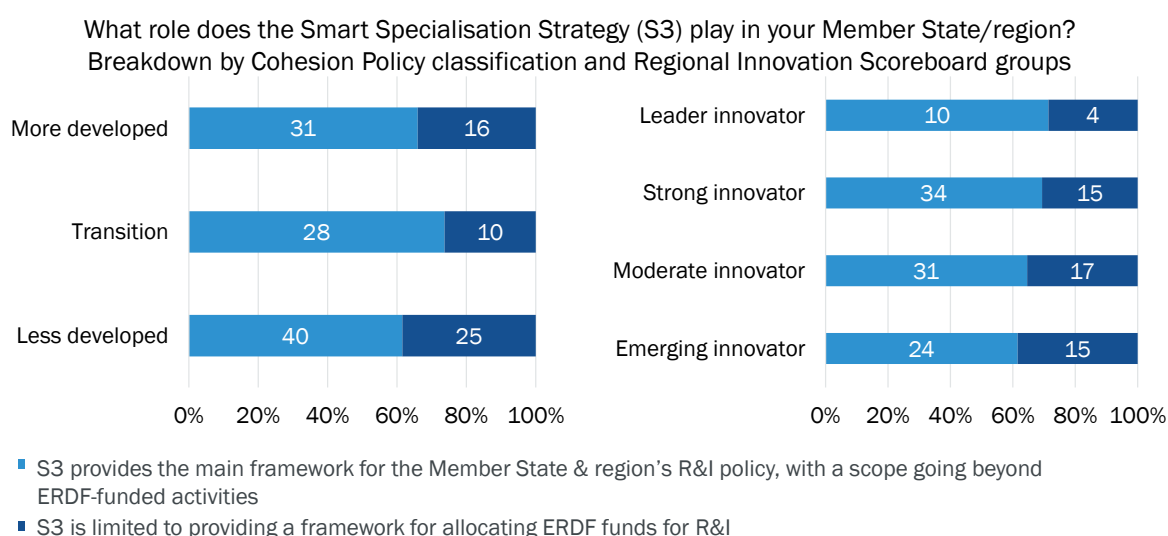
1. **The transition from strategic frameworks to actionable programmes** – including how authorities use mechanisms such as biennial or triennial action plans and work programmes to refine and implement S3 priorities in a flexible, responsive manner.
2. **The integration of S3 in the implementation phase** – detailing the specific mechanisms used to ensure alignment with S3, such as mandatory eligibility and selection criteria, dedicated calls for proposals, and governance structures that facilitate coherence between strategic priorities and ERDF-supported actions.

3. **The challenges faced by national and regional authorities in stimulating S3-aligned investments for R&I** and an analysis of how ERDF resources are allocated to capacity-building and skills development to address these barriers.

**From S3 strategic framework to actionable programmes**

**S3 generally serves as a key framework for research and innovation (R&I) in most Member States and regions.** Overall, 66% of survey responses indicate that S3 is recognised as more than just a strategic framework for allocating ERDF funds for R&I. In all categories of regions, based on economic development and innovation performance, the majority of respondents emphasised that S3 has a broader scope that extends beyond ERDF-funded activities (see Figure 19).

**Figure 19: Role of S3 in regional / national R&I strategy by type of region / Member State**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of survey respondents: Actors tasked with S3 coordination, ERDF programming and/or JTF implementation. Number of valid answers: 150 referring to 126 different national/regional strategies.

Stakeholder consultation (through both the survey and direct interviews) highlighted several mechanisms that support the transition from S3 as a strategic framework to concrete investments. A key mechanism identified across various regions where interviews were conducted (Lombardy, Austria, Extremadura, Slovakia, and Croatia) is the use of **biennial or triennial action plans or work programmes**. These instruments **help translate broad S3 strategies into more specific sub-priorities and actionable measures**. This additional planning layer, generally developed through a dynamic EDP involving ongoing stakeholder consultation, introduces essential flexibility. It allows regions to test the interest and responsiveness of beneficiaries, assess demand, and refine priorities over time. This mechanism is particularly valuable when S3 priorities are initially defined in broad terms and require further specification, or when a wide range of priorities has been identified, and it is decided to temporarily focus on a more limited set.

**Some regional and national authorities indicated that these action plans are inspired by the structure of Work Programmes under EU Framework Programmes for Research and Innovation.** They offer a flexible, phased approach to implementation that allows for periodic updates based on strategic focus, stakeholder input, and emerging opportunities. According to interviews, aligning S3 strategies with centrally managed

programmes such as Horizon Europe enhances the coherence of funding streams and facilitates the mobilisation of additional resources. In the case of Lombardy, regional authorities indicated that the “destinations” defined by the European Commission within Pillar II of Horizon Europe served as a starting point for identifying regional S3 priorities (see Info box 4). The alignment with Horizon Europe was positively received by industrial stakeholders, who viewed it as an opportunity to support the same projects through multiple funding sources.

**By enabling regular updates and adjustments, these action plans help ensure that S3 remain relevant in light of evolving regional needs and shifting policy environments.**

For example, the Strategic Technologies for Europe Platform (STEP), introduced in 2023 to steer investments in digital technologies and deep-tech innovation, clean and resource-efficient technologies, and biotechnologies, has already prompted the revision of 21 ERDF programmes by January 2025 (12% of the total). Other Managing Authorities are currently reviewing their existing priorities to assess alignment with the STEP technologies and to explore how their strategies can contribute to EU-level goals and take advantage of new funding opportunities made available to support these objectives. The flexibility embedded in well-functioning S3 frameworks, particularly those that allow for periodic refinements, has been key in facilitating this alignment. Further insights on the alignment between S3 strategies and STEP priorities are discussed in Section 3.2.1 of this report.

Regions such as Lombardy (Italy) and Lower Silesia (Poland) offer concrete examples of how this adaptive approach supports the continued relevance and responsiveness of S3. Similarly, Austria’s experience demonstrates how the use of action plans can help bridge the gap between high-level strategic intent and practical, on-the-ground implementation.

*i*

**Info box 4: Translating S3 into action: the role of Work Programmes in Lombardy's evolving context**

In Lombardy, the S3 serves as the overarching framework for guiding R&I investments throughout the seven-year programming period. Biennial Work Programmes (WPs) act as strategic documents that operationalise the S3 priorities, translating them into concrete actions.

The process for defining the Work Programmes begins with the selection of 27 **macro-themes**, directly inspired by the “destinations” identified by the European Commission Horizon Europe - Pillar II (Global Challenges and European Industrial Competitiveness).<sup>21</sup> In collaboration with regional stakeholders, particularly the Lombard Technology Clusters, the region validates and adapts these macro-themes to ensure their relevance to regional needs and strategic importance.

These macro-themes are then translated into **specific priorities** through stakeholder consultations, which serve as the foundation for targeted calls for proposals. Each priority is defined in terms of its **expected impacts**, explicitly linking the actions to broader regional benefits. For instance, under the macro-theme “Staying Healthy in a Rapidly Changing Society”, a specific priority has been developed around creating innovative models for sustainable food distribution. The expected impacts include reducing food waste, delivering both economic and environmental benefits, and raising public awareness about sustainability.

The entrepreneurial discovery process that underpins the definition of the WPs is repeated every two years, ensuring that both the WPs and the broader S3 framework are regularly updated. This approach maintains flexibility, enabling the integration of emerging needs and new opportunities arising from both local stakeholders (bottom-up) and higher-level

<sup>21</sup> <https://www.horizoneuropeni.com/pillar-two>.

initiatives and priorities (top-down). For example, the WP have recently been revised to incorporate the STEP technologies initiative, which was not initially foreseen in earlier versions of the strategic documents (see Box under Section 3.2.3 for further information on Lombardy's alignment between S3 and ERDF).

**i**

### **Info box 5: The role of the RTI Pacts in implementing and adapting Austria's R&I strategy to changing context conditions**

Austria's national S3 is integrated into the broader Research, Technology and Innovation (RTI) (in German Forschung, Technologie und Innovation - FTI) Strategy. This FTI framework provides the overarching direction for the country's research and innovation policy, while coordination with the Länder (regions) ensures alignment across Austria's federal structure.

A key tool for translating the RTI Strategy into operational action is the triennial FTI-Pakte (RTIPacts). These "rolling" agreements define specific objectives, allocate funding, and set performance and financing frameworks for universities, research institutions, and other actors. Updated every three years, the RTI Pacts provide a mechanism for regularly revising and adapting Austria's R&I and S3 priorities in light of new challenges, policy shifts, and evaluation results. Each new Pact is negotiated through an evidence-based process, informed by the RTI Monitor and the mid-term evaluation of the strategy, and involves consultations with both federal and regional stakeholders. This structured updating process enables Austria to maintain strategic flexibility while ensuring continuity and coherence across levels of governance.

The latest Pact (2024-2026) reflects a broader set of challenges compared to the 2021-2023 cycle.<sup>22</sup> While the previous Pact focused primarily on climate change and digitalisation, with early efforts to align with Horizon Europe and the European Green Deal, the new Pact expands its scope to address emerging pressures, such as the energy crisis, the war in Ukraine, supply chain disruptions, inflation, and declining public trust in science and democracy. Priorities were updated accordingly to address the new challenges and to ensure alignment with sector-specific national and European strategies that were introduced after the preparation of the first Pact. As an example, the RTI Pact 2024–2026 refers to the "creation of a strong hydrogen ecosystem" to support the energy transition and the implementation of the 2022 national hydrogen strategy. The green transition remains a central pillar. Moreover, alignment with European initiatives – including the Recovery and Resilience Facility, Horizon Europe, and the European Research Area – is further reinforced. This demonstrates how the Pacts are used as a dynamic instrument to ensure alignment with changing context conditions, allowing Austria's R&I strategy to remain responsive and forward-looking.

### **Ensuring alignment with S3 priorities in the implementation phase**

The integration of S3 into the implementation of ERDF programmes is a key aspect for the successful realisation of S3. It requires mechanisms to steer ERDF support towards investments that deliver on the S3 priorities. In line with Article 73 of the Common Provisions

<sup>22</sup> [RTI Pact 2021-2023](#) & [RTI Pact 2024-2026](#).

Regulation<sup>23</sup>, Managing Authorities must apply selection criteria that ensure operations are consistent with Smart Specialisation Strategies and effectively contribute to the specific objectives of the programme and “that selected operations which fall within the scope of an enabling condition are consistent with the corresponding strategies and planning documents established for the fulfilment of that enabling condition”.

Evidence from the survey has highlighted that the **following tools are generally used to ensure alignment with S3 in measures** under Specific Objectives 1.1 and 1.4:

- **Mandatory eligibility criteria:** These are formal mechanisms used to ensure alignment with S3 priorities, mentioned by 20% of survey respondents originating from 10 Member States/regions. For a project to be considered eligible for funding, it must be aligned with the S3 priorities. For instance, in Molise (Italy), only projects developed within the regional S3 domains (such as agri-food, biotechnology, and smart manufacturing) are eligible for ERDF funding under SO 1.1 and SO 1.4. In North-East Romania, calls for proposals only accept projects included in the S3 project portfolio, which has been previously validated through the EDP. This ensures not only technical alignment but also strategic relevance. In the Azores (Portugal), mandatory alignment of project proposals under SO 1.1 is assessed through a structured assessment methodology, using the Quantitative Alignment Indicator, which scores proposals from 0 to 100 based on several sub-criteria. These include alignment with priority areas, cross-cutting areas, lines of action, transformative areas, SDG contributions, innovation potential, and result exploitation. This methodology also applies to projects funded under the ESF+ within Policy Objective 4 (RSO 4.f), particularly for advanced training initiatives such as PhD scholarships.
- **Dedicated calls for proposals targeting S3 priority areas:** Similar to mandatory eligibility criteria, these calls represent another mechanism for ensuring alignment with S3. They are mentioned by 42% of survey respondents, originating from 21 Member States/regions. Unlike general funding schemes, they are specifically designed and targeted to support projects that align with S3 priorities, thereby ensuring that investments are focused on the strategic areas outlined in the S3. For instance, in Calabria (Italy), targeted calls have been launched to support R&I partnerships between SMEs, research organisations, and large enterprises, as well as innovative startups. These calls are directly linked to the regional S3, aiming to boost the innovation ecosystem and foster high-potential projects within the smart specialisation domains. In the Basque Country (Spain), the Hazitek programme supports industrial R&I projects in strategic sectors aligned with the PCTI 2030 (regional science and technology plan), which mirrors the S3. This includes fields like electric mobility, healthy ageing, and the circular economy, ensuring systemic integration of ERDF and S3 objectives.
- **Preferential selection criteria:** Preferential selection criteria are a softer tool compared to the previous two, and it is widely used by Managing Authorities. It is mentioned by majority of respondents in the survey – 88%, originating from 44 Member States/regions. This approach gives priority to projects that align with the S3 priorities but does not necessarily exclude projects that do not fully align. It may take the form of additional award points or higher aid intensity, offering a financial incentive to projects that are more closely aligned with the S3 priorities. For instance, in Wallonia (Belgium), project selection includes a specific criterion rewarding contributions to at least one of the five S3 themes. This criterion boosts the chances

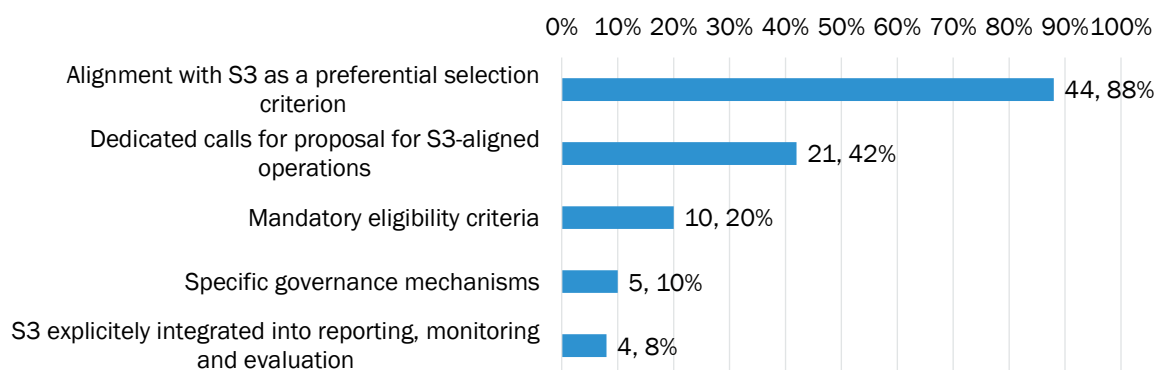
<sup>23</sup> Regulation (EU) 2021/1060 of the European Parliament and of the Council of 24 June 2021 laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Just Transition Fund and the European Maritime, Fisheries and Aquaculture Fund and financial rules for those and for the Asylum, Migration and Integration Fund, the Internal Security Fund and the Instrument for Financial Support for Border Management and Visa Policy.

of success for aligned projects without making S3 alignment an outright eligibility requirement. In several Polish regions, invitations to submit applications for ERDF support clearly state that bonus points are awarded to projects falling within the core S3 domains, reflecting the regional specialisation areas. In France, particularly regions with recently updated S3 strategies, project scoring systems are built around S3 compliance, with aligned projects receiving enhanced evaluation scores.

**Five regions report the existence of specific governance mechanisms designed to strengthen linkages between different stages of the policy cycle**, particularly between the actors involved in designing the S3 strategy and the programme’s managing or implementing authorities. These mechanisms refer to both structures and processes that ensure coherence between the S3 and ERDF programme implementation. Examples include the use of dedicated coordination units, structured involvement of innovation councils, and validation procedures carried out by regional clusters or thematic working groups to align project selection with S3 priorities. For a more detailed discussion on governance and coordination mechanisms deployed in S3 processes, see Section 3.3.

**Other four regions report that alignment with the S3 is explicitly integrated into reporting, monitoring, and evaluation mechanisms**, providing a structured way to ensure that investments remain coherent with regional innovation priorities. These mechanisms help track how effectively the selected operations contribute to S3 objectives and provide evidence for continued strategic coherence across the policy cycle (see further discussion on the monitoring and evaluation models used to assess progress in the S3 objectives or fields of action in Section 3.6).

**Figure 20: Mechanisms ensuring alignment of ERDF investments with S3 priorities under Specific Objectives 1.1 and 1.4 – survey results**



*Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Types of respondents: Actors tasked with S3 coordination, ERDF programming, and/or JTF implementation. Multiple response options were allowed. Number of answer: 50, representing 46 different national/regional strategies. The chart shows the absolute number of responses and the share of each option relative to the total number of 50 responses.*

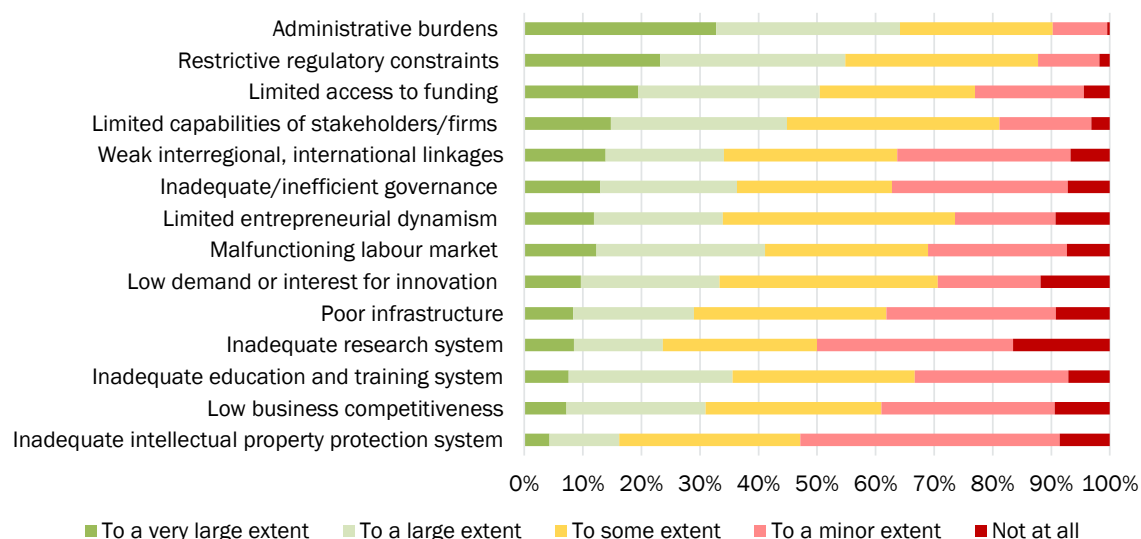
### Capacity building for smart specialisation: analysis of funding allocations

**Implementing investments aligned with the S3 can be hindered by various barriers.** More than half of the survey participants consider administrative burdens, regulatory constraints, and limited access to funding as the main bottlenecks, followed by low stakeholder capabilities, weak interregional linkages, inefficient governance and limited entrepreneurial dynamism (see Figure 21). Importantly, these challenges are common across all types of regions, including both More and Less Developed ones, as well as regions with varying innovation performance (see Table 9). Certain barriers tend to be more

pronounced in specific regional contexts. For example, inadequate research systems, malfunctioning labour markets, insufficient education and training systems, limited firm capabilities, and low demand or interest in innovation are more frequently reported by respondents from emerging and Less Developed Regions.

**Figure 21: Bottlenecks in innovation and industrial ecosystems which affect the implementation of S3 investments – survey results**

D1: What are the main bottlenecks in your innovation and industrial ecosystem, which affect the implementation of S3 investments?



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Type respondents: all. Number of valid answers ranging from 210 to 228, referring to 120-131 Member States and regions depending on the type of bottleneck.

**Table 9: Share of respondents indicating bottlenecks affecting S3 implementation to a very large extent or to a large extent by RIS classification and Cohesion Policy classification**

| Bottlenecks affecting S3 implementation            | RIS classification |        |          |          | Cohesion Policy classification |            |                | Type of respondent                                   |                    |
|--|--------------------|--------|----------|----------|--------------------------------|------------|----------------|--|--------------------|
|  | Leader             | Strong | Moderate | Emerging | More developed                 | Transition | Less developed | ERDF Managing Authorities or S3 coordinators or body | Other stakeholders |
| Administrative burdens                             | 50%                | 54%    | 70%      | 70%      | 62%                            | 59%        | 67%            | 59%  | 74%                |
| Inadequate education and training system           | 31%                | 18%    | 38%      | 55%      | 23%                            | 25%        | 51%            | 33%  | 40%                |
| Inadequate intellectual property protection system | 15%                | 9%     | 14%      | 29%      | 13%                            | 6%         | 25%            | 13%  | 23%                |
| Inadequate research system                         | 6%                 | 17%    | 22%      | 40%      | 12%                            | 23%        | 33%            | 23%  | 24%                |
| Inadequate/inefficient governance                  | 20%                | 21%    | 43%      | 49%      | 26%                            | 30%        | 46%            | 30%  | 50%                |
| Limited access to funding                          | 44%                | 47%    | 55%      | 49%      | 51%                            | 48%        | 51%            | 47%  | 57%                |
| Limited capabilities of stakeholders / firms       | 40%                | 33%    | 40%      | 66%      | 37%                            | 35%        | 56%            | 44%  | 46%                |
| Limited entrepreneurial dynamism                   | 25%                | 24%    | 35%      | 46%      | 24%                            | 29%        | 43%            | 32%  | 39%                |
| Low business competitiveness                       | 19%                | 17%    | 39%      | 44%      | 19%                            | 21%        | 47%            | 33%  | 26%                |

|  |            |            |            |            |            |            |            |            |            |
|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Low demand or interest for innovation      | 19%        | 21%        | 32%        | 54%        | 23%        | 30%        | 43%        | 35%        | 29%        |
| Malfunctioning labour market               | 33%        | 23%        | 53%        | 51%        | 28%        | 33%        | 57%        | 37%        | 49%        |
| Poor infrastructure                        | 25%        | 16%        | 32%        | 43%        | 22%        | 20%        | 40%        | 27%        | 34%        |
| Restrictive regulatory constraints         | 60%        | 49%        | 60%        | 56%        | 62%        | 41%        | 59%        | 52%        | 61%        |
| Weak interregional, international linkages | 20%        | 21%        | 40%        | 44%        | 26%        | 31%        | 40%        | 31%        | 41%        |
| <b>Grand Total</b>                         | <b>29%</b> | <b>27%</b> | <b>41%</b> | <b>50%</b> | <b>31%</b> | <b>31%</b> | <b>47%</b> | <b>36%</b> | <b>42%</b> |

Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Type respondents: all. Number of valid answers ranging from 210 to 228, referring to 120-131 Member States and regions depending on the type of bottleneck.

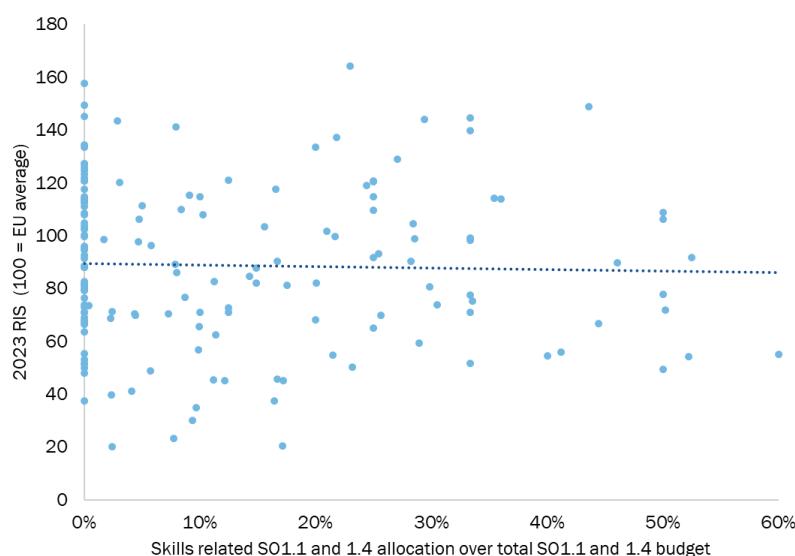
Overall, while regional differences exist, the data underline that many structural and systemic challenges affecting S3 implementation are broadly shared across regions. **This underscores a persistent need for targeted capacity-building and support measures.** Interviews with stakeholders from various EU regions confirm diverse capacity-building needs, reflecting differing institutional maturities and implementation challenges:

- **Greece:** While past capacity-building efforts, such as participation in the TAIEX programme, have been valuable, current needs remain substantial. National authorities acknowledge “different speeds and levels” of institutional capacity across regions. Ongoing challenges include ensuring consistent quality in S3 implementation across all regions, improving coordination between national and regional levels, and enhancing the capacity of smaller regions, particularly those without strong academic or research institutions.
- **Lower Silesia (Poland):** Emphasised the need for training and upskilling among S3 implementation teams, citing a lack of integration between national and regional strategies. Capacity building is also needed to better align S3 with other strategic frameworks such as well as for workforce upskilling.
- **Lombardy (Italy):** Despite relatively stronger administrative structures, capacity remains a challenge. The region has developed targeted training programmes (e.g., PRIGA) for administrative staff, with “competences” seen as a persistent bottleneck. At the business level, capacity building remains a key reform area.
- **Brandenburg (Germany):** Stressed the importance of effective intermediaries who can engage with firms, especially SMEs. Challenges such as limited access, time constraints, and barriers to interregional collaboration suggest the need for tailored support measures to strengthen regional innovation networks.
- **Extremadura (Spain):** Initially lacked internal expertise for effective S3 monitoring and had to bring in external specialists, pointing to a need for building internal analytical and strategic planning capacities.
- **Hungary:** Reported underperformance of institutional structures central to EDP (e.g., Territorial Innovation Platforms), highlighting the need for strengthened inter-institutional coordination and capacity to mainstream S3 objectives across policy areas.
- **Wallonia (Belgium):** While resource levels were considered adequate, regional actors noted that flexible support in the design and potentially in the implementation of reforms could still provide added value.

These examples support the view that capacity-building needs are not confined to less developed or less innovative regions, but extend across a broad spectrum of regional contexts. This reflects the diverse challenges related to institutional maturity, coordination, and stakeholder engagement experienced throughout the EU. However, it is important to question whether less innovative or Less Developed Regions, where institutional and absorptive capacities may be more limited, allocate a greater share of ERDF resources to capacity-building measures, or whether such investments are equally relevant across all types of regions. To explore this, we analysed the volume and share of ERDF and ESF funding programmes dedicated to institutional capacity and skills development.

Our analysis of the 2021-2027 ERDF programmes budget (cut-off date January 2025) reveals **no systematic correlation between regional innovation performance or development levels and the share of ERDF funding allocated to skills and capacity-building measures aligned with S3 priorities** (see Figure 22). The analysis focused on SO 1.4, which is fully dedicated to skills development for S3, as well as relevant policy measures under SO 1.1 that are linked to skills and capacity-building activities.<sup>24</sup> The results suggest that the decision to allocate ERDF resources to skills and capacity-building activities aligned with S3 priorities is not (solely) driven by regional innovation performance or the level of development. However, these findings do not definitively exclude the possibility that territories with lower allocations have still invested in skill development measures. Such investments may occur through other SOs that are not directly linked to S3, or they may be supported by complementary national or EU programmes and funding instruments. This could explain the observed differences in allocations even among regions with similar innovation scores.

**Figure 22: Share of ERDF funding allocation for skills and capacity building by Innovation Scoreboard score**



Source: Prognos AG/CSIL (2025), elaboration based on EC Cohesion Open Data platform available at: [https://cohesiondata.ec.europa.eu/2021-2027-Categorisation/2021-2027-Planned-finances-detailed-categorisation/hgyj-gyin/about\\_data](https://cohesiondata.ec.europa.eu/2021-2027-Categorisation/2021-2027-Planned-finances-detailed-categorisation/hgyj-gyin/about_data). Note: this figure considers only ERDF programmes that have allocations for SO 1.1 and/or 1.4.

<sup>24</sup> Data retrieved from Cohesion Data platform available at: [https://cohesiondata.ec.europa.eu/2021-2027-Categorisation/2021-2027-Planned-finances-detailed-categorisation/hgyj-gyin/about\\_data](https://cohesiondata.ec.europa.eu/2021-2027-Categorisation/2021-2027-Planned-finances-detailed-categorisation/hgyj-gyin/about_data). The identification of policy measures supporting skills development and capacity building under SO 1.1 was based on the policy inventory developed in this study, which extracted and analysed all ERDF programme measures (see methodology in Annex 4). We included in this analysis all policy measures under SO 1.1 whose descriptions referred to objectives such as “Skill development”, “Administrative capacity building”, and “Capacity building for innovation in business”.

Moreover, as also illustrated in Figure 22 above, **there is considerable variation in the amount allocated by ERDF programmes to skills-related activities under SO 1.1 and 1.4.** This variation is notable even among regions with similar innovation performance. It can be attributed to three underlying factors.

- **Broader support for skills development and administrative capacity building within the ERDF programmes:** Support for skills development and capacity building is not confined to SO 1.1 and SO 1.4 within ERDF programmes. Additional investments may be channelled through other SOs within the same programmes. For instance, several Italian regions, as well as Brittany (France) and the Flemish Region (Belgium), have included policy measures under SO 2.1 that focus on energy efficiency and emissions reduction, which address skills development for workers in sectors affected by the green transition. These measures also support capacity-building initiatives aimed at strengthening public administrations' ability to design and implement ERDF projects in the environmental domain. Furthermore, many measures targeting skills development are planned under Policy Objective 4,<sup>25</sup> which focuses on improving labour market participation, lifelong learning, and education systems.
- **Coordination with national or multi-regional ERDF programmes:** Some regional programmes may have deliberately avoided allocating funding to skills development and capacity-building measures to prevent overlap with national or multi-regional programmes that already address these priorities. For example, many Greek regions do not include policy measures targeting skills or capacity-building objectives in their regional ERDF programmes. However, these themes are addressed at the national level through the "Competitiveness – ERDF/ESF+" programme, which allocates funding to policy instruments aimed at enhancing skills development and administrative capacity.
- **Support through other EU funds:** Support for skills development can also be delivered through other EU funds, particularly the European Social Fund (ESF), which plays a key role in human capital development. Some ERDF programmes that do not allocate resources to skills and capacity-building under SO 1.1 and 1.4 are associated with regions that receive ESF funding for human capital development. To further explore the role of Cohesion Policy in supporting skills development, we conducted an exploratory analysis of ESF programmes to assess whether regions with ERDF programmes that do not invest in these objectives also have corresponding ESF allocations. Although a direct comparison between ERDF and ESF objectives is not possible due to thematic differences, the data show that regions without ERDF allocations for skills and capacity policy instruments have planned ESF investments in human capital development. A notable example is Cyprus, which does not allocate ERDF resources to skills-related activities under SO 1.1 and 1.4, but does have an ESF budget dedicated to related objectives in the area of skills and capacity building.

**This analysis highlights the multifaceted nature of funding allocations for skills and capacity building,** underscoring that regional investments may be supported through a combination of ERDF, ESF, and national programmes, with no clear pattern of allocation based solely on innovation or development scores.

Moreover, it should be noted that targeted funding to capacity building measures alone may not be sufficient. Addressing persistent bottlenecks, such as weak governance, inadequate research and training systems, or low stakeholder capabilities, may require broader

<sup>25</sup> Policy Objective 4 a more social and inclusive Europe implementing the European Pillar of Social Rights as defined in Article 3 Regulation (EU) 2021/1058.

structural reforms. **While capacity-building measures play a key role, complementary reforms in areas such as administrative efficiency, education and training, or governance (notably strategic coordination) can be critical for enabling effective S3 implementation.** This is particularly relevant in regions with more limited institutional maturity, but it is also echoed across More Developed Regions facing implementation gaps or coordination challenges. These issues are further discussed in Section 3.5.

## 3.2 Smart specialisation and its role for industrial transformation

### KEY FINDINGS ON S3 AND INDUSTRIAL TRANSFORMATION

- **All interviewees consistently indicate that S3 are conceived as a crucial policy tool for supporting industrial transformation across the EU (Section 3.2.1).** All types of S3 priorities can contribute to industrial transformation in different ways, by fostering innovation and specialisation within specific sectors, addressing cross-cutting societal challenges or industrial transformation goals (such as the twin transition), and supporting ecosystem development, capacity-building, and enabling conditions across regions.
- **Regions have distinct industrial transformation needs based on their level of development and capacity for innovation.** An analysis of ERDF measures related to industrial transformation and referencing S3 reveals varying regional priorities, with Less Developed Regions focusing more on diversification and workforce support and More Developed Regions prioritising firm growth and risk-taking investments. It is important to note that the ERDF is just one source of funding, alongside other EU, national and regional funds which also play a significant role in shaping these regional transformation strategies (see Section 3.2.2).
- **The document analysis shows that S3 is referenced in 51% of the 183 ERDF programmes, which are spread across various Specific Objectives (SOs), not just R&I-focused SOs 1.1 and 1.4.** S3 is mentioned most frequently in relation to SME competitiveness, STEP technologies, digitalisation and quality employment. Different regions apply tailored mechanisms for aligning funding with S3 priorities, such as preferential conditions and dedicated calls (Section 3.2.3), reflecting diverse approaches to fostering industrial transformation.
- **The alignment between S3 priorities and the STEP initiative is strong.** Many regional S3 strategies already address areas that align with STEP's technology domains, even before the initiative was formally adopted. Where reprogramming has been undertaken, or is being undertaken, to include specific STEP objectives, the S3 framework proves to be a key tool in guiding regional focus and enabling regions to concentrate on areas where their local strengths intersect with STEP's technological priorities. However, challenges remain in fully integrating STEP objectives into ERDF programmes. These include difficulties in engaging large enterprises, governance issues and regulatory barriers (see Section 3.2.4).

- **A strong alignment exists between S3 priorities and Territorial Just Transition Plans (TJTPs).** 80% of TJTPs either explicitly reference S3 alignment or focus on sectors closely related to S3 priorities. These sectors include environment, clean technologies, and energy. This highlights the significant potential for integrated strategies in regional industrial transformation and transition. Although shared governance mechanisms and S3-aligned selection criteria help to ensure alignment during implementation, governance fragmentation can hinder the achievement of full coherence (see Section 3.2.5).

**Over the last decade, despite various strategies to boost growth rates, the downward trend in European competitiveness has persisted, underscoring the urgency of reigniting sustainable growth in Europe.**<sup>26</sup> The Single Market must be regarded as an ongoing project, requiring updates and alignment with the EU’s current vision to remain relevant and effective (Letta, 2024). Meanwhile, the EU continues to lose the global innovation race to the United States and China, finding itself trapped in a ‘middle-tech trap’ – a position where it struggles to compete in both cutting-edge and mass-market technologies.<sup>27</sup> Despite Cohesion Policy has historically grappled with regional imbalances and the tensions between promoting competitiveness and convergence<sup>28</sup>, many regions remain unable to benefit from current economic developments, while others dominate and ‘take it all’.<sup>29</sup>

**At the start of the current programming period, the new EU industry policy (COM 2020 120) and its Update (COM 2021 350) published after the burst of the Covid-19 crisis seek to raise competitiveness and spur growth** by taking a world-wide lead in de-fossilised and other environment-friendly solutions through a transition to a green mode of producing and consuming goods and services, as well as by transiting to digitalised economic, social and civil activities, while raising its strategic autonomy and resilience against adverse impacts of unforeseeable events on its economic, social and security conditions or strategic dependencies on third countries. The strategy includes the objective that the twin transition in resilience “must ensure that no one is left behind”, notably regions with heavy negative consequences on their industrial tissue. Pushing further the implementation of this strategy, the more recent communication on the **Competitiveness Compass (COM 2025 30)** sets out the agenda of ongoing and future policy initiatives along three pillars: closing the innovation gap with other major economies; a joint plan for decarbonisation and competitiveness; reducing excessive dependencies and increasing security. Under the second pillar, the **Clean Industrial Deal (COM 2025 85)** aims at strengthening the business case for competitiveness and decarbonisation in Europe with a particular focus on energy intensive industries and clean technology sectors. In particular,

<sup>26</sup> Draghi, M. (2024). The future of European competitiveness: A competitiveness strategy for Europe. Report prepared for the European Commission. [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_24\\_4932](https://ec.europa.eu/commission/presscorner/detail/en/ip_24_4932); European Commission (2024). Align, act, accelerate: Research, technology and innovation to boost European competitiveness. Publications Office of the European Union. <https://doi.org/10.2777/9106236>

Letta, E. (2024). Much more than a market: A new approach to the single market. Report prepared for the European Council. <https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>

<sup>27</sup> Fuest, C., Gros, D., Mengel, P.-L., Presidente, G., & Tirole, J. (2024). EU innovation policy: How to escape the middle-technology trap? A Report by the European Policy Analysis Group. <https://www.ifo.de/en/econpol/publications/2024/working-paper/eu-innovation-policy-how-escape-middle-technology-trap>; European Commission (2024). Align, act, accelerate: Research, technology and innovation to boost European competitiveness. Publications Office of the European Union. <https://doi.org/10.2777/9106236>

<sup>28</sup> Molica, F., Santos, A. M., and Conte, A. (2024). Measuring achievements: Can cohesion policy programmes effectively monitor their performance? European Commission.

<sup>29</sup> Balland, P.-A., and Boschma, R. (2024). Pathways of regional diversification: Connecting the relatedness and complexity approaches. *Regional Studies*; Diemer, A., Iammarino, S., and Rodríguez-Pose, A. (2022). Development traps in EU regions. *Regional Studies*, 56(6), 897–915.

it announces actions to improve access to affordable energy, lead markets, public and private investments, materials and resources, global markets and international partnerships, skills and quality jobs.

**These transitions differ across regions and build on the specific needs, capabilities and aspirations of each region.** Indeed, depending on their educational, research and economic tissue and thus their knowledge and technological endowment, their economic transformation process might shape in a diverse way. While the EU is adapting the framework for jobs, growth and innovation, most policy instruments to attain these objectives are available on the national and regional level, adapted to the specific national and regional conditions, rather than applying a one-size-fits-all approach. To this purpose, the EU provides the means to Member States and regions to cater for their specific transformation needs in partnership through smart specialisation (COM 2017 479).

**Several initiatives have been designed to support investments that strengthen technological development and uptake and address regional transformational needs.** For instance, reforms and investments in Recovery and Resilience Plans and Country Specific Recommendations addressing technological development. As well, to facilitate the green and digital transformation within the fourteen European Industrial Ecosystems, Transition Pathways have been developed between 2021 and 2025. These are strategic plans co-created with industry stakeholders, public authorities, and social partners to outline the necessary actions, investments, and policy measures required for each ecosystem to achieve sustainability, digitalisation, and resilience. The Just Transition Mechanism, established in 2021 as part of the European Green Deal, aims to ensure no person or region is left behind in the transition to a climate-neutral economy. This mechanism has been implemented through national just transition plans that identify areas most at risk. More recently, the Strategic Technologies for Europe Platform (STEP) was launched in 2024 to boost investments in critical technologies. STEP mobilises and directs funding from 11 EU programmes towards three target investment areas: digital technologies and deep-tech innovation, clean and resource-efficient technologies, and biotechnologies.

To de-risk through public funding specific industrial investment in decarbonisation and in the development of clean solutions, the Clean Industrial Deal puts forwards concrete initiatives, such as the increase in Invest EU's financial guarantees, the Industrial Decarbonisation Bank or additional EIB financial tools. As a key initiative under the Clean Industrial Deal, the Clean Industrial State Aid Framework (CISAF) for adoption by mid-2025 will facilitate Member States support for the deployment of renewable energy, manufacturing of clean technologies and industrial decarbonisation projects in line with EU industrial policy priorities.

**Against this background, this study has examined the role of S3 in strengthening industrial transformation objectives and supporting regional economic growth.** While alignment with broader industrial transformation goals is not required by Regulation, this study explores whether and how such alignment is being pursued in practice. It is important to note that the policy framework is continuously evolving, and adjustments between S3 strategies and ERDF programmes may still be underway and not yet fully visible.

This section is structured as follows:

- Section 3.2.1 explores how R&I and industrial transformation goals are interconnected, starting from the formulated S3 priorities.
- Section 3.2.2 considers the ERDF programmes and analyses the role that S3 plays in driving industrial transformation investments beyond R&I. In particular, it examines which measures are programmed to contribute to industrial

transformations across different types of EU regions, and the extent to which they explicitly reference S3 strategies.

- Section 3.2.3 investigates the mechanisms in place to ensure alignment between S3 and the Strategic Technologies for Europe Platform (STEP) objectives.
- Sections 3.2.4 and 3.2.5 then provide an in-depth analysis of the alignment between ERDF programmes, STEP initiatives, and the Territorial Just Transition Plans (TJTPs). They examine the degree and mechanisms of alignment with S3 priorities, as well as the challenges in ensuring coherence across these frameworks.

### 3.2.1 S3 priorities for industrial transformation

This section analyses how S3 priorities are being formulated to support broader industrial transformation goals. An AI-assisted analysis of 29 interview transcripts indicates that **all interviewees indicate that Smart Specialisation Strategies are conceived as a crucial policy tool for supporting industrial transformation across the EU**. The interviews consistently highlighted the value of S3's place-based approach, which ensures that strategies are rooted in the specific characteristics of each region. This regional grounding enables S3 to respond effectively to diverse development trajectories by identifying and leveraging existing or emerging strengths. According to the interviewees, this allows regions to pursue industrial transformation in ways tailored to their own resources, opportunities, and challenges, rather than adhering to a one-size-fits-all model.

Moreover, stakeholders pointed to the essential role of R&I in driving technological progress, nurturing innovation ecosystems, and fostering knowledge diffusion. Several interviewees<sup>30</sup> emphasised that R&I investments enhance the absorptive capacity of regions, by promoting collaboration, skills development, and the emergence of new industries. These views align with arguments advanced by.<sup>31</sup> **Through this dual emphasis on regional specificity and innovation, the interviews suggest that S3 offer a coherent and adaptive framework for regions to pursue transformation strategies that reflect both their current assets and future potential.**

*i*

#### Info box 6: Industrial transformation in EU regions: insights from the literature

**Industrial transformation is a complex, ongoing process involving structural shifts in both production and consumption**, driven by digitalisation, automation, AI, and clean technologies (Dosi & Nelson, 2010; Perez, 2010; Autor, 2015; OECD, 2017, 2019; Acemoglu & Restrepo, 2019). These changes are influenced by supply- and demand-side dynamics, such as technological progress, labour trends, and consumer preferences.

**The pace and nature of transformation vary widely across EU regions**, shaped by local capabilities, institutional quality, and global pressures. While more advanced regions can leverage strong innovation ecosystems, Less Developed Regions often rely on technology diffusion and face higher risks of stagnation (Martin & Sunley, 2006; Verspagen, 2010; Martin, 2010; Diemer et al., 2022).

<sup>30</sup> In Brandenburg, Croatia, Emilia-Romagna, Upper Austria, Hungary, Northern Netherlands, Greece, and Slovakia.

<sup>31</sup> Foray D. (2015). Smart Specialisation: Opportunities and Challenges for Regional Innovation Policy. Routledge Taylor & Francis Group. London; European Commission (2020). Regions in Industrial Transition. [https://ec.europa.eu/regional\\_policy/sources/studies/regions\\_indust\\_trans\\_en.pdf](https://ec.europa.eu/regional_policy/sources/studies/regions_indust_trans_en.pdf)

**Some regions are “trapped” in low-growth trajectories**, struggling with high production costs, low innovation, and weak institutions (Iammarino et al., 2020; Diemer et al., 2022; Rodríguez-Pose et al., 2023). This leads to persistent underperformance and declining competitiveness.

**The green and digital transitions could exacerbate these divides**, as regions with greater “readiness” in skills, infrastructure, and governance are more likely to benefit (Maucorps et al., 2022). Meanwhile, others risk being left behind as carbon pricing and automation favour already prosperous areas (Rodríguez-Pose & Bartalucci, 2024). These dynamics threaten to reinforce a two-speed Europe, where some regions accelerate towards high-value, sustainable growth while others face a deepening spiral of decline (Dijkstra et al., 2020; McCann, 2020; McCann & Ortega-Argilés, 2021).

**The various types of S3 priorities**, as discussed in Section 3.1, **play a pivotal role in driving industrial transformation by targeting specific sectors, societal challenges, broad technological domains, and innovation ecosystems**. This is particularly evident in regions that have identified ecosystem-related or industrial transformation priorities. These interventions focus on enhancing industrial competitiveness through skills development, modern infrastructure for advanced manufacturing, digital connectivity, supply chain digitalisation, and the adoption of cleaner production methods and sustainable practices. Such priorities are cross-sectoral, impacting multiple industries and technologies, with broad implications for labour markets, education systems, and regional innovation performance, ultimately driving competitiveness across sectors.

The analysis of S3 priority typologies, presented in Section 3.1.2, shows that, during the 2021-2027 programming period, many regions are moving beyond traditional, sector-specific innovation goals. Instead, they are framing their strategies around these broader objectives, such as industrial restructuring, capacity-building, and ecosystem development. This shift reflects a growing recognition of the strategic role S3 plays in addressing complex regional transitions and enabling more systemic industrial transformation.

**Sectoral or technology-specific priorities**, which account for 45% of individual S3 priorities, **along with priorities focused on broader societal challenges, are also crucial for fostering specialisation and value chain development**. These priorities support innovation and technological advancement within distinct economic sectors or interconnected sets of sectors. Many of these technology-specific priorities are aligned with the European twin transition goals or target technology areas that were later identified as critical to EU competitiveness, resilience, and strategic autonomy under the STEP initiative (see Section 3.2.4 for further details on the alignment between S3 and STEP).

Overall, whether through cross-sectoral industrial transformation priorities or sector-specific technological priorities linked to these transitions (such as information and communication technologies, environmental technologies, and clean, resource-efficient technologies), every S3 strategy incorporates at least one priority area aligned with the twin transition objectives or the STEP initiative.

**i**

### Info box 7: Wallonia's S3 as a strategic framework for guiding innovation and industrial policy

In Wallonia, the S3 has been conceived and implemented as a genuinely strategic framework, extending beyond the programming of R&I investments and the allocation of ERDF resources.

It is explicitly designed to guide the region's broader innovation and industrial policy, serving as a reference point for multiple public actors and policy instruments. The strategy is integrated with wider regional priorities, including the digital transition, energy and climate policy, and industrial modernisation. Its influence is also evident in areas such as the programming of national and regional recovery plan, as well as in the implementation of initiatives like the "hydrogen strategy" and support for strategic ecosystems.

The strategy also serves as a common orientation for various regional tools, such as competitiveness clusters (*pôles de compétitivité*), skills development initiatives, and internationalisation programmes. Public agencies have progressively aligned their activities with the strategy, not through legal obligations, but by incorporating its rationale into their own planning and operations.

*Source: Prognos AG/CSIL (2025), Interviews with Wallonia S3 coordination body.*

Some illustrative stakeholder interviews with representatives of S3 coordination authorities, ERDF managing authorities, and implementing bodies indicate that, **in certain regions, S3 are increasingly being used as broader policy frameworks for innovation and economic development**. In these cases, S3 appear to extend beyond their initial role linked to ERDF investments in R&I, contributing instead to regional industrial policy objectives and positioning within evolving global value chains or strategic technology domains. More specifically:

- In **Lombardy (Italy)**, the shift from sector-based specialisation areas to broader innovation ecosystems has enabled the region to mobilise investments not only in R&I, but also in industrial competitiveness, digitalisation and strategic technologies, most notably through alignment with the STEP platform. S3 coherence is applied even to ERDF priorities such as SME support, where it is not formally required, as a way to foster systemic upgrading of production structures.
- In **Norte (Portugal)**, the S3 defines four industrial priority areas through which the region addresses structural challenges in traditional sectors. The strategy is explicitly framed as a transformation agenda, aiming to strengthen value chain positioning and technological upgrading. ERDF is deployed in combination with national and Horizon Europe instruments to enhance complementarities and avoid fragmentation of efforts.
- In **Wallonia (Belgium)**, the scope of the S3 includes links with digitalisation, energy and climate goals, and industrial modernisation, being also closely linked with the regional recovery strategy, and the long-term vision for industrial policy.
- **Lower Silesia (Poland)** has integrated its S3 into a single, overarching innovation strategy since 2021. This positions S3 as a broader policy framework for innovation and economic development, with a clear ambition to develop new industries, become smarter and greener, and strengthen innovation capabilities in technologies and industries consistent with the region's industrial profile.

**While the EU Industrial Transition Pathways are not often explicitly referenced in regional S3 strategies, this does not necessarily indicate a lack of alignment.** The 14 Transition Pathways, developed under the revised EU Industrial Strategy between 2021 and 2025, are key guiding documents intended to support industrial transformation across EU value chains. They aim to steer the green and digital transitions while enhancing competitiveness and resilience within each industrial ecosystem by outlining key actions, enabling conditions, and expected impacts. However, because these pathways were formulated in parallel with the preparation of the 2021-2027 S3 strategies, direct references in regional documents are generally limited. It is important to note that the absence of formal citation does not imply that regional strategies are disconnected from these objectives. In many cases, S3 priorities and actions align with the content and intent of the Transition Pathways, even if this connection is not explicitly stated.

One notable exception is Campania: its S3 explicitly engages with the EU's industrial ecosystems and transition pathways, using them as a structural framework for setting regional priorities. In other cases, the connection remains either implicit or not formally articulated (see case study report below for more details).



## Case study

## S3 linked to ecosystem transition pathways: the case of Campania

## Campania

**Introduction**

The Campania region distinguishes itself by updating the 2021-2027 S3 through an “ecosystemic approach”, explicitly aligning the strategy with the EU goal of industrial transformation. It leverages the 14 EU industrial ecosystems and the Transition Pathways as strategic tools to define its regional priorities.

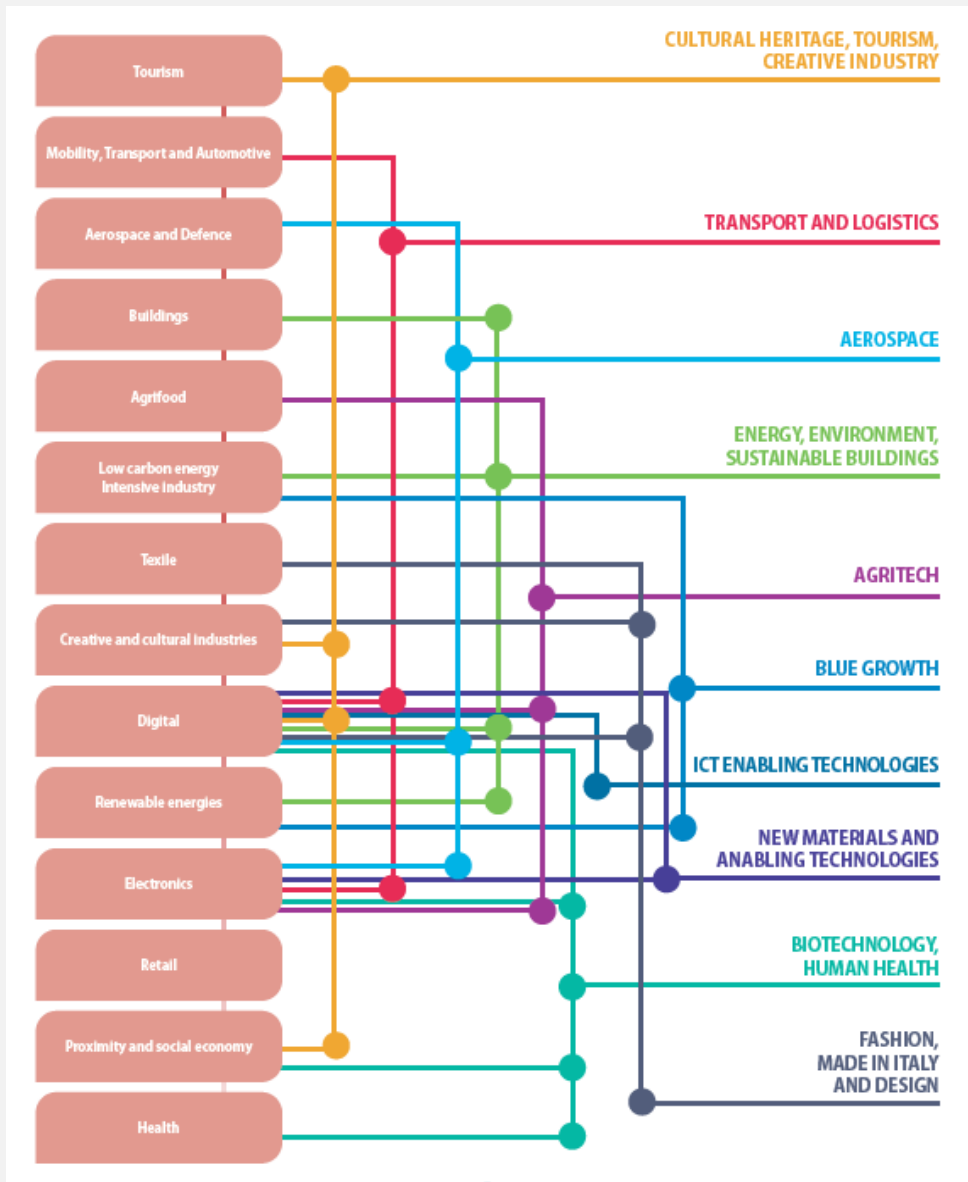
**Key success factors, challenges and transferability of the learnings**

Campania structured its regional innovation priorities around nine thematic innovation ecosystems and one transversal ecosystem for enabling technologies, each intentionally framed within the EU Industrial Policy focused on the green and digital transition., which were explicitly benchmarked against the 14 EU industrial ecosystems (see Figure 23 below to see the connections).

These innovation ecosystems are not defined in a static way. They are designed to evolve over time based on future foresight and input from businesses and other stakeholders through the entrepreneurial discovery processes. This dynamic structure should ensure that Campania's innovation priorities can adapt to industry and technology trends. At the same time, it facilitates ongoing alignment with the EU transition pathways, which themselves are conceived as evolving frameworks to be regularly updated through stakeholder collaboration.

According to the managing authority, the revised prioritisation approach represents a fundamental shift in the region's innovation strategy, moving from a sector-based model to a systemic vision of industrial transformation. The objective is to build interconnected networks of enterprises, universities, research centres, public authorities, and civil society, working together to develop knowledge, skills, and innovative solutions. By leveraging local strengths, this collaborative ecosystem aims to enhance Campania's competitive position at both national and international levels.

**Figure 23: Links Between Campania's S3 Innovation Ecosystems and the EU's 14 Industrial Ecosystems**



Source: S3 document of Campania region

**Conclusion**

The case of Campania illustrates how S3 can reference the 14 EU Industrial Ecosystems and the corresponding Transition Pathways to support industrial transformation objectives. The approach builds on dynamic innovation ecosystems - explicitly connected to groups of EU industrial ecosystems - that are designed to evolve over time through stakeholder co-creation processes. Such adaptability also enables regional strategies to remain aligned with the evolving EU Transition Pathways. This model may also facilitate the identification of specific local needs and inform the design and implementation of ERDF-funded interventions.

Source: Prognos AG/CSIL (2025).

### 3.2.2 From S3 to programmes: ERDF measures for industrial transformation

This section explores the distribution of various ERDF policy measures for industrial transformation across regions with different levels of development, innovation capacities, and other factors.

**A policy inventory was developed based on the 2021-2027 ERDF programme documents** (cut-off date: January 2025; see Annex 4: Methodology for the text analysis of ERDF programmes and TJTPs for details on the methodology). We used automated NLP techniques to extract from the ERDF programme documents all the policy actions under any Specific Objectives related to industrial transformation goals. These included not only policies for R&I under SO 1.1 but also interventions for SME competitiveness and growth (SO 1.1), STEP and JTF objectives (1.6, 2.9, and JSO 8.1), digital transition (SO 1.2 and 1.4), green transition (2.1-2.3, 2.6-2.8, and 3.1-3.2), and interventions related to education, skills development, labour market measures, and administrative capacity building for public authorities (SOs 1.4, 4.1, 4.2, 4.5, 4.6, 5.1, 5.2, as well as ESOs 4.1, 4.2, and 4.5-4.8).

An analysis was then conducted of the descriptions of the programmed policy measures, with a keyword matching analysis being used to identify policies associated with any of the following objectives related to industrial transformation (see Annex 4 for more details):

- **Industrial diversification:** Measures aimed at supporting regions with weaker innovation and industrial ecosystems in diversifying their economies towards new sectors and niche markets.
- **Company growth:** Measures designed to support the scaling-up of firms, facilitating their transition from start-ups to SMEs, mid-cap firms, and large enterprises.
- **Risk-taking investments:** Measures that encourage innovation-driven and high-risk investments, including support for disruptive technologies and new business models.
- **Support for the workforce in industries:** Measures focused on upskilling and reskilling workers, especially to enable capabilities related to innovation and support the twin green and digital transitions.
- **Education programmes tailored to industry and labour market needs:** Measures to strengthen education systems through initiatives such as industry-academia collaboration, applied research programmes, and vocational education and training aligned with industrial demand.

Since the literature indicates that regions with different characteristics have distinct industrial transformation needs (see Info box 8), we conducted a statistical analysis to verify whether regions tend to implement different types of policies for industrial transformation based on their characteristics. Given that the ERDF is not the only source of funding for industrial transformation, we cannot make any critical judgment regarding the relevance of the allocation and distribution of funding across various industrial policy objectives. This analysis is purely descriptive, aimed at providing insights into how the ERDF is used to stimulate industrial transformation across different types of regions.



### Info box 8: Diversity of regional profiles and industrial transformation needs

Based on the literature review and on an analysis of regional statistical indicators, it is possible to identify distinct industrial transformation needs according to different types of regions, reflecting their varying innovation capacities and development levels.

**Leader or Strong Innovators**, typically found in more developed metropolitan areas, exhibit high industrial sophistication and robust institutions. These regions often demonstrate high industrial sophistication and robust institutions. Some are highly dynamic and integrated into global value chains. Others face sluggish growth due to limited diversification and weak connections between traditional and innovative industries (Hidalgo and Hausmann, 2009; Cristelli et al., 2015; Boschma, 2015; Balland et al., 2019). Vulnerabilities in traditional sectors and disparities in investment between urban and rural areas may pose some challenges in the green and digital transition (Rodríguez-Pose and Bartalucci, 2024). These regions need to focus on maintaining their leadership through advanced R&I investments and disruptive innovations, while fostering company scaling and exploring new niche specialisations. Investments in green and digital technologies, especially in carbon-intensive and traditional sectors, are essential, alongside building adaptive ecosystems that emphasize complex lifelong skills development and multi-stakeholder governance.

**Moderate Innovators**, often located in medium-level development or Transition Regions, are typically shifting from imitation-based growth towards innovation-driven models (Pinheiro et al., 2022; Hidalgo and Hausmann, 2009; Cristelli et al., 2015; Boschma, 2015; Balland et al., 2019). They tend to have some degree of industrial specialisation, but face challenges related to weak inter-industry connections and vulnerability to development traps (Rodríguez-Pose et al., 2023). These regions require support to accelerate this transition through targeted R&I and participation in collaborative EU projects. Diversification efforts should build on existing capabilities to enhance knowledge flows, alongside investments in sustainable practices, education, vocational training, infrastructure, and improved administrative quality to strengthen absorptive capacity.

**Emerging Innovators**, generally situated in less developed and peripheral regions, often specialise in traditional sectors characterised by low innovation and weak integration into international markets. These regions face significant structural challenges, including low diversification, skill shortages, and limited institutional and absorptive capacity (Iammarino et al., 2020; Rodríguez-Pose and Ketterer, 2020; Rodríguez-Pose and Bartalucci, 2024; Boschma, 2015; Barbero et al., 2024). For these regions, opportunities for diversification are limited, and their economies are prone to stagnation (Balland and Boschma, 2024). Industrial transformation here depends on attracting foreign direct investment and fostering participation in EU research networks to leapfrog development stages. Emphasis is needed on small-scale innovation, operational efficiency, skill development (including digital and managerial capabilities), and building administrative and institutional capacity to nurture a more vibrant innovation ecosystem.

*Source: Prognos AG/CSIL (2025), based on literature review and statistical analysis of regional data.*

In total, 1,607 actions were analysed, of which 941 refer to SOs 1.1 and 1.4, and 666 relate to other SOs in the programmes that include references to S3.

**When looking specifically at diversification-related actions, it is found that more advanced regions are less reliant on ERDF support to promote industrial diversification**, likely due to their already mature and diversified industrial ecosystems. Specifically:

- Less developed regions allocate 50% of actions to diversification.

- Moderate innovator regions assign 67% of actions to diversification.
- More Developed Regions allocate only 17% of actions under SOs 1.1/1.4 and 11% under other SOs to diversification, with strong or Innovation Leader regions reporting identical figures.

**Firm growth is a widespread policy objective across ERDF programmes.** In particular:

- More Developed Regions allocate 36% (SOs 1.1/1.4) and 30% (other SOs) to this category.
- Moderate and emerging innovator regions report similar ranges, 36-37% under all considered SOs.
- Less developed regions allocate 36% under SOs 1.1/1.4 and 43% under other SOs.

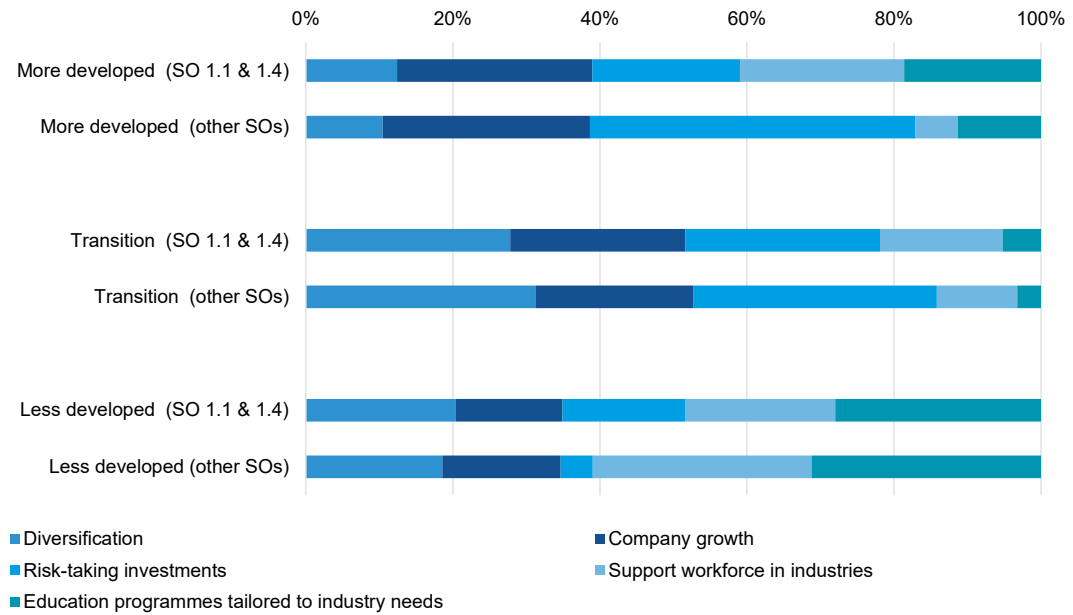
**Strong/leader and More Developed Regions have a stronger focus on risk-taking investments**, where a higher share of ERDF actions is dedicated to this category. This indicates a relatively stronger emphasis on disruptive and experimental innovation beyond core industrial policy objectives. **Interestingly, high-risk investments are more frequently mentioned in relation to SO 1.3 (SME competitiveness), rather than R&I measures** under SO 1.1. This is notable because it suggests that risk-oriented programming in these regions is closely tied to efforts to boost competitiveness in SMEs, beyond just focusing on research and innovation. Lower shares in less developed and emerging innovator regions suggest that, while there is ambition for risk-taking in R&I investments, broader institutional and market readiness may still limit the effectiveness of these investments in these regions. Specifically, results show that:

- Strong/leader and More Developed Regions dedicate 47% of actions under other SOs to risk-taking investments, compared to 26-27% under SOs 1.1/1.4.
- Less developed regions dedicate 41% of actions under SOs 1.1/1.4 to risk-taking investments, but only 12% under other SOs.
- Emerging innovator regions show a similar drop, from 29% under SOs 1.1/1.4 to only 6% under other SOs.

**The most marked divergence across regional types is found in support for workforce development and education.** These high shares confirm the central role of the ERDF in supporting human capital development in regions still consolidating their innovation ecosystems. In contrast, this is a less prominent policy focus for ERDF programmes in More Developed Regions, which are more focused on specialised innovation efforts. Specifically:

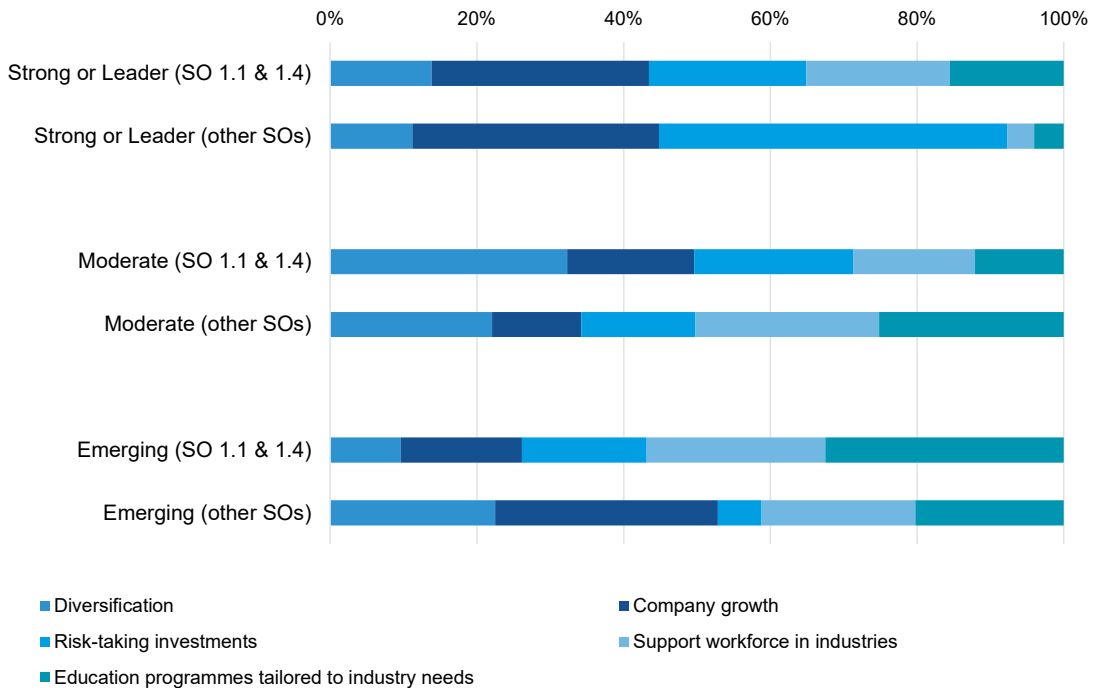
- Less developed regions allocate 50% of SOs 1.1/1.4 actions and 80% of other SO actions to workforce support, while 69% and 84% respectively target education programmes.
- Moderate innovator regions devote 34% (SOs 1.1/1.4) and 76% (other SOs) to workforce-related actions, and 25% and 76% to education.
- Strong/leader regions allocate just 4% of actions under other SOs to workforce and education, and 24-19% under SOs 1.1/1.4.

**Figure 24: Distribution of ERDF programmed actions aligned with S3 by objective and Cohesion Policy category of region**



Source: Prognos AG/CSIL (2025), elaboration on ERDF programme documents (January 2025). Percentages refer to the total of actions identified under each specific category.

**Figure 25: Distribution of ERDF programmed actions aligned with S3 by objective and Regional Innovation Scoreboard category**



Source: Prognos AG/CSIL (2025), elaboration on ERDF programme documents (January 2025). Percentages refer to the total of actions identified under each specific category.

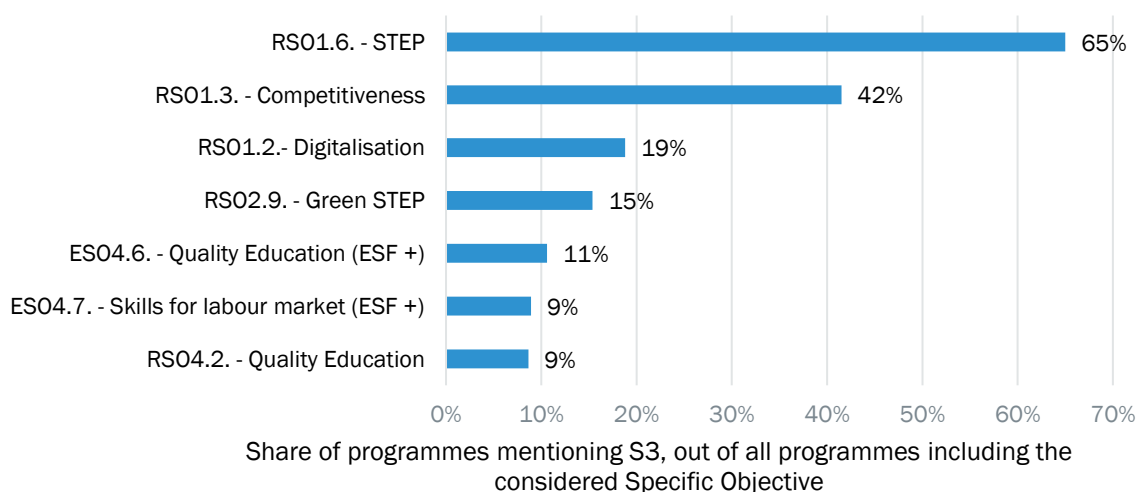
### 3.2.3 Mechanisms for aligning S3 priorities with ERDF investments for industrial transformation

This section presents the findings of our analysis of the 183 national and regional 2021-2027 ERDF programmes, with a particular focus on the Specific Objectives beyond 1.1 and 1.4 in which S3 is explicitly referenced. The objective was to examine the mechanisms employed to ensure alignment between S3 and ERDF investments aimed at industrial transformation across all relevant SOs. The latest programme versions available in January 2025 were considered for the analysis. We used a Natural Language Processing (NLP) algorithm to assess the frequency of S3 mentions across the programme documents, specifically searching among any Specific Objectives other than SO 1.1 and SO 1.4.

**When excluding SO 1.1 and 1.4, which are directly dedicated to R&I, S3 is referenced in 93 out of the remaining 183 ERDF programmes examined (51%).** The highest share of S3 references appears under SO 1.6 (STEP), where 13 out of 21 programmes (as of the January 2025 cut-off date) explicitly mention S3. Other SOs with notable levels of S3 references include SO 1.3 (SME competitiveness), SO 1.2 (Digitalisation), and selected objectives under Policy Objective 4, particularly those related to skills development and ecosystem support. These patterns suggest that the influence of S3 extends beyond core innovation areas into broader dimensions of regional development. Figure 26 illustrates the full distribution across SOs.

**The findings of the documentary analysis were further complemented by findings from the survey.** Question B8 asked whether the S3 framework is currently being used as a strategic guide for investments supporting industrial transformation, and which specific SOs or policy areas are aligned with S3. Among the authorities responsible for S3 coordination, ERDF programming, and/or JTF implementation that participated in the survey, 89% (142 out of 159) indicated that at least one SO beyond 1.1 and 1.4 is aligned with S3. Survey responses most frequently cited areas such as sustainable growth, SME competitiveness, job creation through productive investments, digitalisation and the green transition.

**Figure 26: Share of ERDF programmes referencing S3 by Specific Objective**

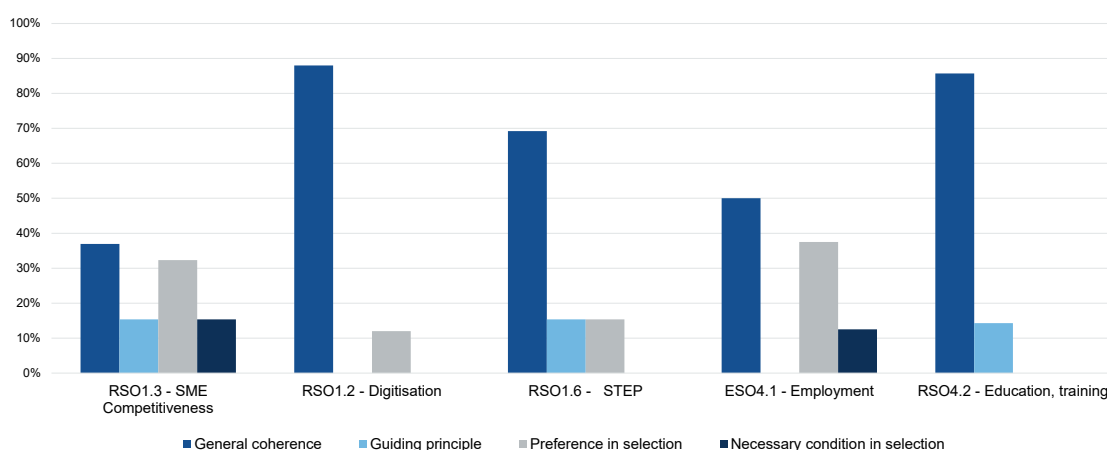


Source: Prognos AG/CSIL (2025), text analysis of ERDF programme documents (cut-off date: January 2025). Note: Percentages indicate the share of SOs that include at least one mention of S3, calculated over the total number of programmes including the respective SO. Only the top SOs by relative share of mentions is included in the chart.

Our analysis of the ERDF programmes also examined in detail *how* S3 is referenced, providing insight into the mechanisms through which alignment is operationalised (see Figure 27). **S3 is primarily cited to ensure strategic coherence and guide interventions.** Two distinct mechanisms emerge in this context: S3 is used as a general strategic framework to maintain consistency (“general coherence”), and as a directive instrument that informs intervention logic and actively steers actions (“guiding principle”). Additionally, S3 may be referenced as a criterion for selecting projects and investments. A distinction can be made based on the strength of this conditionality. In some cases, programmes indicate that projects aligned with S3 priority areas will be preferred (“preferential condition for selection”), while in others, compliance with S3 priorities is required as a prerequisite for eligibility (“necessary condition for selection”).

**The analysis reveals that in 72% of S3 references across SOs other than SO 1.1 and SO 1.4, S3 serves to ensure strategic coherence and guide interventions. In the remaining 28%, S3 is expected to play a role in project selection.** Within this category, the “preferential condition for selection” appears more frequently (19%) than the “necessary condition for selection” (9%). These functions are observed across only five SOs in total. Notably, the preferential condition is cited in 15% of S3 references under SO 1.3 and 12.5% under SO 4.1. However, the preferential role is concentrated primarily in SO 1.3.

**Figure 27: Distinct role of S3 by top 4 SOs (% over the total mentions by SO)**



Source: Prognos AG/CSIL (2025), elaboration on ERDF programme documents. Note: Percentages indicate the share of S3 mentions referring to a specific role, calculated over the total number of references to S3 within each respective SO.

**However, the programme document analysis offers only a partial picture.** Even if S3 is not referenced in the SO or no specific conditions for alignment are mentioned, it is still possible that managing authorities and implementing bodies apply these criteria in calls for proposals. Therefore, the stakeholder survey is useful for going beyond what is stated in the programmes and understanding current practices and intentions. Question B10, which targeted managing authorities responsible for S3 coordination, ERDF programming, and/or JTF implementation, explored the measures used to mobilise investments beyond SOs 1.1 and 1.4 (see Figure 28). Only 33% of respondents (53 out of 159) provided valid responses. Among them, **the most frequently cited measure was the application of S3 as a “preferential condition” for project selection (23% of respondents).** This was followed by “dedicated funding calls or competitions” and “strict eligibility criteria” (15% each).

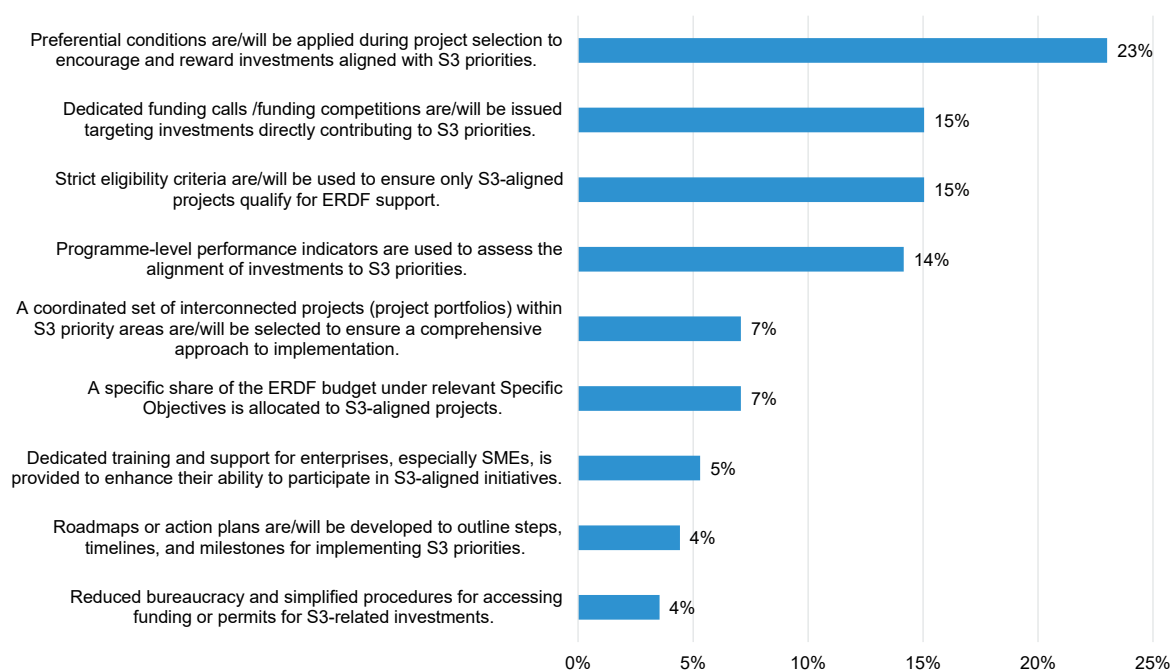
A number of respondents (33 out of 53) provided open comments (question B11) to further elaborate on the practical mechanisms and actions adopted to ensure alignment with S3. **Preferential conditions are often implemented through higher scores or increased funding intensity.** In Lithuania, for example, additional points are systematically awarded

during the evaluation process to proposals that directly contribute to the defined S3 domains. In Latvia, preferential conditions are applied in the case of financial instruments, while stricter criteria are more common for other forms of funding. In Calabria (Italy), in some dedicated call, projects can access additional funding if aligned with the S3.

**The use of dedicated calls is further illustrated to highlight the varying degrees of strictness in applying this mechanism.** For example, in Romania, the Centre and North-East regions have reported that specific calls have been designed to support investments in S3 areas under SO 1.2 and 1.3. In contrast, South Muntenia awards a high score – though only in certain calls – to projects submitted by clusters investing in S3 areas. Other regions apply stricter criteria, varying by the specific objectives. In Slovenia, for instance, the same criteria used for SOs 1.1 and 1.4 are also enforced for SOs 1.2 and 1.3, while other SOs under Priority 4 are governed by broader guidelines and recommendations. Meanwhile, regions such as Flanders (Belgium), Central Finland, and East Netherlands have adopted a more generalised and stricter approach, in which alignment with S3 priorities is a prerequisite for accessing ERDF funding.

In general, while reference to S3 is considered a mandatory selection criterion more often for investments under SO 1.1, softer forms of alignment are more likely to be found for other SOs. A notable example is the Azores (Portugal). For SO 1.1, all submitted projects must comply with an admissibility condition requiring alignment with the regional S3. However, for SO 1.3, a different approach is applied: projects are assessed for S3 alignment as part of a merit assessment, with aligned projects receiving five points and non-aligned ones receiving three points. This allows S3 alignment to influence project prioritisation without being a rigid requirement.

**Figure 28: Mechanisms in place to ensure alignment between ERDF investments and S3 for SOs beyond 1.1. and 1.4**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Only authorities responsible for S3 coordination, ERDF programming and/or JTF implementation are included. Percentages refer to the total number of selections, regardless of the order in which items were chosen. A total of 119 valid selections were recorded referring to 47 different regional/national strategies.

Evidence from interviews conducted during the case studies suggest that there is no “one-size-fits-all” approach when it comes to aligning ERDF funding instruments with S3. Rather, tailored mechanisms are required to both facilitate fund absorption and preserve coherence with the S3 framework.

**i**

## Case study example

**S3 as a framework to support investments for SME support and digitisation****Lombardy, Norte****Introduction**

This box presents the key insights of two regional case studies – Lombardy (Italy) and the Norte region in Portugal – focused on how alignment between ERDF investments for industrial transformation and S3 is operationalised in practice. The analysis draws on interviews with ERDF managing authorities and S3 coordination bodies in both regions, offering insight into their respective approaches, mechanisms, and experiences in implementing S3-aligned funding strategies.

**Key success factors, challenges and transferability of the learnings**

In Lombardy, strategic alignment is pursued through incentive design rather than mandatory eligibility criteria. Under SO 1.3 (SME competitiveness), preferential scoring and differentiated funding intensities reward projects consistent with S3 priorities. For SO 1.2 (digitalisation), informal mechanisms such as a digital maturity self-assessment for SMEs proved highly effective, despite initial concerns over complexity. The success of this flexible approach hinges on structured governance, a mature innovation ecosystem, and a strong commitment to treating S3 as a living, evolving document.

By contrast, the Norte region adopted a more rigid model to address past issues with fund absorption. Calls for proposals explicitly rewarded coherence with S3 priorities even when not formally required, and performance indicators were introduced to monitor strategic adherence. This disciplined approach ensured a tight link between planning and implementation but required significant administrative capacity and rigorous governance structures.

**Conclusion**

The two cases offer contrasting yet insightful models for aligning ERDF investments for industrial transformation with S3. These cases reflect two fundamentally different governance logics: one prioritising flexibility and incentive-driven alignment, the other favouring stricter compliance and control to ensure strategic consistency. Exploring their approaches reveals how regional context, institutional maturity, and policy objectives can shape the design of alignment mechanisms.

### 3.2.4 Alignment between S3 priorities and the Strategic Technologies for Europe Platform (STEP) initiative

Having examined the overall alignment between the ERDF and S3 across all SOs in the previous section, this section now takes a closer look at the STEP initiative, focusing specifically on how alignment with S3 is addressed within SOs 1.6 and 2.9.

The STEP, launched in 2023, aims to reinforce the EU's leadership in critical and emerging technologies that underpin industrial competitiveness and economic resilience.<sup>32</sup> Assessing the alignment between S3 and the STEP objectives begins with examining the thematic coherence between regional innovation priorities and the STEP-related technologies. To explore this alignment, we conducted a matching exercise<sup>33</sup> comparing S3 priority areas with the technology domains identified under STEP.<sup>34</sup>

Our analysis, based on the S3 priority databases presented in Section 3.1, shows that **there is already a relatively high degree of thematic overlap between S3 priorities and STEP technology areas**. Approximately 84% of the S3 priorities in the dataset correspond to at least one STEP domain. Figure 29 shows that many S3 priorities align with key technology areas of STEP, with clean and resource-efficient technologies (248 occurrences) and digital technologies (212), being the most frequently matched. Biotechnologies, though less frequently cited alone (60 matches), often appear in combination with other areas, particularly clean and digital technologies. At the level of S3 strategies, we found that every strategy analysed had already identified at least one strategic area that later became central to STEP. In Figure 30, we observe that a very high proportion of S3 strategies have at least one S3 priority matching a STEP technology area.

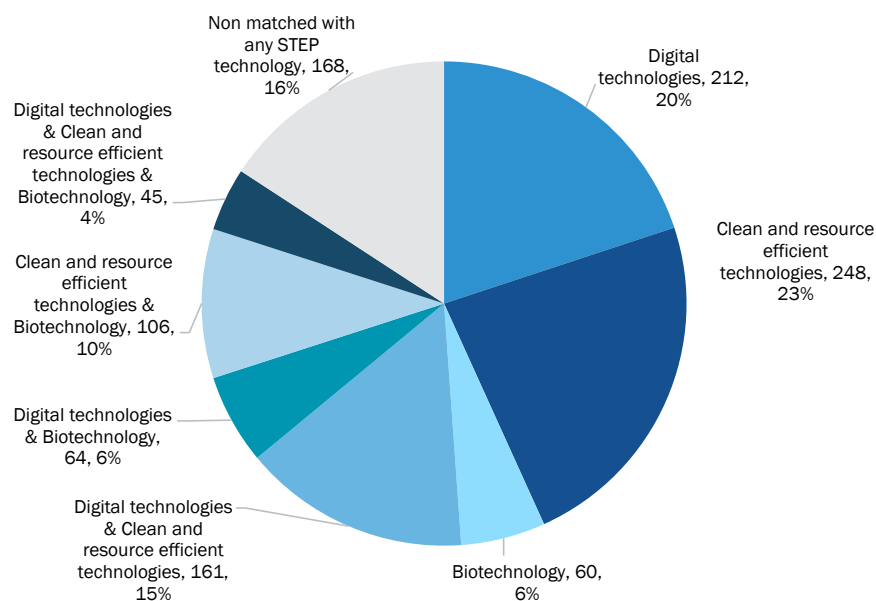
This analysis provides an initial, yet valuable benchmark for evaluating the potential of regional S3 strategies to contribute to the EU's broader industrial transformation agenda. It indicates that many of the priorities promoted by STEP were already present in regional S3 strategies prior to the initiative's formal adoption. In this sense, all regions have the potential to support STEP objectives based on their already identified S3 priorities.

32 The STEP targets three key technological domains that are central to the twin green and digital transitions. Firstly, it prioritises digital technologies and deep-tech innovation, such as artificial intelligence, advanced semiconductors, and quantum computing, which are essential to boost Europe's technological sovereignty and competitiveness across sectors. Secondly, STEP focuses on clean and resource-efficient technologies, including renewable energy, energy storage, and carbon capture solutions, in line with the EU's climate objectives and the broader push towards a sustainable, net-zero economy. Finally, the platform strengthens biotechnologies, fostering advances in health-related innovation, such as critical medicines and advanced therapies, while also contributing to food security and bio-based industries. See for further details [https://strategic-technologies.europa.eu/document/download/e204ce9e-0407-4f03-82f8-6f518ce12886\\_en?filename=C\\_2024\\_3148\\_F1\\_COMMUNICATION\\_FROM\\_COMMISSION\\_EN\\_V6\\_P1\\_3408774.PDF](https://strategic-technologies.europa.eu/document/download/e204ce9e-0407-4f03-82f8-6f518ce12886_en?filename=C_2024_3148_F1_COMMUNICATION_FROM_COMMISSION_EN_V6_P1_3408774.PDF)

33 The correspondence between S3 priorities and STEP technologies was assessed using a sentence similarity algorithm implemented in Python. The algorithm is based on state-of-the-art LLMs and it was locally deployed (i.e., implemented without the need of external, non-proprietary, servers). It maps sentences and words into a numerical vector space, where the distance between two vectors is proportional to their semantic similarity. The similarity between priority names and STEP overarching technology areas (i.e., "Digital technologies", "Clean and resource efficient technology" and "Biotechnologies") was computed along with the similarity between each keyword associated to the priorities and the STEP overarching technology areas, the STEP technology areas and the underlying specific technologies. After a trial-and-error process a cut-off threshold for the similarity was determined to assign the matches. Finally, the results were checked and manually adjusted in cases where the algorithmic matching showed potential inconsistencies or lacked sufficient precision.

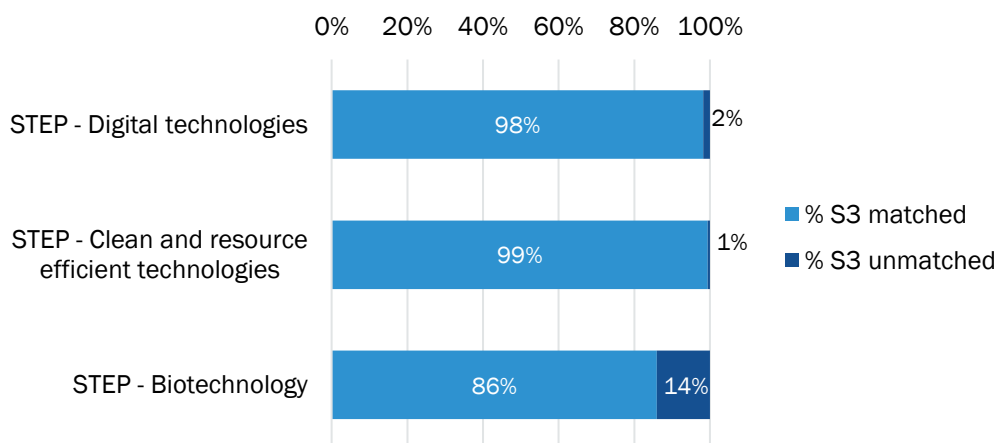
34 See for further details [https://strategic-technologies.europa.eu/document/download/e204ce9e-0407-4f03-82f8-6f518ce12886\\_en?filename=C\\_2024\\_3148\\_F1\\_COMMUNICATION\\_FROM\\_COMMISSION\\_EN\\_V6\\_P1\\_3408774.PDF](https://strategic-technologies.europa.eu/document/download/e204ce9e-0407-4f03-82f8-6f518ce12886_en?filename=C_2024_3148_F1_COMMUNICATION_FROM_COMMISSION_EN_V6_P1_3408774.PDF)

**Figure 29: Distribution of S3 priorities across STEP technology areas**



Source: Prognos AG/CSIL (2025), elaboration S3 documents and COM 2024/795 establishing the Strategic Technologies for Europe Platform (2025). The total number of distinct S3 priorities found across 171 strategies is 1,064. Each S3 priority can be associated with none, one, or multiple STEP technology areas. The chart represents the number and shares of S3 priorities associated with each specific category or combination of STEP technology area. The cases of no matches (168) are largely linked to priorities associated to ecosystem improvements or sectors (see Section 2.2).

**Figure 30: Matching between S3 strategies and STEP technology areas**



Source: Prognos AG/CSIL (2025), elaboration S3 documents and COM 2024/795 establishing the Strategic Technologies for Europe Platform (2025). This chart shows the share of S3 strategies (out of a total of 171) that have at least one S3 priority matching any of the three STEP technology areas.

The next step was to examine the specific mechanisms, if any, that national and regional authorities have put in place to operationalise this alignment. Building on the broader analysis of coherence between S3 priorities and ERDF programmes, this section focuses specifically on ERDF investments fully dedicated to STEP-specific objectives 1.6 and 2.9.

A note of caution is warranted: **as of early 2025, only 21 ERDF programmes (approximately 12% of the total) have formally integrated STEP-related specific objectives.** As a result, the analysis presented here reflects only the partial state of STEP

integration at the time of assessment, as not all programmes had operationalised these objectives during the data collection period.

**Compared with other Specific Objectives relevant to industrial transformation**, particularly SO 1.3 (Enhancing SME competitiveness) and SO 1.2 (Promoting digitalisation), **STEP SO 1.6 demonstrates a relatively stronger alignment with S3 priorities**. As outlined in Section 3.2.2.2, S3 is explicitly referenced in 65% of the programmes that incorporate SO 1.6,<sup>35</sup> marking the highest share among all SOs. Conversely, S3 is referenced in only 15% of programmes that include SO 2.9.<sup>36</sup> In most cases, reference is made to S3 as a framework against which STEP investments should ensure general coherence. Only two programmes mention that S3 is a criterion for preferential project selection (i.e., Aragón (Spain) and Sicily (Italy)). Table 10 below, illustrate how STEP objectives are integrated into regional programming, by providing some examples from different Member States and regions.

**Table 10: Examples of STEP integration into S3-aligned programming**

| MS / region                            | Type of MS / region by level of development | Except from the ERDF programme   |
|--|---|--|
| Aragón (Spain)                         | More developed                              | “Taking into account the territorial characteristics of Aragon and taking advantage of the network of open laboratories located there, the development of STEP technologies will be promoted in strategic industrial enclaves in Aragon, prioritising strategic sectors of the current S3 of the Autonomous Community of Aragon”.  |
| Sicily (Italy)                         | Less developed                              | “In this context, interventions can be envisaged, in the thematic area S3 of Life Sciences, for the development of tools, technologies and digital solutions for health and care, including personalized medicine, for the use of cloud platforms integrated with AI solutions for intelligent prevention, up to the creation of new drugs.” [...] “In any case, priority will be given to investments that are consistent with the Smart Specialisation Strategy (S3) of Sicily.”   |
| North Rhine (Germany)                  | More developed                              | “[...] Funding will be directed at these STEP technologies in the innovation fields of the regional innovation strategy of the state of North Rhine-Westphalia. [...] Funding is available for the development of critical technologies that bring an innovative, new and groundbreaking element with significant potential for the EU internal market or that contribute to reducing the strategic dependencies of the European Union and thus contribute to the sustainable solution of the major societal challenges and to strengthening the NRW economy in the innovation fields of the NRW Regional Innovation Strategy. [...] Measure 3 - Patent exploitation for critical technologies”. |
| Macroregiunea Unu, Doi, Trei (Romania) | Less developed                              | “The actions in this priority are complementary to the interventions in: PoCIDIF – will finance the same measures with national impact, but in other S3 areas. PRs – regional S3 areas, regional impact, strengthening regional RDI ecosystems/developing mechanisms that stimulate innovative activities of enterprises. PTJ identifies productive investments in SMEs related to RIS3 and actions in the STEP priority (P8) PTJ.”  |
| Emilia-Romagna (Italy)                 | More developed                              | “The action will be developed in full coherence with the Smart Specialisation Strategy which, confirming the relevance of the STEP sectors for the regional economy, already includes among its industrial specialization systems [...] The action aims to reconcile immediately available technological trajectories with the capacity of the business system to work with the scientific and technological results in production processes through projects that will have to identify the industrial implications of the results and their valorisation in favour of the companies and supply chains of the S3 in the STEP sectors and with   |

<sup>35</sup> 13 out of 20 programmes.

<sup>36</sup> 2 out of 13 programmes.

|                  |                |   |
|------------------|----------------|---|
|                  |                | specific reference to the critical technologies identified by the reference community documentation.”   |
| Bayern (Germany) | More developed | “[...]. By focusing on the STEP technology fields mentioned here, the development and production of critical technologies in three sectors are particularly promoted in line with the Bavarian RIS3 strategy with MA 3.2 and 3.3. [...] These three STEP technology areas are also reflected in the Bavarian RIS3 strategy - the digital and technology-intensive innovations are addressed in the RIS3 specialization field "Digitalization", the environmentally friendly and resource-efficient technologies in the RIS3 specialization field "Energy", including in particular in the application field "CleanTech", and the biotechnologies in the RIS3 specialization field "Life Science", accompanied by cross-sectional topics (such as the bio-based industries, which fall into an intersection of "Life Science" and "Materials & Substances"). [...].” |

Source: Prognos AG/CSIL (2025). Text-analysis from ERDF programme documents.

**For some regions, the integration of STEP into their strategies and programmes was facilitated by the fact that the thematic focus of STEP closely aligned with the region’s existing technological priorities and ongoing innovation strategies.** This was the case, for instance, in Lombardy (Italy) and Baden-Württemberg (Germany). According to insights gathered from interviews, in these regions, the regional ERDF programmes were already strongly anchored in the S3 framework, with a particular emphasis on key enabling technologies and industrial modernisation. Additionally, the S3 strategy included priorities that already aligned with STEP technologies. As a result, many of the priorities identified in the regional S3 strategies already overlapped with STEP technologies and the integration of STEP objectives required only limited adjustments, mainly involving the strategic targeting of specific calls and the reinforcement of existing instruments.

Where reprogramming was (or is being) undertaken to include specific objectives dedicated to STEP, **the S3 framework proves valuable in helping regions identify their own specialisation niches within the broader STEP initiative.** In these cases, S3 serves as a useful tool for guiding regional focus during the reprogramming process, allowing regions to hone in on areas where local strengths intersected with STEP’s technological priorities.

In Portugal, for instance, a study was commissioned to map the country’s technological capabilities and production assets as part of the S3 EDP. This exercise aimed to identify existing competencies and determine areas with potential for future specialisation, many of which overlap with STEP’s technology domains. At the national level, the goal is to use STEP to concentrate efforts on these key areas, giving them sharper focus. Similarly, in the Portuguese Norte region, a mapping exercise is currently being conducted to identify regional specialisation areas aligned with broader technological trends and develop a roadmap to integrate STEP technologies into future calls via thematic platforms. While STEP implementation is a national matter, this process is expected to provide valuable insights for the region to focus on areas that intersect with STEP’s priorities, reinforcing alignment with national objectives. In Campania (Italy), the integration of STEP objectives involved mapping STEP’s technological trajectories and aligning them with the region’s areas of specialisation. This ensured the regional strategy incorporated STEP’s technological focus while highlighting niches for future development, enhancing alignment with EU-wide innovation goals.

While there is generally broad overlap in S3 priorities with STEP key thematic areas such as digitalisation, clean technologies, and biotechnology, **not all regions find aligning their specific objectives with the EU-level STEP priorities straightforward.**

Some regions have raised concerns about the fit between STEP’s goals and their own regional needs. For example, Upper Austria has noted that aligning directly with STEP objectives would require a substantial shift in their regional strategy.

**One key challenge mentioned by some interviewees is the effective involvement of large enterprises.** While these enterprises are critical actors within regional innovation ecosystems, securing their engagement under STEP objectives can be difficult. Their limited involvement may restrict the transformative potential of S3, particularly in driving innovation in strategic sectors.

**Strategic independence and global R&I priorities limit large enterprises' engagement with STEP even when thematic alignment exists.** In Baden-Württemberg (Germany), while large enterprises play a central role in shaping regional innovation priorities, they remain largely disengaged from STEP implementation. The strategic independence of these enterprises, combined with their global R&I agendas and limited reliance on ERDF funding instruments, reduces the impact of STEP as a mechanism to mobilise their direct involvement. Although STEP priorities align with key industrial sectors in the region, regulatory constraints, particularly around State Aid, and the SME-focused design of funding instruments further hinder active participation by large enterprises.

**Regions with emerging innovation ecosystems can face structural challenges in integrating large enterprises into STEP activities.** In regions like Lower Silesia (Poland), where the innovation ecosystem is still developing, there is often a clear divide between the support system for SMEs and start-ups, and large multinational companies operating in strategic sectors like automotive and aerospace. The innovation system in these regions is primarily designed to support smaller firms. Large enterprises, despite being major investors in the region, tend to operate independently of the regional policy frameworks, which makes their participation in STEP initiatives more challenging.

**The scarcity of key players in strategic sectors further compounds the difficulty in mobilising large enterprises under STEP.** Regions with few existing companies in strategic sectors often rely on a handful of large enterprises that may be less willing to engage in high-risk innovation initiatives. This limited pool of potential actors constrains the potential of STEP to drive technological transformation, as the lack of active involvement from large enterprises hinders the development of vibrant regional innovation ecosystems. A specific example of these challenges can be seen in the southern Italian region of Sicily. Here, STEP investments are concentrated around one dominant player, a global leader in semiconductors. This company is currently facing complex financial and governance challenges. The strong dependence on a single entity makes the STEP initiative particularly vulnerable in Sicily. Any setbacks or strategic shifts within this key player could severely undermine the success of STEP investments in the region.

Moreover, **regulatory barriers can hinder regional efforts to adapt ERDF programming to better align with STEP objectives.** In Upper Austria, interviews with regional authorities have revealed that an initial attempt to revise ERDF programming to better accommodate STEP-related technologies encountered significant obstacles. The revision process faced objections from DG COMP regarding State Aid rules, which created legal and procedural ambiguities. Regional representatives expressed frustration that while DG REGIO encouraged strategic reprogramming in line with STEP, institutional bottlenecks at European level hindered progress. This lack of clarity stalled implementation and created uncertainty not only for regional administrations but also for potential beneficiaries, as it was unclear how large enterprises would be engaged under STEP without violating State Aid regulations.

Some interviews also argue that **multilevel governance can create challenges in integrating STEP objectives into ERDF programmes.** In the case of the Portuguese Norte region, while the regional authority is committed to supporting STEP-related areas, it lacks a dedicated funding axis within its ERDF programme. This is due to a national decision to concentrate STEP implementation within the National Competitiveness Programme, which primarily targets large enterprises. As a result, the regional programme, which

focuses on SMEs, cannot directly fund STEP initiatives. This example highlights how a fragmented governance structure and limited political autonomy could make it more difficult for some regions to fully align funding with this strategic goal.

### 3.2.5 Alignment between S3 and the Territorial Just Transition Plans (TJTPs)

This section focuses on the role of S3 in providing a strategic framework for policy intervention supported by the Just Transition Mechanisms. The Territorial Just Transition Plans (TJTPs) were designed to support regions and communities heavily reliant on carbon-intensive industries, facilitating their transition to a sustainable, green economy while ensuring social and economic equity. **A total of 73 TJTP documents were drafted in 2021: the documents include plans for the economic diversification and transition related to 100 distinct territories across Europe**, generally sub-regional areas. All countries have at least one territory that benefits from the Just Transition Fund, 18 Member States have more than one. Notably Finland has 14 JTF territories, Spain 13, Germany 8, and France, the Netherlands and Romania have 6 JTF territories each.

Similar to the analysis conducted on STEP-related investments, we began by exploring the alignment between the S3 and/or S3 priority areas and the TJTPs' main sectors and areas supported. This involved examining how frequently S3 is referenced across the whole TJTPs and identifying any thematic overlaps between the S3 priorities and the sectors targeted by the TJTPs (see Annex 4: Methodology for the text analysis of ERDF programmes and TJTPs). Our findings reveal a notable thematic alignment between the two. Specifically:

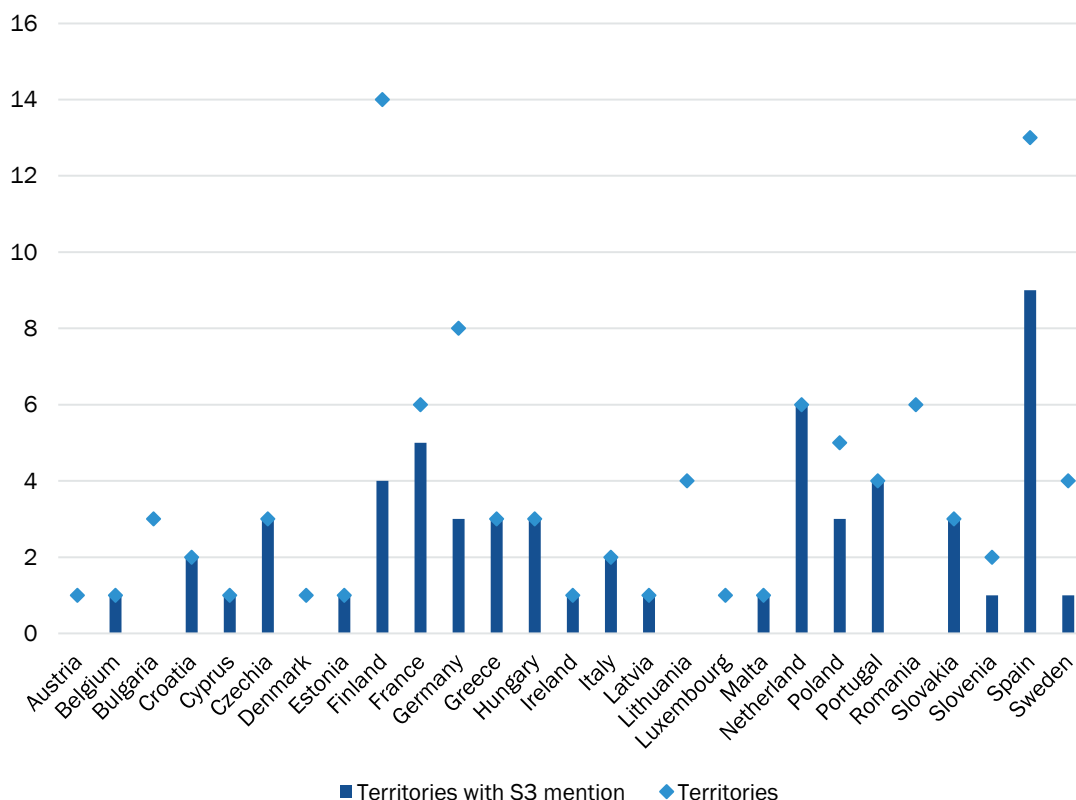
- **58% of the TJTPs explicitly reference S3 priorities:** the countries where the largest number of territorial plans include mentions to the S3 are Spain, the Netherlands and France (see Figure 31).
- **Over 62% of plans focus on sectors that can be directly linked to one of the overarching region's S3 priorities.** A total of 122 TJTP sectors, from 62 different territories, can be directly connected to one of the S3 priorities of their corresponding region or country. More than half of the TJTP sectors are linked to S3 priorities related to environment and clean technologies or energy (see Figure 32). This is consistent with the general scope of TJTPs.
- **Overall, 80% of the TJTPs either explicitly mention S3 alignment or target sectors closely related to S3 priorities.**<sup>37</sup>

This demonstrates a **significant degree of alignment between the S3, and the objectives outlined in the TJTPs**, suggesting considerable potential for integrated approaches in addressing regional industrial transformation and transition challenges.

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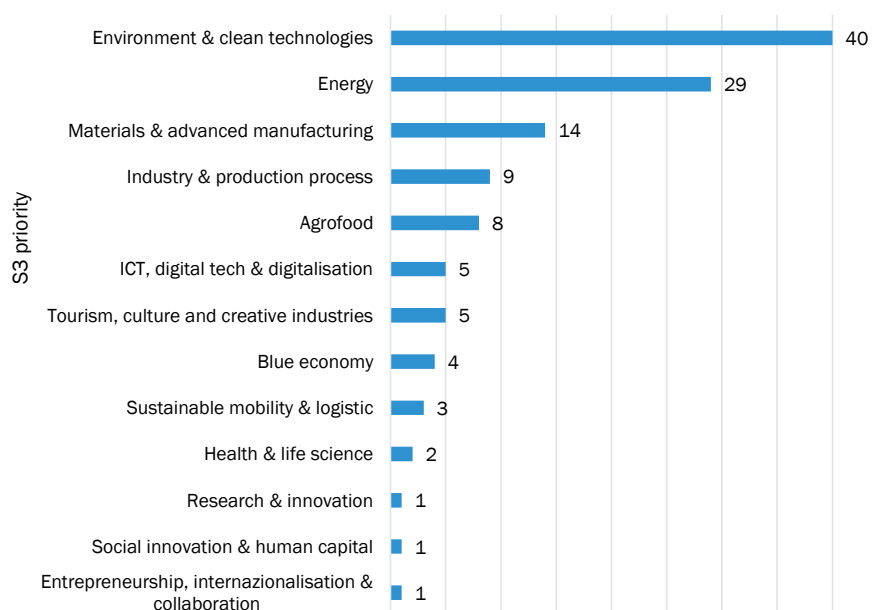
<sup>37</sup> For more details on the text analysis conducted on the TJTPs, please refer to Annex 4

**Figure 31: Number of territories covered by TJTPs and number of territories with at least one direct mention of S3**



Source: Prognos AG/CSIL (2025), automated text analysis based on Territorial Just Transition Plans documents.

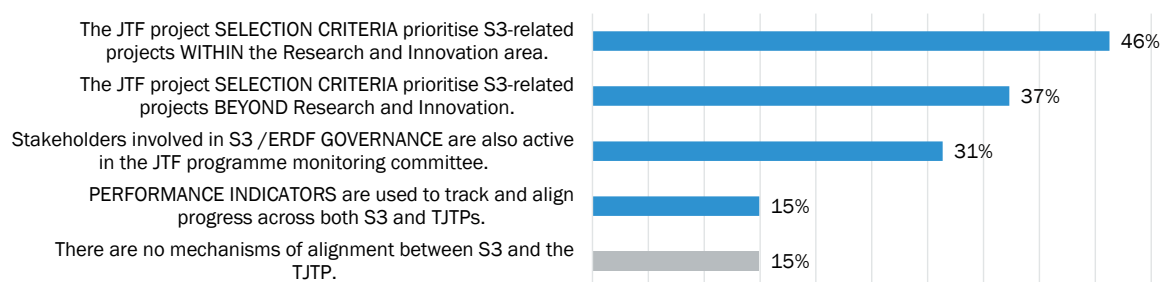
**Figure 32: Number of TJTP sector aligning with S3 priorities**



Source: Prognos AG/CSIL (2025), automated text analysis based on Territorial Just Transition Plans and S3 documents.

The survey was then used to ask S3 coordinators, ERDF Managing Authorities, and JTF implementing bodies about the actual mechanisms put in place to ensure alignment between the strategies.<sup>38</sup> **The majority of respondents indicated that S3 is used as a selection criterion for JTF investments, not only in the research and innovation area but also beyond.** Shared governance mechanisms are another widely used method of alignment, mentioned by 31% of respondents, often combined with the use of S3-aligned selection criteria.

**Figure 33: Mechanisms of alignment between S3 and TJTP - Survey responses**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: S3 coordinators, ERDF MA, JTF implementing bodies. Multiple answers were allowed. N. valid answers: 67, referring to 49 national/regional strategies.

Insights from the survey open-ended responses highlight how governance mechanisms can facilitate alignment between TJTPs and S3 strategies. In one case, the S3 implementation agency was responsible for preparing the TJTP, and criteria for R&I programmes were selected in coordination with national-level missions. In another region, stakeholders involved in S3 governance are also active in the monitoring committee for the JTF programme. These stakeholders are working together on cross-cutting issues, such as decarbonisation, and pooling resources and contacts to ensure alignment. In a third region, the regional S3 team was highly involved from the outset in the development of fair transition territorial plans. This team worked closely with the regional programme, ensuring that the calls launched through the JTF focused on specific domains of the region's S3, with alignment to S3 being a key evaluation criterion. Finally, in another region, regional assemblies are represented on both the EU JTF Programme Monitoring Committee and the S3 steering group. In addition, regional enterprise plan chairs and managers for areas covered by the EU JTF territory are also part of the JTF Programme Monitoring Committee, ensuring coherence between regional enterprise priorities and the JTF programme.

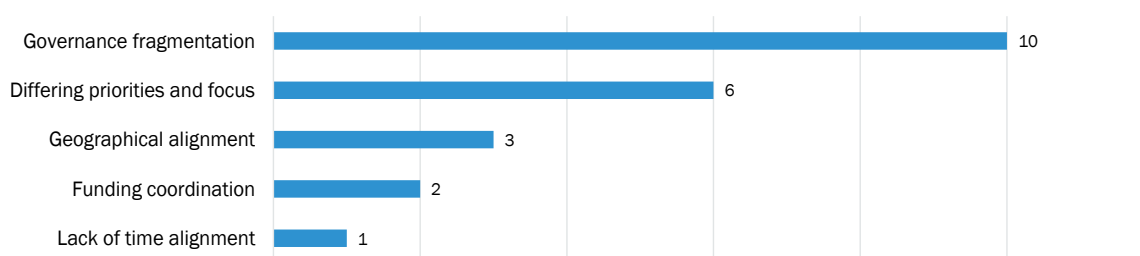
Some challenges remain in aligning the objectives of S3 and TJTPs. Survey responses<sup>39</sup> and interviews conducted for the case study (see Box below) highlight several obstacles to alignment. **Governance fragmentation is the most frequently cited issue** (see also Section 3.3). Respondents emphasised problems related to communication and coordination across various entities responsible for implementing S3, TJTPs, and other related strategies and programmes (such as other regional or subregional development plans. In some regions, this fragmentation is further complicated by the division of responsibilities across different governance levels, for example, where TJTPs are managed at the regional level while S3 is governed nationally, leading to misalignment.

<sup>38</sup> Question B12: How are the Smart Specialisation Strategy (S3) and the Territorial Just Transition Plan (TJTP) aligned in your Member State/region to support industrial transformation? Please select one or more options that apply to your Member State/region.

<sup>39</sup> Question B13: Which challenges do you see in aligning the objectives of S3 and the TJTP? Consider challenges such as governance fragmentation, differing priorities, and any other barriers.

A number of respondents also pointed to the absence of a shared strategic vision, noting that different policy instruments often develop separate analyses of regional context and priorities. This lack of integration can result in inconsistent approaches to identifying needs and defining goals across S3, TJTPs, and other EU and national programmes. Additionally, in some cases, the implementation of TJTPs was perceived as being focused on fund absorption and identifying beneficiaries, rather than fostering innovation or structural transformation, which further complicated alignment with the broader strategic objectives of S3. This latter view is particularly noteworthy as it echoes insights from the case study interviews (see case study report below), where **the lack of a common strategic direction with the TJTP managing authorities** emerged as the primary challenge to aligning S3 and TJTP objectives.

**Figure 34: Challenges preventing an alignment between S3 and TJTPs - survey responses**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: S3 coordinators, ERDF MA, JTF implementing bodies. Multiple answers were allowed. Free text answers manually classified. N. valid answers: 19 referring to 17 national/regional strategies.

i
Case study

## Alignment between S3 and TJTPs to foster industrial transformation

### Lower Silesia (Poland) and Wallonia (Belgium)

**Introduction**

The heads of the units responsible for S3 in Wallonia (Belgium) and Lower Silesia (Poland), as well as a member of the ERDF /JTF Managing Authority in Wallonia were interviewed to understand how S3 and TJTPs can be aligned for industrial transformation. Wallonia, with its higher level of innovation, and Lower Silesia, both classified as Transition Regions, face similar challenges in aligning S3 and TJTP despite their differences in innovation capacities.

**Key success factors, challenges and transferability of the learnings**

Both regions have ensured that their TJTPs align with the priorities and objectives outlined in their respective S3s, particularly in areas such as innovation, research, and decarbonisation.

- In Wallonia, the S3 was conceived as a pre-existing strategic framework for regional innovation and industrial policy, with ERDF funds necessarily linked to its priorities. The S3 was finalised before the drafting of the TJTP, and the latter was based on the existing S3 document and integrated as a dedicated priority of the ERDF programme. The alignment between S3 and TJTP is made mandatory for R&I investments within the TJTP, which must fall under S3 priorities. Specifically, two research measures within the TJTP

require alignment with Smart Specialisation, focusing on three of the five S3 innovation areas (circular materials; agile/safe design and Industry 4.0; sustainable energy systems, and sustainable habitats).

- In Lower Silesia, the S3 was revised in 2021, incorporating seven specialisations, three of which are horizontal (Green Deal, Industry 4.0, Life Assisted Living). The TJTP is used in the Wałbrzych subregion, a former coal region. The inclusion of horizontal specialisations (such as the Green Deal) was partly driven by the anticipation of EU funding and priorities, including the TJTP, and the challenges of the Wałbrzych region influenced the development of the S3. The TJTP document includes a section on synergies with the S3, and the detailed objectives of the TJTP are linked to decarbonisation goals. The strategic objectives of the S3 are considered aligned with the TJTP.

Both Wallonia and Lower Silesia face similar challenges in aligning their S3 with the TJTPs, particularly around governance and strategic integration. In Wallonia, some stakeholders mentioned a lack of in-depth consultation during the drafting of the TJTP. Additionally, the geographical restriction of the TJTP, targeting specific districts, is seen as limiting for a broader regional innovation policy.

In Lower Silesia, there is an administrative separation between the S3 unit and the TJTP implementation unit, which limits the direct influence of the S3 team on TJTP execution. According to the interviewed stakeholders, the focus of the group overseeing the TJTP is primarily on resource allocation, rather than the concrete implementation of S3 objectives. Lower Silesia sees an opportunity in using TJTP funds to address the post-coal region's needs while aligning with EU Green Deal priorities. A stronger connection with the S3 would enhance the relevance of the TJTPs.

In both regions, there is a shared need to secure strong coordination between the S3 and TJTP governance structures to ensure a more coherent and effective alignment.

## **Conclusion**

The examples of Wallonia and Lower Silesia show that with clear selection criteria and shared objectives, alignment can contribute to more coherent industrial transformation. Overcoming the existing governance and strategic focus issues will be key to maximising the impact of these programmes. The TJTP, being geographically focused, may not always lend itself easily to a regional vision. At the same time, the TJTP aligns with EU Green Deal and Clean Industrial Deal objectives. Therefore, it can be effectively integrated into a coherent regional industrial transformation vision when these EU priorities are also embraced by the S3.

### 3.3 Governance and stakeholder management mechanisms – where do we stand in the second cycle of S3?

#### KEY FINDINGS ON S3 AND GOVERNANCE

- **S3 governance across the EU is characterised by three types of operational models:** While formal governance reflects compliance with EU enabling conditions, operational governance captures how strategies are implemented in practice, often revealing further refinements to governance arrangements. Strategies are implemented either primarily or exclusively at the national level, through a mix of national and regional levels, or primarily or exclusively at the regional level (see Section 3.3.1).
- **S3 governance models shape coordination practices:** The most common operational model is the mixed national-regional model (used by 11 Member States), followed by the primarily or exclusively national-level model (used by 10 Member States) and the regional-only model (used by 6 Member States). Taken together, the majority of Member States (17 out of 27) with mixed and regional-only models incorporate a strong regional dimension into their S3 strategies. Member States with regional and mixed national-regional models tend to generate multiple strategies; 150 out of 171 S3 strategies in the 2021-27 period are regional (i.e. 88%). The governance models and the levels at which S3 strategies are adopted significantly influence the type and extent of the mechanisms employed for vertical and horizontal coordination (see Section 3.3.1 and the findings below).
- **Vertical coordination in the context of S3 is shaped by the governance model adopted:** Around half of the S3 strategies explicitly recognise multi-level governance, whereas more specific forms of coordination, such as EU-national and regional-national coordination, are referenced far less frequently (14% and 7%, respectively). Survey data indicate that national-only models mainly use top-down consultation, regional-only models emphasise bottom-up dialogue and mixed models adopt a more balanced, albeit generally less intensive, approach (Section 3.3.1).
- **Horizontal coordination for S3 is recognised in principle yet underutilised in practice:** While almost half of S3 strategies mention cross-sectoral cooperation, fewer than a third refer to inter-ministerial working groups, funding alignment or policy mix coherence. Survey data show that interactive coordination tools are more commonly used in national settings, with significantly lower uptake in regional and mixed models. The coordination of funding sources is the least used coordination tool across all governance models (Section 3.3.2).
- **Stakeholder engagement demonstrates significant participation, albeit with varying levels of involvement:** Government and academic institutions are the most consistently engaged, while businesses participate moderately and civil society is the least represented. Cluster organisations play an important role, particularly in More Developed Regions, where they are more involved and have greater management capacity. Although all groups recognise the pivotal role of public authorities and academia in S3 governance, S3 authorities consistently view stakeholder representation more positively than the stakeholders themselves, who feel that engagement is less inclusive (see Section 3.3.3).
- **Stakeholder engagement varies throughout the policy cycle:** It is strongest during priority-setting, but declines notably during implementation and, in particular, during monitoring and evaluation. A consistent hierarchy of

engagement across all stages of the policy cycle and levels of regional development – with government coming first, followed by academia, intermediaries, businesses and civil society – indicates systemic rather than context-specific patterns. This highlights a reliance on episodic rather than sustained, iterative engagement (see Section 3.3.4).

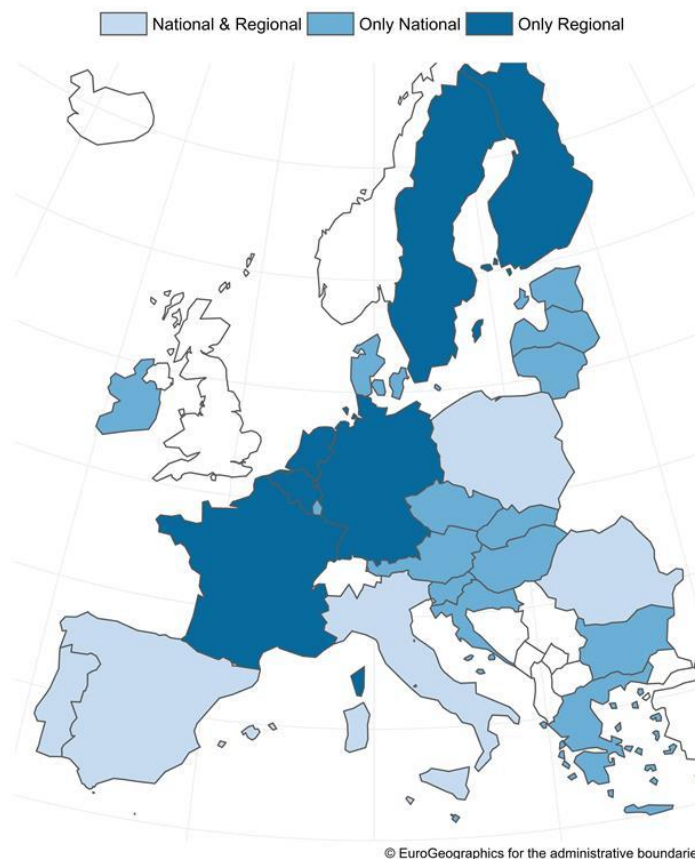
**Effective governance mechanisms throughout the S3 policy cycle – and sustained over time – are essential for enabling informed decision-making and for reflecting the diverse interests of the multiple stakeholders involved in the development and implementation of S3.** In this context, governance comprises the processes through which state and non-state stakeholders coordinate decision-making across the design, implementation, and evaluation phases of S3. Robust governance mechanisms are vital for ensuring continuous stakeholder engagement – particularly through the EDP – and for facilitating inclusive collaboration and coordination at every stage of the S3 policy cycle. Strengthening governance in this way not only reinforces the development and implementation of S3 strategies – which thereby can align more effectively with context-specific specialisation patterns, development trajectories, structural conditions and available resources – but also enhances greater stakeholder understanding, ownership and acceptance of the S3 framework and strategies themselves.

In the 2021-2027 programming period, governance has gained increasing meaning, emphasized by the enabling condition on "Good governance of national or regional smart specialisation strategies," which serves as an ongoing quality requirement throughout the programming period. The map below (Figure 35) shows at which levels of governance the **S3 strategies are formally adopted in each EU Member State** as documented in the S3 CoP Observatory<sup>40</sup>:

- **Six countries** – France, Germany, Belgium, the Netherlands, Sweden, and Finland – **implement S3 exclusively at the regional level**. These countries are generally more developed, with robust innovation ecosystems and high institutional capacity. They are predominantly located in Central, Western, and Northern Europe.
- **Five countries** – Portugal, Spain, Italy, Poland, and Romania – **adopt S3 strategies at both the national and regional levels**. Southern European countries (Portugal, Spain, Italy) are classified as moderate innovators, while the Eastern European countries (Poland, Romania) are considered emerging innovators according to the Regional Innovation Scoreboard.
- The largest group, comprising **16 Member States, adopts S3 solely at the national level**. These countries generally have smaller populations, averaging around 5 million, with the largest among them being Czechia, Greece, and Hungary, having up to 10-11 million inhabitants. Innovation performance in this group varies widely, spanning from emerging to moderate and strong innovators.

<sup>40</sup> [https://ec.europa.eu/regional\\_policy/assets/s3-observatory/index\\_en.html](https://ec.europa.eu/regional_policy/assets/s3-observatory/index_en.html)

**Figure 35: Formal governance levels of S3 Strategies according to S3 CoP Observatory**



Source: Prognos AG/CSIL (2025). Data from S3 CoP Observatory. The map refers to the latest available S3 strategies.

While the EU's Cohesion Policy and the enabling condition for accessing ERDF encourage the adoption of governance mechanisms to facilitate S3 processes, they also allow some flexibility in the level of governance at which S3 strategies are adopted and implemented, in order to accommodate local circumstances. The emphasis is placed on multilevel governance – the coordination across multiple governance levels and policy domains, involving continuous stakeholder engagement to design, implement, and monitor S3 policies.

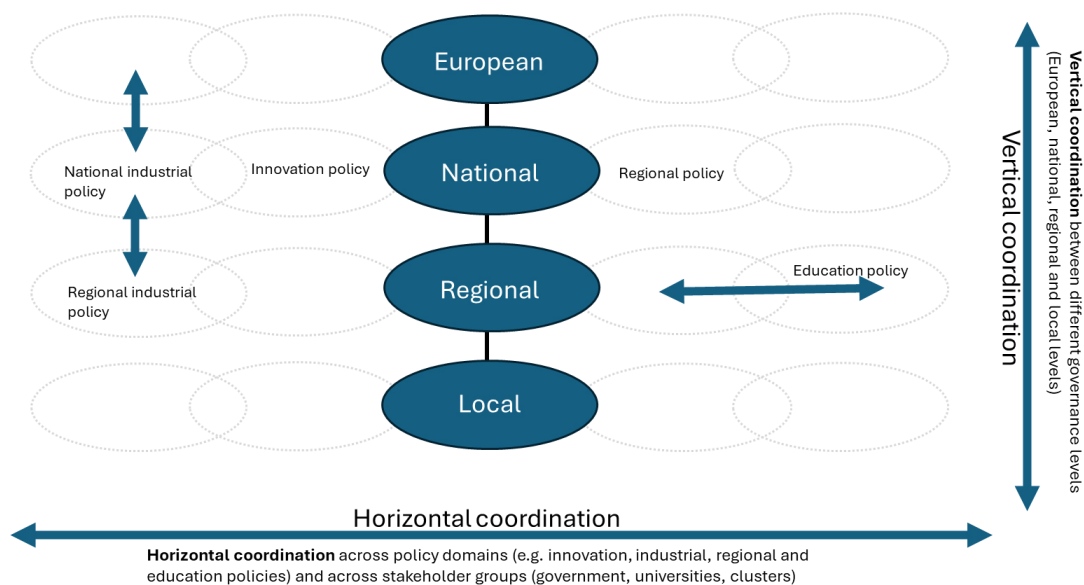
As shown in Figure 36, multilevel governance encompasses both **vertical coordination** across different territorial levels – local, regional, national, and European Union – and **horizontal coordination** across various policy domains integrating the input of a **diverse range of stakeholders** from the quadruple helix, including government authorities, businesses, academia, and civil society, **at each governance level**. However, as prior research on S3 governance has demonstrated, the development and implementation of S3 strategies show significant heterogeneity in governance and stakeholder management mechanisms across regions, each characterized by its unique features and functioning.<sup>41</sup> Although S3 aims to foster stakeholder inclusivity and robust coordination in innovation policy design and implementation, many regions continue to face difficulties with horizontal

<sup>41</sup> Kelchtermans, S., Kardas, M., Klincewicz, K. (2021). Implementing Smart Specialisation Strategies: Analysis of the Role of Regional Strategies in National Innovation Strategies. JRC.

and vertical coordination mechanisms.<sup>42</sup> Furthermore, maintaining sustained stakeholder engagement throughout the EDP and ensuring effective stakeholder management across all stages of the policy cycle and over time remain persistent challenges.<sup>43</sup> As this study’s survey results indicate, over 30% of respondents from S3 authorities and other stakeholder groups identify inadequate governance as a key bottleneck hindering the effective implementation of S3 investments (see Section 3.5.3). These developments on S3 governance underscores the relevance of the objective of this chapter, which is to review governance and stakeholder management in EU Member States and regions in S3 processes during the 2021–2027 programming period, with the goal to derive forward-looking implications for improving governance arrangements. Considering these developments, this chapter will address the **overarching questions** what coordination mechanisms and stakeholder engagement practices are deployed in S3 processes and if there are distinct patterns in coordination and stakeholder engagement across different regions.

The analysis in this section is structured according to the **multilevel governance framework** in Figure 36 as follows. Section 3.3.1 examines the vertical coordination of S3 processes across different levels of governance. Section 3.3.2 explores the horizontal coordination of S3 processes across policy domains within a single governance level. Section 3.3.3 assesses the inclusiveness of stakeholder engagement in S3 processes. Finally, Section 3.3.4 reviews the continuity of stakeholder engagement throughout the S3 policy cycle.

**Figure 36: Multilevel governance in S3**



Source: Prognos AG/CSIL (2025).

<sup>42</sup> Wibisono, E. (2024). Regional Governance Challenges in Implementing EU Smart Specialization Policy: A Critical Review. *European Journal of Geography*, 15(4), 281-292.

<sup>43</sup> Radosevic, S., Zoretic, T. (2024). EU smart specialization policy between experimentation and accountability. A dynamic policy cycle perspective. *European Planning Studies*.

### 3.3.1 Alignment of S3 processes across governance levels: The role of vertical coordination in S3

**Vertical coordination in S3 pertains to the structured alignment and collaboration among various governance levels** – supranational (EU), national, regional, and local – across the S3 policy cycle. It aims to ensure the coherent integration of S3 priorities and funding instruments, particularly the ERDF, across various governance levels and that the EDP and S3 strategies are overall in line with EU and national innovation and industrial policies.

**The existing literature on S3 governance asserts that effective vertical coordination, encompassing robust ties, activities, and instruments that link actors at various territorial and governance levels, is imperative for engaging stakeholders and their agendas in a bottom-up manner.**<sup>44</sup> This approach is designed to ensure that all governance levels are involved in the decision-making and implementation processes. The result of this is to foster multi-level synergies, rather than duplications or contradictory measures. In the context of multi-level governance, the alignment of S3 objectives, priorities, missions and initiatives across the EU, national and regional levels is considered essential to the effective functioning of S3 processes, particularly in Member States where regional and national S3 coexist.<sup>45</sup> Achieving this alignment necessitates a careful balancing act between top-down mechanisms and bottom-up approaches, thereby ensuring that the prioritisation of strategies and initiatives reflects both overarching goals and the specific needs of local contexts.

#### Governance models for S3 across the EU

**The findings of this study indicate significant heterogeneity in the governance levels of adoption and implementation of S3 across EU Member States.** A comprehensive review of relevant sources was conducted to ascertain the S3 strategies employed by EU Member States. This encompassed the analysis of S3 strategy documents, the EU-wide survey, interviews with S3 authorities and Managing Authorities, and existing studies.<sup>46</sup> The resultant data was systematically categorised, yielding **three overarching categories of governance models that reflect the operational practices of S3:**

- Primary or only **national** level strategies;
- **Mixed** national and regional level strategies;
- Primary or only **regional** level strategies.

Table 11, provides an overview of the operational governance levels at which the S3 strategy is adopted and implemented across different EU Member States, illustrating the **diversity in S3 governance models**. The predominant model is the mixed national-regional model, which has been adopted by 11 countries. This is followed by the primarily or exclusively national-level model, which has been adopted by 10 countries, and the primarily or exclusively regional-level model, which has been adopted by six countries. **It is important to highlight that 17 out of 27 Member States adopt either a regional or mixed governance model (i.e., 63%),** indicating that a majority of countries incorporate a

<sup>44</sup> Guzzo, F. and Gianelle, C., *Assessing Smart Specialisation: governance*, EUR 30700 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-37673-6, doi:10.2760/48092, JRC123984

<sup>45</sup> Crist, N. (2024) *Boost Local Institutions and Governance for Effective EU Policy*. Global Europe.

<sup>46</sup> Kelchtermans, S., Kardas, M., Klinecicz, K. (2021). *Implementing Smart Specialisation Strategies: Analysis of the Role of Regional Strategies in National Innovation Strategies*. JRC.

strong regional dimension into their S3 strategies. Large countries such as Germany and France, for instance, adopt regional-only strategies. As countries with regional and mixed national-regional models tend to produce multiple strategies – one per region – altogether, **150 out of 171 S3 strategies are regional (i.e., 88%)**.

**Table 11: Operational governance of S3 strategies across EU Member States and innovation performance in the EIS/RIS**

| Level of S3 Strategy                               | Innovation Leader     | Strong Innovator  | Moderate Innovator        | Emerging Innovator | Total |
|--|-----------------------|-------------------|---------------------------|--------------------|-------|
| Primarily or only <b>national</b> level strategies | 0                     | 3<br>(CY, EE, LU) | 4<br>(HU, LT, SL, MT)     | 3<br>(HR, SK, LV)  | 10    |
| <b>National and regional</b> level strategies      | 1<br>(DK)             | 2<br>(AT, IE)     | 5<br>(CZ, EL, IT, PT, ES) | 3<br>(BG, PL, RO)  | 11    |
| Primarily or only <b>regional</b> level strategies | 4<br>(BE, FI, NL, SE) | 2<br>(FR, DE)     | 0                         | 0                  | 6     |
| Total  | 5                     | 7                 | 9                         | 6                  | 27    |

Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders, interviews and S3 strategy documents. Adapted from Kelchtermans et al. (2021).

Note on methodology: National strategies define priorities only at the national level. Hybrid national/regional strategies define priorities at both national and regional level either within one consolidated S3 document or in separate national and various forms of regional documents. Countries classified as ‘regional’ do not have an S3 strategy at the national level, relying instead solely on regional-level strategies.

This coordination takes different forms across Member States, for instance:

- **In Spain, each region autonomously defines and implements its own Smart Specialisation Strategy**, complete with separate governance structures, priorities, and funding. Since the 2021-2027 programming period, these regional strategies coexist with a newly introduced national S3 strategy, and coherence between both levels is required. To support this, Spain has established several coordination mechanisms, including the R&D&I Policy Network, which brings together national and regional authorities to collaborate on strategic planning and ensure optimal access to EU funds. Additionally, forums like the S3/S4 Working Group of the ADR Forum (coordinated by Andalucía TRADE) facilitate ongoing dialogue. Notably, S4Andalucía includes representatives from the national level in its Co-Decision Committee, ensuring direct national input in regional decision-making.
- **In Czechia, vertical coordination is structured differently:** the national level (ministries) sets out national priorities, while regions – being self-governing territorial units – independently formulate their own S3 strategies. Though formal decision-making remains at the respective governance levels, mutual participation in working groups and consultations allows both levels to comment on each other’s drafts and proposals. Coordination is largely driven by expert networks and informal collaboration, and in practice, national and regional S3 priorities are broadly aligned. These examples demonstrate how vertical coordination can range from formal co-decision and joint governance structures (as in Spain) to more informal, expert-led alignment processes (as in Czechia), helping to ensure coherence while respecting governance autonomy.

**Moreover, a distinction should be noted between the observations in Figure 35 and the observations in Table 11, as they reflect different dimensions of S3 governance.** Table 11 provides a detailed description of operational governance, i.e. the implementation of strategies in practice. Figure 35 illustrates formal governance, which is based on compliance with EU enabling conditions for the 2021-2027 programming period, as outlined in the S3 CoP Observatory documentation. This distinction underscores the observation that what is formally reported does not necessarily reflect the actual practice of governance. To illustrate, although formal governance may suggest a fully centralised or regionalised S3 governance, operational dynamics may in fact involve hybrid or more nuanced arrangements.

**Consequently, the country classification in the primary categories (i.e., national-only, regional-only and mixed) is far from straightforward, as many Member States employ hybrid governance structures that combine national and regional levels in varying ways.** Four examples illustrate this:

- **Denmark's** business support system and management of EU structural funds underwent a broader reform in 2019. Previously, six Regional Growth Fora and a National Growth Council were responsible for regional innovation strategies. Following the reform, this responsibility was transferred to the Danish Executive Board for Business Development and Growth supported by six cross-municipal business centres. The new approach replaced regional strategies with a 'decentralised' but national-led strategy.<sup>47</sup> This governance structure is reflected in the S3 strategy document, which includes dedicated regional sub-chapters.<sup>48</sup>
- **Austria's** S3 governance is characterised by a broad national innovation strategy<sup>49</sup> serving as the official S3 document, supported by regional innovation strategies.<sup>50</sup> These regional strategies are not explicitly integrated into the national strategy but linked through dense formal and informal consultation processes.
- **Czechia** operates its S3 process within a formally national framework; however, its regions develop their own distinct regional S3 strategies.<sup>51</sup> These regional strategies are integrated into the national strategy through an annex known as the 'Cards of Regional RIS3 Strategies'.<sup>52</sup>
- **Greece** follows a dual approach that integrates comprehensive regional chapters into a national S3 strategy.<sup>53</sup>

<sup>47</sup> Aarhus (2021). An Overview of Smart Specialization Strategy in Aarhus, Denmark. Available online: <https://smartup-bsr.aalto.fi/wp-content/uploads/2021/06/O2.6-Aarhus-RIS3.pdf> (last access 13.06.2025).

<sup>48</sup> Danmarks Erhvervsfremmebestyrelse (2024). Virksomhedsudvikling i hele Danmark 2024-2027. Available online: <https://erhvervsfremmebestyrelsen.dk/virksomhedsudvikling-i-hele-danmark-2024-2027> (last access 13.06.2025).

<sup>49</sup> Federal Government Republic of Austria (2020). RTI Strategy 2030. Strategy for Research, Technology and Innovation of the Austrian Federal Government. Available online: [https://era.gv.at/public/documents/4489/RTI\\_Strategy\\_2030-1-1.pdf](https://era.gv.at/public/documents/4489/RTI_Strategy_2030-1-1.pdf) (last access 13.06.2025).

<sup>50</sup> See, for example, Upper Austria's Upper Vision strategy: <https://www.uppervision.at/> (last access 13.06.2025).

<sup>51</sup> See, for example: Central Bohemian Innovation Centre (2020). RIS3 Strategy of the Central Bohemian Region. 2020 Update. Approved by the Central Bohemia Regional Assembly on 1 June 2020. Available online: [https://s-ic.cz/wp-content/uploads/2020/09/RIS3\\_CBR\\_2020\\_EN\\_final\\_2020-06-01.pdf](https://s-ic.cz/wp-content/uploads/2020/09/RIS3_CBR_2020_EN_final_2020-06-01.pdf) (last access 13.06.2025).

<sup>52</sup> Ministry of Industry and Trade of the Czech Republic (2022). National Research and Innovation Strategy for Smart Specialisation of the Czech Republic 2021-2027. Annex 2 Cards of Regional RIS3 Strategies. Version 4, December 2022. Available online: <https://ris3.gov.cz/sites/default/files/2023-03/Annex%20-%20Cards%20of%20regional%20RIS3%20strategies.pdf> (last access 13.06.2025).

<sup>53</sup> Hellenic Republic Ministry of Development and Investments (2024): National Smart Specialisation Strategy 2021-2027. Available online: <https://gsri.gov.gr/ethniki-stratigiki-exyppnis-exeidikefsis-2021-2027/> (last access 13.06.2025).

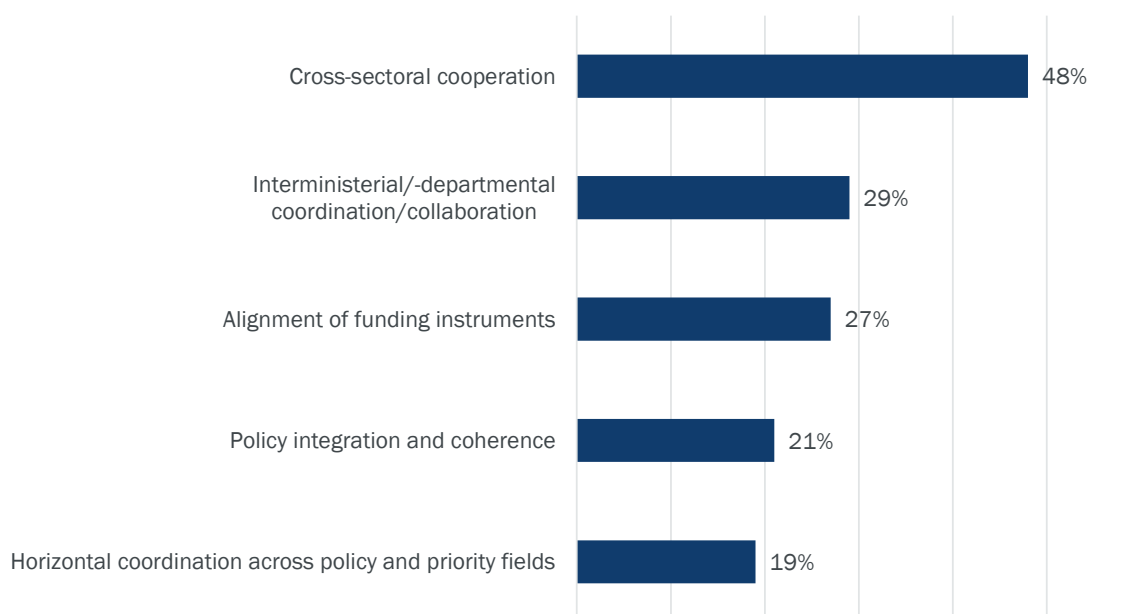
For further insight, please also refer to Section 3.1.1 on the articulation of priorities, which discusses how the coexistence of national and regional S3 strategies – for example, in Greece and Austria – adds complexity to governance, as priorities may intersect across governance levels.

Moreover, Table 11 provides a classification of the governance levels in the European Innovation Scoreboard/Regional Innovation Scoreboard taxonomy. It is suggested that the depicted patterns may offer explanations for the chosen governance modalities. While the overall distribution among the four EIS/RIS categories is relatively equal, certain patterns emerge with regard to the maturity of (regional) innovation ecosystems. It is evident that national-level strategies are predominantly prevalent among Member States categorised as emerging or moderate innovators, as evidenced by the EIS/RIS (seven countries). This approach is likely to ensure a consistent approach to innovation on a national scale. It is evident that Innovation Leaders and strong innovators in six countries primarily adopt regional level strategies, with the potential objective of leveraging localised strengths and specialisations. The presence of a combination of national and regional level strategies within a variety of Innovation Leaders, strong innovators, moderate innovators, and emerging innovators countries, underscores the significance of the concrete operationalisation of mixed governance structures.

### Types of vertical coordination in S3

In order to deepen the examination how vertical coordination is implemented in Member States' S3 processes, we deployed Natural Language Processing (NLP) to extract and assess, in a first step of the analysis, the frequency of references to vertical coordination across S3 strategy documents, specifically identifying terms describing vertical coordination mechanisms. Figure 37 below presents the **share of S3 strategies that mention various forms of vertical coordination**.

**Figure 37: Share of S3 strategies mentioning vertical coordination; by governance terms**



Source: Prognos AG/CSIL (2025), based on a semi-automated analysis of S3 documents for the 2021-2027 programming period.

The key categories of vertical coordination terms extracted and their respective shares among all S3 strategies are as follows:

- The term **‘multi-level governance’** is the most common reference to vertical coordination, mentioned in 49% of S3 strategies. This indicates an acknowledgement of the importance of coordinating across multiple governance levels (e.g., EU, national, regional) in S3 strategies.
- Other general terms, such as **‘vertical coordination across governance levels’** are referenced in about one-third (33%) of programmes.
- In contrast, **more specific terms for vertical coordination**, such as ‘EU-national coordination’ and ‘regional-national coordination’ are mentioned far less frequently (14% and 7% respectively). This suggests that, while the general principles of multi-level governance and vertical coordination across governance levels are recognised, explicit references to coordination between particular governance levels are less common.
- **‘Vertical coordination within priority fields’** is the second least cited terms (7%), indicating that coordination efforts are rarely tailored to specific thematic or sectoral areas within S3 documents.

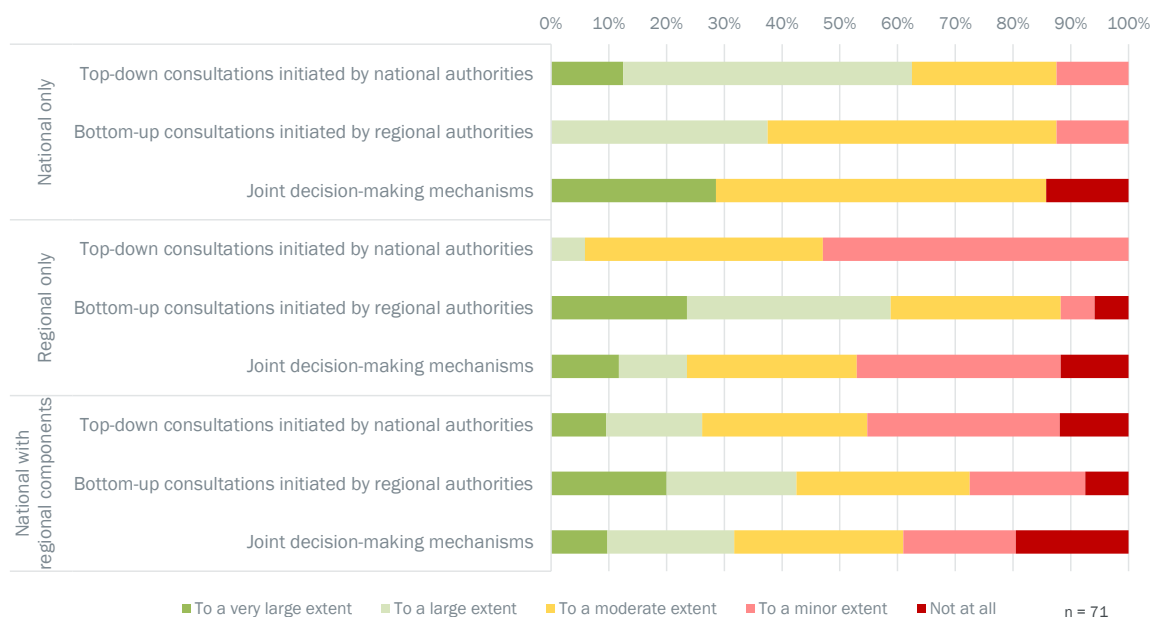
In summary, vertical coordination is acknowledged in S3 strategies, primarily at a general level (multi-level governance), but is less salient when it comes to concrete or specific coordination mechanisms between particular governance levels.

While the former analysis on vertical coordination mechanisms displayed formal ambitions outlined in S3 documents, we deepened the analysis of the **actual functioning of vertical coordination in different regional settings** through the EU-wide survey of S3 stakeholders. The survey examines the extent to which various vertical coordination mechanisms are used to enable cooperation and alignment between governance levels in the S3 process. Figure 38 displays the survey answers according to the types of governance models: primarily or only at national level strategies, primarily or only at regional level, and mixed national and regional level strategies.

**The findings show that the use of vertical coordination mechanisms in S3 processes depends heavily on the governance structures and levels at which S3 strategies are adopted (i.e., national, regional, mixed):**

- **National-only governance models** tend to rely more on top-down consultations initiated by national authorities, with a significant portion also using joint decision-making mechanisms to a very large extent.
- **Regional-only governance models** operate almost entirely through bottom-up consultations initiated by regional authorities, and to a lesser extent on joint decision-making mechanisms, with a notable reliance on moderate and minor extents.

**Figure 38: C2. To what extent are the following vertical coordination mechanisms used to enable cooperation and alignment between governance levels in the S3 process in your country/region?**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: authorities that indicated some form of vertical coordination for their country, all. Number of valid answers: 71 ranging from 7 to 42 depending on the option and referring to 57 regional/national strategies.

**National-with-regional-components governance models exhibit a more balanced use of all three types of vertical coordination mechanisms** (top-down, bottom-up, and joint decision-making) across various extents, but with a tendency towards moderate and minor extents rather than very large or large extents. This suggests a collaborative approach that integrates both national and regional inputs, but which does not heavily rely on any single mechanism to a very large or large extent. This might be because countries with mixed governance systems have, by design, more balanced governance structures between centralisation and decentralisation, leading to a more balanced use of top-down, bottom-up, and joint decision-making mechanisms, but not overly extensive use of any single vertical coordination mechanism. The cases of Greece and Austria (see case study below) illustrate the functioning of multi-level governance in different contexts.

i

## Case study

### S3 multi-level governance

#### Austria (including Upper Austria) and Greece (including Crete)

#### Introduction

Effective multi-level governance – coordinating across governance levels (EU, national, regional, and sub-regional) – is crucial for the successful design and implementation of S3, ensuring the alignment of policy actions within S3 processes.

This case study aims to provide a deeper understanding of the characteristics and functioning of multi-level governance in S3 in Austria and Greece.

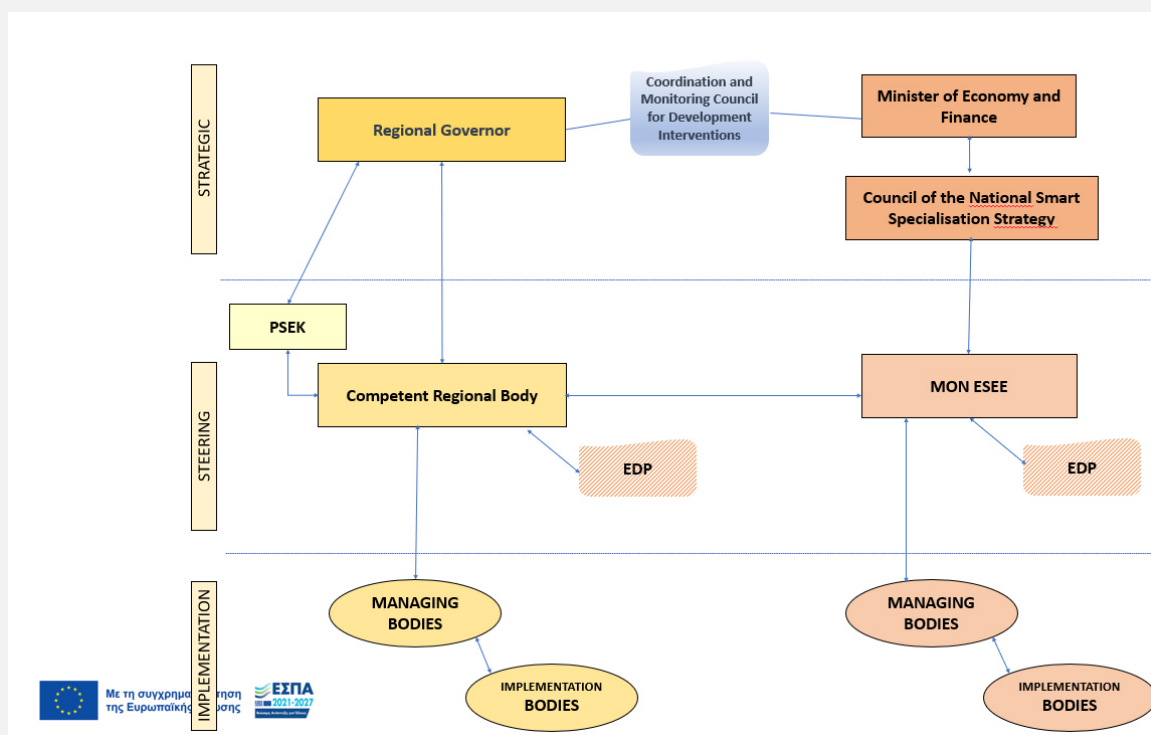
### **Key success factors, challenges and transferability of the learnings**

Greece and Austria both implement S3 through multi-level governance, but their structures reflect their distinct administrative contexts.

In Greece's multi-level system, with a national strategy coordinated by the Ministry of Economy and Finance sets the overall strategic direction of S3. The 13 Greek regions, as exemplified in the case of Crete, develop their own strategies, generating local engagement and collaboration throughout the EDP, while aligning with national and EU priorities. Coordination between national and regional levels is formally maintained through a network of ministries and regional authorities. As shown in Figure 40 below, the governance processes within both the national and regional levels are further differentiated into three tiers: the strategic, the coordination/steering, and the implementation tiers. At the national level, a Council for National Smart Specialisation Strategy provides strategic direction (strategic tier), while a dedicated unit of the Ministry of Economy and Finance (MON ESEE) oversees the EDP for the national S3 strategy, as well as design, programming, monitoring, and coordination (coordination tier). At implementation tier, there are the two bodies responsible for management and implementation of the individual projects. At the regional level, each region has a dedicated S3 body responsible for management, coordination, and implementation and an advisory body, the Regional Council for Research and Innovation (PSEK). As illustrated by the case of Crete, the strategic tier integrates entities such as the Regional Governor and the Regional Council for Research and Innovation of Crete (PSEK-K), while the coordinating tier includes the Regional Economy Development and Openness Directorate and the Innovation Business Observatory (IBO) operating within the General Directorate of Development Planning of the Region of Crete. At the implementation tier, the Managing Authority for the Program Crete oversees the administration of S3 implementation funds. The collaboration between levels is facilitated by a National S3 Coordination Network with representatives from the 13 regional branches, regular meetings, and the Council for Monitoring Development Interventions. Alignment between regional, national, and EU priorities is achieved through joint planning, peer-to-peer learning, and structured consultation processes.

Austria, in contrast, integrates federal and state-level governance through national Research, Technology, and Innovation (RTI) strategy operationalised via multi-year pacts and coordinated by platforms like the Austrian Conference on Spatial Planning (ÖROK), with regions such as Upper Austria adapting national frameworks to local priorities through dynamic, regularly evaluated strategies.

Both countries share several **successful factors**: robust coordination across governance levels, mechanisms for ongoing stakeholder engagement, and adaptability of strategies to regional needs. The EDP in Greece, and broad consultation and regular evaluation in Austria, are particularly effective in fostering innovation and ensuring strategies remain relevant. These approaches enable both countries to balance national oversight with regional autonomy.

**Figure 39: Multi-Level governance structure of the Greek S3 Strategy**

Source: Ministry of Economy and Finance, Greece (2025)

However, **challenges** remain. Greece faces visible disparities in regional capacity, procedural delays due to complex governance structures, and risks of national priorities overshadowing local needs – especially in regions lacking established innovation ecosystems. Austria’s main challenge is aligning federal programmes with the diverse needs of its states/regions, particularly in funding and thematic focus.

### Conclusion

This case study underscores the critical importance of flexible governance structures, stakeholder involvement, and effective vertical coordination mechanisms in implementing S3 across diverse regional contexts. Each region's approach provides valuable insights into harmonizing national directives with local specificities, offering models for countries looking to strengthen S3 governance.

### 3.3.2 Cross-sector policy alignment: How horizontal coordination is leveraged in S3

**In the context of S3, horizontal coordination involves the alignment and integration of S3 strategies and funding instruments across various sectors and policy domains at the same governance level.** Horizontal coordination shall guarantee that S3 strategies are developed in a coherent and complementary manner across relevant policy domains such as industry, regional development, education, and environmental sustainability policies, rather than in isolation. It requires formal interaction and collaboration among S3 authorities, ERDF Managing Authorities, sectoral ministries, innovation agencies operating at a given level of governance and other key stakeholders for promoting cross-sectoral synergies, supporting EDP, and aligning S3 priorities with wider economic and transformation policies.

These formal interactions are often implemented through instruments such as interdepartmental committees, working groups, and alignment assemblies, which align the activities of various ministries and departments to ensure effective strategy development

and implementation. As evidence shows, they play a crucial role in fostering coherence and alignment among the goals, strategies, policy instruments, and funding streams from the various policy domains relevant to S3.<sup>54</sup> An essential aspect of horizontal coordination is addressing and dismantling policy and administrative silos. This approach enables not only alignment in goals but also the design of consistent policy mixes and the effective coordination of policy initiatives' implementation.<sup>55</sup>

As with the analysis of vertical coordination, the initial step in analysing horizontal coordination in S3 across various regions involved the extraction of horizontal coordination keywords from all S3 strategies using Natural Language Processing (NLP) and the assessment of the frequency of references to horizontal coordination terms in the S3 strategy documents. Figure 40 shows the share of S3 strategies that mention different aspects of horizontal coordination, highlighting the most frequently used terms identified:

- The terms '**cross-sectoral cooperation**' are the most prominent, appearing in almost half of the strategies (48%).
- '**Interministerial and interdepartmental coordination**' is cited by about one-third of S3 strategies (29%), indicating a focus on breaking down silos within government and fostering joint action among ministries and departments.
- '**Alignment of funding instruments**' (27%) and '**policy integration/coherence**' (21%) are mentioned less frequently, suggesting these aspects are recognized but less systematically addressed.
- Explicit references to '**horizontal coordination across policy and priority fields**' are relatively uncommon (19%).

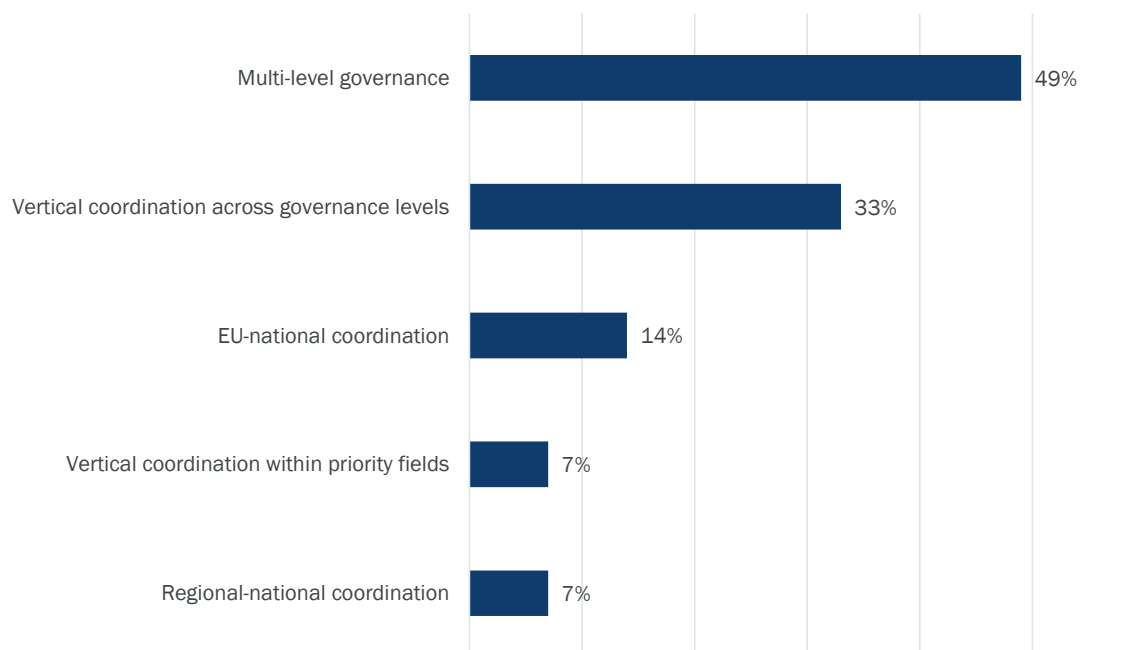
These findings demonstrate that horizontal coordination is a prominent theme in S3 strategies.

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<sup>54</sup> Aranguren, M. J., Morgan, K., Wilson, J. R. (2023). The institutional challenges of dynamic regional innovation strategies. *Regional Studies*, 57 (1), 72-83.

<sup>55</sup> Janssen, M., Wanzenböck, I., Fünfschilling, L., Pontikakis, D. (2023). Capacities for transformative innovation in public administrations and governance systems: Evidence from pioneering policy practice, Publications Office of the European Union, Luxembourg, 2023, doi: 10.2760/220273, JRC131490.

**Figure 40: Share of S3 strategies mentioning horizontal coordination; by governance terms**



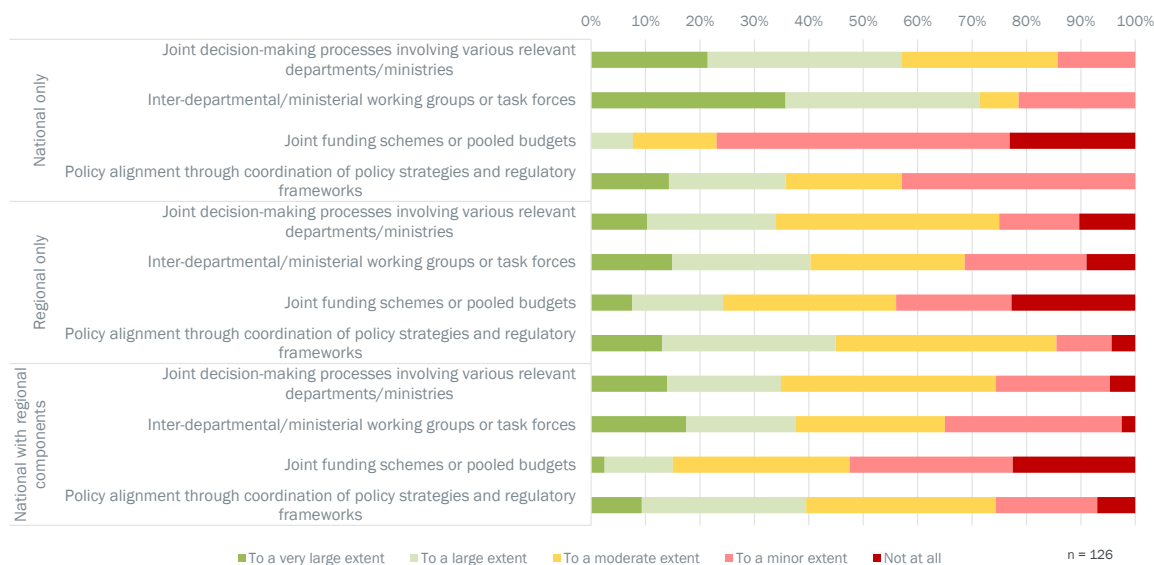
Source: Prognos AG/CSIL (2025), based on a semi-automated analysis of S3 documents for the 2021-2027 programming period.

Going beyond the document analysis, the survey assesses the extent to which horizontal coordination mechanisms are used for cross-sectoral alignment in the S3 process. Figure 41 provides insights into how different Member States and regions practically approach horizontal coordination within S3 processes on the ground.

The findings indicate that, in a manner analogous to the observations made in the context of vertical coordination, **the governance models and levels at which S3 strategies are adopted exert a significant influence on the type and extent of the mechanisms employed for horizontal coordination.**

**Member States that implement national-only governance predominantly utilise network coordination and interactive mechanisms.** These mechanisms include inter-ministerial/inter-departmental working groups and task forces (72%) and joint decision-making processes involving various departments or ministries (58%).

**Figure 41: C3. To what extent are the following horizontal coordination mechanisms used to enable cross-sectoral alignment and collaboration in the S3 process in your country/region?**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: authorities, all. Number of valid answers: 126 ranging from 13 to 69 depending on the option and referring to 106 regional/national strategies.

In contrast, **regional-only and mixed governance systems show a notably lower use of horizontal coordination mechanisms overall**. Only 45% (regional-only) and 40% (mixed) report using policy and regulatory coordination mechanisms – the most favoured horizontal coordination mechanism in these settings – to a large or very large extent. The use of more interactive tools, such as joint decision-making processes, drops to 34% (regional-only) and 35% (mixed). Similarly, inter-departmental working groups or task forces are used to a large or very large extent in only 40% of regional-only and 38% of mixed governance settings.

When breaking down the use of horizontal coordination mechanisms by levels of economic development (i.e., less developed, transition, and more developed) it is noteworthy that **no single horizontal coordination mechanism is reported as being used "to a large extent" or "to a very large extent" by a majority of respondents across any of the regional development categories**. Less developed countries show slightly higher relative usage of inter-ministerial/inter-departmental working groups and task forces (around 50%). Yet, the overall low uptake across all development levels points to a systemic underutilization of horizontal coordination mechanisms in the S3 process, regardless of a country's level of development.

While potentially a powerful mechanism for both horizontal and vertical coordination of S3, **joint budgeting or the coordination funding resources emerge consistently as the least used coordination tools across all governance models and levels of development**. This confirms the findings of the document analysis, which shows this mechanism to be less frequently mentioned in S3 strategies. Notably, the share of respondents indicating that these mechanisms are "not at all" used exceeds 20% across all three development levels and governance models. This consistent pattern suggests a widespread challenge in aligning financial planning across sectors and policy domains. However, the case study of Baden-Württemberg (see case study summary below) stands in contrast to this general trend. In Baden-Württemberg, the coordination of multiple funding sources – including EU, national, regional, and private funds – is a central pillar of the S3

strategy, serving as an effective and central tool for S3 governance and horizontal and vertical coordination.

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## Case study

### Coordination of multiple funding sources

#### Baden-Württemberg (Germany)



#### Introduction

This case study examines the coordination of multiple funding sources in the implementation of Smart Specialisation Strategies (S3) in Baden-Württemberg, Germany. Baden-Württemberg's approach showcases a well-integrated use of diverse funding sources, from various levels – EU, national, regional, and private – to support S3 objectives and drive innovation.

#### Key success factors, challenges and transferability of the learnings summary

Several key success factors contribute to the effective coordination of multiple funding sources underpinning S3 in Baden-Württemberg.

**One crucial factor is strategic alignment and a diverse funding mix that the region leverages.** S3 in Baden-Württemberg serves as an overarching framework for innovation policy, guiding not only the allocation of EU funds (notably ERDF) but also influencing national, regional, and private investment decisions. The region draws on a wide range of funding sources, with most of the R&I investment (about 85%) coming from the private sector, supplemented by significant contributions from state and federal sources, and a smaller share from EU programmes such as ERDF and Horizon Europe. The total annual R&I investment in the region amounts to approximately €5 billion, with only a small fraction (around €290 million over the seven-year period) provided by ERDF.

**Complementarity and gap-filling are also essential, ensuring resources are targeted where they are most needed, and duplication is avoided.** Regional funding programmes are designed to complement federal and EU initiatives, addressing gaps where national schemes do not reach, particularly in supporting regional research organisations and SMEs.

**This approach is achieved through ongoing, dialogue-based coordination.** Continuous stakeholder engagement – via both formal and informal mechanisms such as the RegioWIN competition and various strategic, industry, training and skills dialogues – ensures that regional needs and priorities are consistently integrated into the S3 and funding decisions.

**Furthermore, flexibility and adaptability in the design and implementation of the S3 strategy are key contributors to its success.** The S3 in Baden-Württemberg is described as a "breathing" strategy: it is regularly updated and remains responsive to new technological, economic, and geopolitical developments, rather than being a static document.

Main challenges:

- **Timing and synchronization:** Asynchronous planning cycles between funding levels make synergy difficult, especially with EU programs like Horizon Europe.
- **Complex multi-level governance:** Coordination relies on adapting to federal structures; formal working groups have limited practical impact.

- **Centralisation risks:** National or merged EU funds could undermine S3's regional, place-based approach.
- **Resource competition:** Innovation funding must compete with other public priorities, requiring ongoing advocacy.

### Conclusion

Baden-Württemberg's approach to coordinating multiple funding sources for S3 demonstrates the importance of a regionally tailored strategy underpinned by broad stakeholder engagement and adaptive program design. While formal coordination mechanisms exist, the main factors underpinning success are ongoing dialogue, a clear strategic framework, and the ability to complement rather than duplicate other funding streams.

### 3.3.3 Inclusive stakeholder engagement in S3: Participation across the quadruple helix

**The inclusivity of stakeholder engagement refers to the degree to which a diverse range of stakeholders is actively involved in S3 policy processes**, ensuring equal access to participation for all groups within the quadruple helix – government, academia, industry, and civil society. Effective governance arrangements rely heavily on diverse stakeholder participation that facilitate ongoing EDP. Inclusive stakeholder engagement serves to connect the EDP with a broad range of external expert knowledge, enriching the process and enhancing its outcomes.<sup>56</sup> The cases of the Basque Country and Catalonia illustrate how regions can strengthen stakeholders' capacity to participate effectively in S3 processes by tailoring capacity-building mechanisms to their specific local contexts (see Box on capacity building below). The comprehensive stakeholder survey explored the extent to which stakeholder engagement in S3 processes is inclusive and reflects broad representation across the various groups of the quadruple helix. Figure 42 below illustrates how different stakeholder groups are perceived to be represented, comparing the views of Managing Authorities and other stakeholders.

**While there is broad agreement among all stakeholder groups on the central role of public authorities and academia in S3 governance, perceptions of stakeholder engagement differ between S3 authorities and (ERDF) Managing Authorities and broader stakeholders.** In general, S3 authorities and Managing Authorities assess the representation of nearly all stakeholder categories – except for large enterprises – more positively than other stakeholders do. In contrast, other stakeholders offer a less positive view, indicating that engagement across the board is perceived as less inclusive.

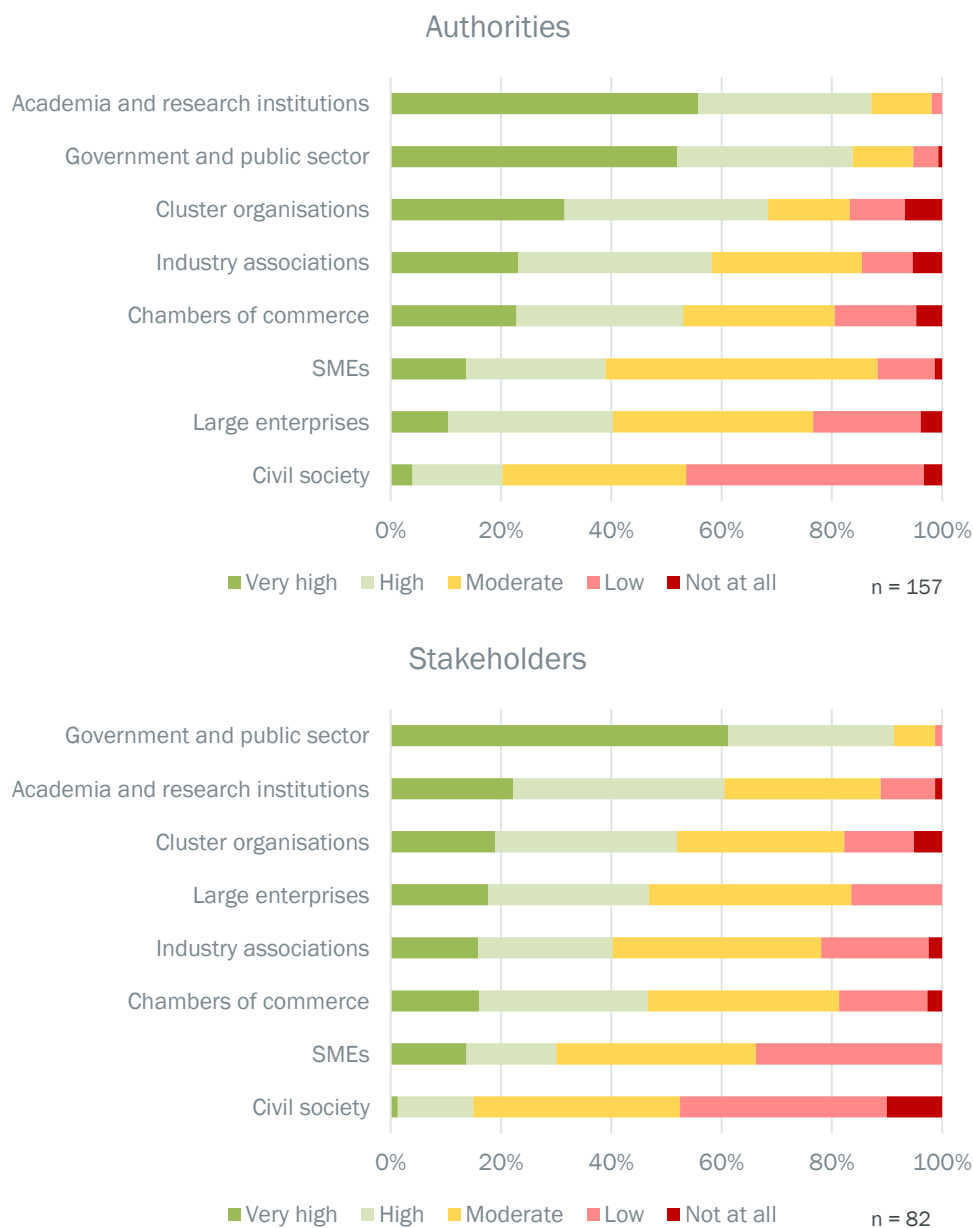
**On the one hand, S3 Authorities/Managing Authorities tend to rate the engagement of academia and research organisations higher than that of the government and public sector**, including themselves. They perceive academia and research organisations as the most well-represented stakeholder group, with approximately 87% of responses indicating "very high" or "high" levels of representation. In contrast, only 60% of other stakeholders believe that these actors are strongly involved in S3 processes.

**On the other hand, other stakeholders perceive the S3 process as heavily government driven.** Over 90% of other stakeholders believe the government and public sector are the most involved, compared to 84% of S3 authorities/Managing Authorities' responses. This different assessment indicates a possible perception gap regarding stakeholder engagement in S3 processes, due to normative expectations, particularly for

<sup>56</sup> Estensoro, M., & Larrea, M. (2023). Facilitation of entrepreneurial discovery processes by policymakers: an actionable definition of roles and challenges. *Journal of the Knowledge Economy*, 14(2), 1321-1342.

S3 authorities/Managing Authorities, about the desirability of diverse stakeholder engagement as precondition for effective S3 governance.

**Figure 42: C4. To what extent do you think the following groups are well represented in S3 stakeholder engagement processes?**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all. Number of valid answers: 239 in total referring to 140 regional/national strategies.

**Across all business sector categories – including large firms, SMEs, business associations, and chambers of commerce – representation is generally perceived as moderate, with some notable limitations, particularly in the case of SMEs. Large firms are considered well represented by 40% of authorities and 48% of other stakeholders, while SMEs receive lower ratings, with 38% of authorities and just 30% of other stakeholders viewing them as adequately engaged. Indirect representation through cluster organisations, industry associations and chambers of commerce is rated more positively. 58% of authorities and 40% of other stakeholders report “high” or “very high” representation for**

industry associations; 52% of authorities and 47% of other stakeholders for chambers of commerce. The ratings for cluster organisations are even higher. These values suggest that intermediary organisations play an important role in representing firms in the S3 processes, and might somewhat compensate for weaker direct engagement, especially among SMEs.

Finally, civil society receive the lowest ratings across both groups. Only 20% of S3 authorities/Managing Authorities and 15% of other stakeholders view them as well represented.

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Case study

Capacity building measures to enhance the capabilities of S3 stakeholders

Basque Country and Catalonia (Spain), and Portugal (including Norte)






**Introduction**

Capacity building is an important enabler of effective S3 governance, supporting vertical and horizontal coordination and stakeholder engagement. It contributes to the enhancement of skills, knowledge, resources, and institutional capabilities of various stakeholders across governance levels and policy sectors to plan, design, implement, monitor and coordinate S3 strategies. An analysis of the Basque Country, Catalonia, and Portugal (including Norte) illustrates how each region tailors its approach to address unique local contexts while managing broader systemic challenges.

**Key success factors, challenges and transferability of the learnings**

Each region has developed unique capacity-building mechanisms to support their S3 initiatives. In the Basque Country, the creation of a dedicated department for science, universities, and innovation, along with partnerships with organisations such as Innobasque and Orkestra, underscores a centralised governance model. This approach focuses on workshop-driven training programs that enhance R&D&I evaluation skills and foster innovative policy experimentation.

Catalonia emphasizes strong stakeholder engagement through its Opportunities Discovery Mechanism, employing Innovation Camps and transformative initiatives supported by academic collaborations, which foster collaborative and place-based innovation. The emphasis on inclusivity and stakeholder-driven processes empowers diverse actors to contribute meaningfully to decision-making and the EDP.

Portugal adopts a multi-level approach to capacity building, targeting both public actors and other stakeholders such as businesses, academia, and civil society and integrating innovative technologies and data-driven methodologies to strengthen institutional capabilities both nationally and regionally. Training programs are offered in cooperation with higher education organisations, covering topics such as public policy evaluation. Both national and regional actors have implemented capacity building to foster stakeholder engagement and support for the EDP. ANI organises EDP sessions focusing on the six national priority domains and preceded by preparatory workshops that provide stakeholders with relevant background knowledge and strategic orientation. The collaboration between national authorities and regional entities, such as the Norte Regional Authority, promotes a coordinated alignment of capacity building measures to ensure sustainable impact. Yet, similar to the Basque Country's challenge of sustaining pilot models and Catalonia's financial constraints, Portugal faces hurdles in synchronizing strategies across governance levels.

The Basque model's structured governance could be scaled to regions with robust institutional frameworks, while Catalonia's participatory mechanism offers insights for resource-constrained

areas. Portugal's data-centric approach exemplifies how advanced technologies can enhance capacity building, providing lessons for regions embracing digital transformations.

### Conclusion

The experiences from Portugal, the Basque Country, and Catalonia emphasize the need to adapt capacity-building mechanisms to local contexts, thereby strengthening stakeholders' ability to engage effectively in S3 processes. Continuous training and learning play a central role within each region: Portugal (including Norte) leverages advanced data systems, the Basque Country utilizes structured cross-sectoral governance models, and Catalonia applies participatory, place-based approaches like Innovation Camps. Collectively, these strategies highlight the dynamic and multifaceted nature of capacity building in supporting effective S3 governance.

**The analysis of stakeholder inclusivity in S3 governance, structured by regional development levels, reveals several key patterns.** The public sector, academia and research organisations are rated consistently as the most represented groups across all development levels. Public sector engagement is particularly strong in Transition Regions, where 93% of respondents rate their representation as high or very high, compared to 83% in Less Developed and 86% in More Developed Regions. Academia and research organisations are also rated as having high levels of engagement, though their prominence declines slightly as regions develop, dropping from 82% in Less Developed Regions to 75% in More Developed Regions.

**Cluster organisations show a clear upward trend in engagement as regions advance,** with positive ratings rising from 46% in Less Developed Regions to 73% in Transition and 75% in More Developed Regions (for further discussion of this finding, see also Section 3.3.4). Industry associations and chambers maintain moderate and stable levels of engagement across all development stages, typically ranging from about 49% to 57%.

**The business sector displays a notable divergence between large enterprises and SMEs.** Large enterprises are more engaged in developed regions, with engagement increasing from 39% in Less Developed Regions to 53% in More Developed Regions. In contrast, SMEs are most engaged in Less Developed Regions (43%), but their participation drops sharply in Transition Regions (25%) and remains relatively low in more developed areas (35%).

**Civil society remains consistently underrepresented in S3 stakeholder engagement.** Only 17-20% of respondents across all regions rating their involvement as high or very high.

### 3.3.4 Continuous stakeholder engagement: How involvement is sustained throughout the S3 policy cycle

**Continuity in stakeholder engagement means consistently involving stakeholders throughout the entire S3 policy cycle** – from priority setting and decision-making to implementation, evaluation, and ongoing adjustments. Effective engagement relies on stable, long-term partnerships and inclusive participatory mechanisms that involve a broad spectrum of quadruple helix actors – businesses, research institutions, public authorities, and civil society – throughout the entire policy cycle.<sup>57</sup> Securing commitment from all relevant stakeholders requires more than mere participation in consultation processes; it

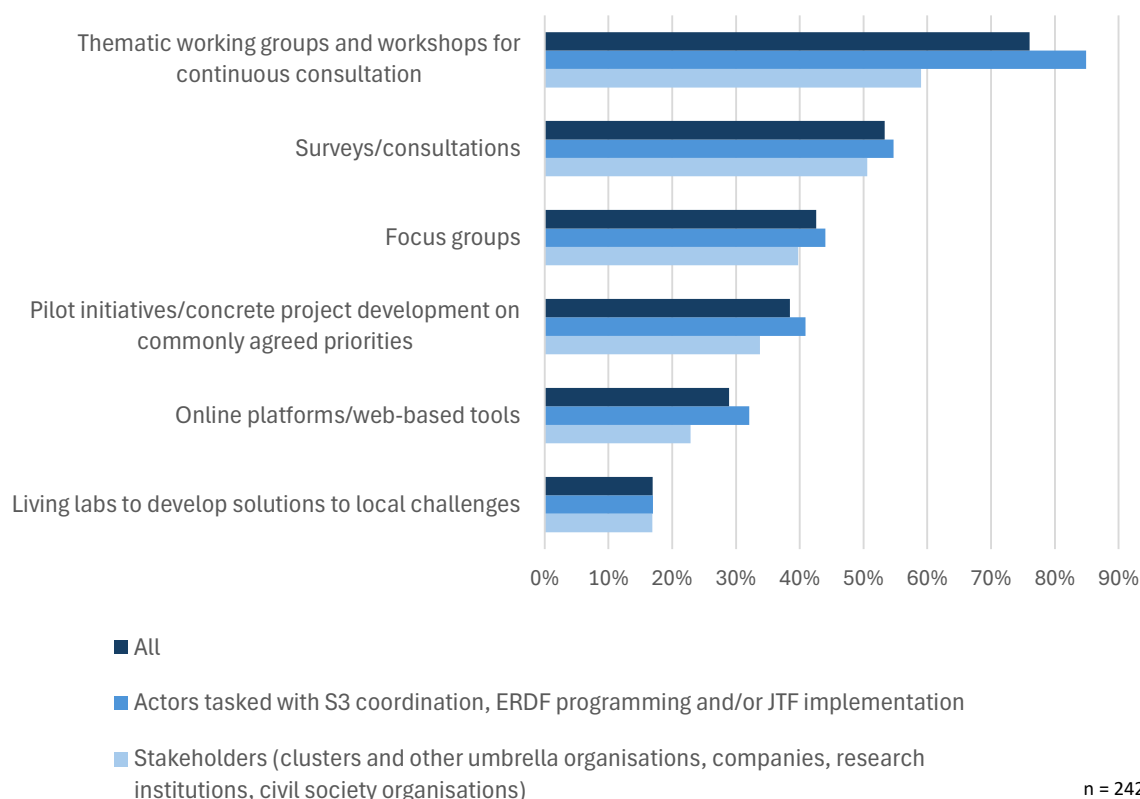
<sup>57</sup> Fratesi U., Gianelle, C. and Guzzo, F, Assessing Smart Specialisation: Policy Implementation Measures, EUR 30758 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-40034-9, doi:10.2760/71769, JRC123821; Radosevic, S., Zoretic, T. (2024). EU smart specialization policy between experimentation and accountability. A dynamic policy cycle perspective. European Planning Studies.

involves active engagement in decision-making and co-creation, fostering shared ownership of strategies and initiatives.

The survey examines the specific tools and mechanisms used to maintain ongoing stakeholder engagement throughout the EDP in the S3 framework. Figure 43 presents these findings, disaggregated by respondent group, namely S3 authorities/Managing Authorities and other stakeholders. Thematic working groups and workshops emerge as the primary mechanisms for continuous stakeholder engagement across the EDP. S3 authorities/Managing Authorities report particularly high usage of these instruments, with 85% indicating their use. All other engagement mechanisms play a supplementary role, receiving considerably lower ratings, with reported usage ranging from approximately 15% to 55% depending on the tool and respondent group.

**There is an overall agreement about what are the most used tools, yet across nearly all engagement mechanisms, S3 authorities/Managing Authorities consistently report higher usage rates than other stakeholders.** This trend is evident in Figure 43, where S3 authorities/Managing Authorities report greater use of tools such as thematic working groups and workshops (85% vs. 59%), surveys (55% vs. 50%), focus groups (45% vs. 40%), pilot initiatives (40% vs. 35%), and online platforms (32% vs. 23%). The only exception in this pattern is the use of living labs, where both S3 authorities/Managing Authorities and other stakeholders report similar – and relatively low-usage rates – around 15%. This indicates that living labs remain an emerging practice in the context of EDP stakeholder engagement, not yet widely adopted.

**Figure 43: C5. What specific tools/mechanisms are used to maintain ongoing stakeholder engagement throughout the Entrepreneurial Discovery Process (EDP) in the S3 framework?**



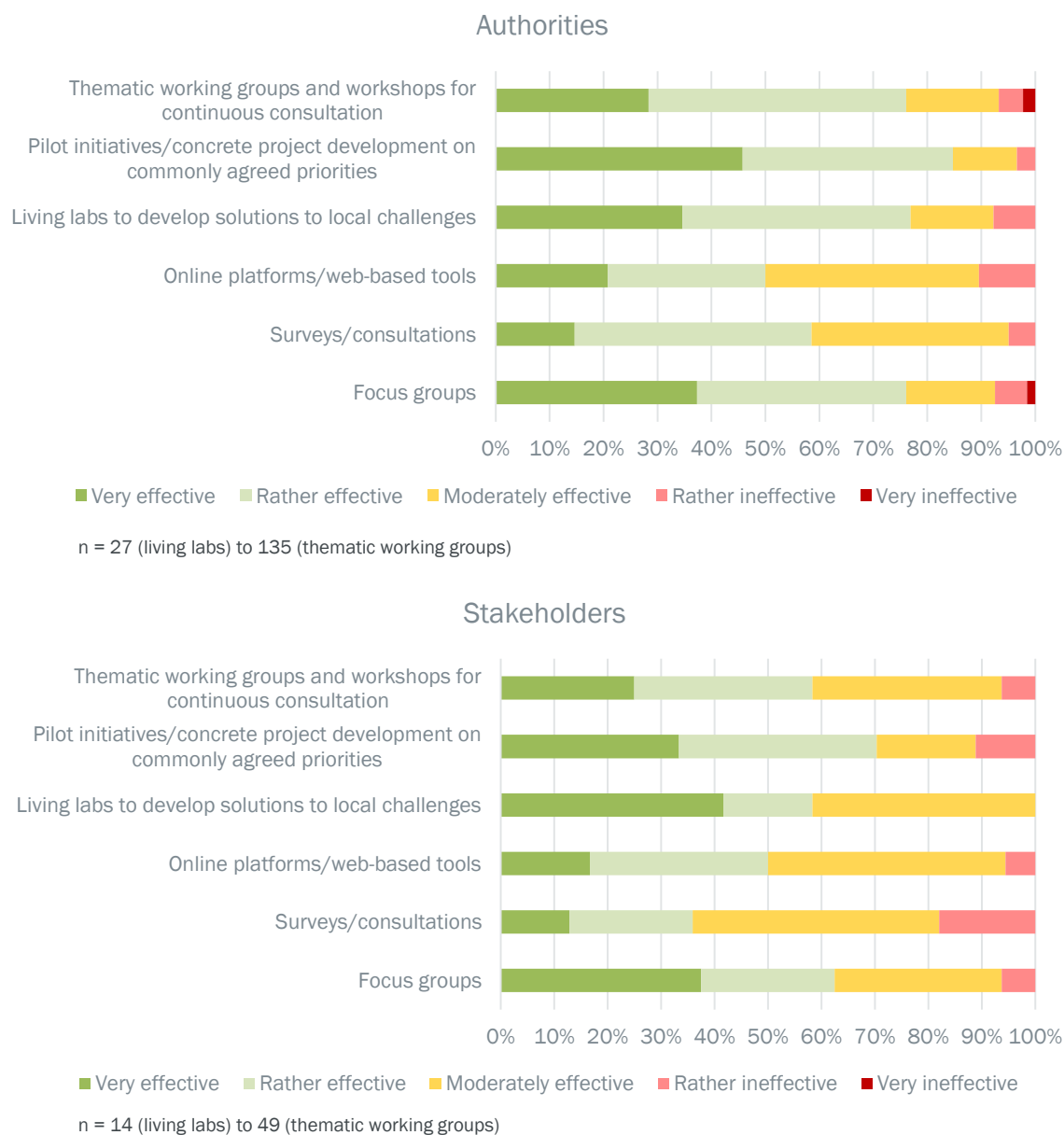
Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all. Number of valid answers: 242 referring to 135 regional/national strategies.

**The Figure 44 presents the effectiveness ratings for a range of instruments, again as evaluated by two groups:** S3 authorities/Managing Authorities and other stakeholders. Consistent with findings on the extent of use (see Figure 43), S3 authorities/Managing Authorities tend to rate the effectiveness of engagement instruments higher than other stakeholders. This pattern is evident across all instruments, except online platforms and web-based tools. This perception gap is particularly pronounced for surveys/consultations (21 percentage points difference) and living labs (19 points).

**Both S3 authorities/Managing Authorities and other stakeholders perceive pilot initiatives as the most effective instrument for continuous engagement**, with 85% of S3 authorities/Managing Authorities and 70% of other stakeholders rating them as “very effective” and “rather effective.” Online platforms/web-based tools and surveys/consultations are seen as less effective. Online platforms and web-based tools are the lowest rated for authorities, with only 50% of both authorities and other stakeholders considering them highly effective. Surveys/consultations are the lowest rated for other stakeholders, 58% of authorities rate them as highly effective, compared to just 37% of other stakeholders.

**Notably, the instruments most frequently used in S3 stakeholder engagement are not always those rated as most effective** (see Figure 44 and Figure 45). While surveys/consultations are commonly deployed due to their scalability and ease of implementation, they are not perceived as highly effective for fostering continuous engagement. In contrast, pilots and living labs, though less widely used, are rated more highly as tools able to sustain active stakeholder involvement and co-creation. Such a misalignment between usage and perceived effectiveness suggests that more resource-intensive, participatory formats (like pilot initiatives and living labs) may be underutilized relative to their potential impact on engagement.

**Figure 44: C.6 How effective are these instruments in maintaining continuous engagement of stakeholders across different phases of the S3 process? By stakeholder group**

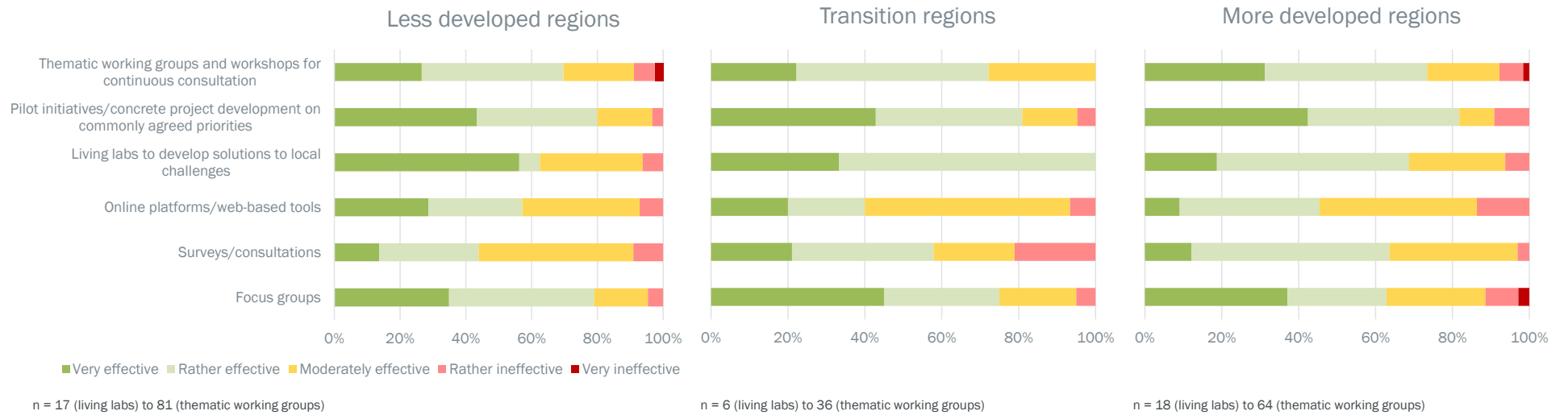


Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all, visualisation split between authorities and stakeholders. Number of valid answers: ranging from 14 to 135 based on the option referring to 134 regional/national strategies.

The analysis of Figure 45 highlights how the effectiveness of different instruments for maintaining continuous stakeholder engagement in the S3 process varies by regional development level. Some instruments, such as pilot initiatives and thematic working groups or workshops, are consistently rated as highly effective across all contexts. Pilot initiatives receive the highest ratings overall (80% in Less Developed, 81% in Transition, and 82% in More Developed Regions). Thematic working groups and workshops also show high and stable effectiveness (70-74% across all regions). Their high ratings indicate a broad consensus on their usefulness for sustaining engagement throughout the S3 cycle, regardless of regional context.

In contrast, other instruments display more variation in effectiveness depending on the region. Living labs, for example, are rated extremely effective in Transition Regions (100%) but considerably lower in less developed (63%) and more developed (69%) areas. Focus groups follow a similar pattern, with high ratings in Less Developed (79%) and Transition Regions (75%), but a notable drop in More Developed Regions (63%). The effectiveness of surveys and consultations increases with the level of development, from 44% in Less Developed Regions to 57% in Transition and 64% in More Developed Regions. On the other hand, online platforms and web-based tools are consistently rated as the least effective instrument, with effectiveness declining from 57% in Less Developed Regions to 40% in Transition and 45% in More Developed Regions.

**Figure 45: C6. How effective are these instruments in maintaining continuous engagement of stakeholders across different phases of the S3 process? By regional development level**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all. Number of valid answers: ranging from 17 to 64 based on the option and referring to 134 regional/national strategies.

## Stakeholder engagement at each stage of the policy cycle

As a central component of our investigation into S3 governance, we examined the **continuity of stakeholder engagement throughout the S3 policy life cycle**. In the following, first, we assess the degree of involvement of various stakeholder groups at each distinct phase of the policy cycle, emphasising key differences in engagement across development levels. We then synthesise, compare, and summarise the engagement patterns observed across all stakeholder groups, policy phases, and development categories, drawing attention to the most significant trends and overarching patterns.

Figure 46 presents the survey results disaggregated along the regional development levels of Cohesion Regions and the three main elements of S3 governance: priority-setting and decision-making, implementation, and monitoring and evaluation.

### *Priority-setting and decision-making*

**Across all regions, government and public sector actors, along with academia and research organisations, are rated as the most engaged in priority-setting and decision-making.** Notably, while government and public sector involvement increases slightly with development (from 80% in Less Developed to 87% in More Developed Regions), the participation of academia and research organisations declines in More Developed Regions (from 77% in Less Developed and 76% in Transition to 68% in More Developed Regions). In contrast, **cluster organisations** play an increasingly significant role as development advances, with their involvement rising from 43% in Less Developed to 65% in More Developed Regions.

**Business sector engagement in S3 priority-setting and decision-making is generally limited to moderate, both directly and through intermediary organisations.** The direct engagement of companies – both large enterprises and SMEs – remains limited and inconsistent across all development contexts. Large enterprises are involved at 38% in both Less Developed and More Developed Regions, but only 28% in Transition Regions; SMEs are least engaged in Transition Regions (15%), compared to 37% in Less Developed and 28% in More Developed Regions. **Intermediary organisations maintain a stable level of involvement** across all development levels (43-47%), indicating a consistently recognised role in representing business interests. **Civil society remains consistently underrepresented**, with only 17% involvement in both Less Developed and More Developed Regions and just 10% in Transition Regions. This highlights the persistent marginal role of this group in S3 governance.

### *Implementation*

Shifting the focus to **stakeholder engagement in the implementation phase of S3** the findings reveal that **the public sector and academia are the leading actors in S3 implementation, with cluster organisations becoming increasingly important as regions develop.** The involvement of the public sector is strong in Less Developed (72%) and Transition (74%) Regions, reaching its highest level in More Developed Regions (82%), which highlights the growing influence of public authorities in implementation governance as regions advance. Showing inversed trends, **the engagement of research organisations and universities slightly declines as development progresses, whereas cluster organisations become increasingly engaged.** Academia and research organisations show high engagement in Less Developed and Transition Regions (70%), but their involvement declines modestly to 65% in More Developed Regions. In contrast, **the role of cluster organisations rises from 32% in Less Developed to 54% in More Developed Regions**, which may be a sign of higher maturity levels of the cluster organisations (including larger cluster management teams, see Table 13 below).

**Figure 46: C7. Involvement of different stakeholder groups along the policy cycle, by Cohesion region types**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all. Number of valid answers: ranging from 44-96 per sub-chart and referring to 131-138 regional/national strategies depending on the phase.

**Business sector engagement is mixed.** Interestingly, SMEs are most involved in Less Developed Regions (53%), but their participation drops sharply to 30% in Transition Regions and only partially recovers to 38% in More Developed Regions. Large enterprises are not central actors in S3 implementation, with low and fluctuating involvement: 30% in Less Developed, 32% in Transition, and 25% in More Developed Regions. **Industry associations and chambers of commerce maintain consistently low engagement** across all regions (21–26%), suggesting a limited role in implementation processes.

**Civil society remains minimally involved across all development levels.** Their participation is rated at just 10% in Less Developed and Transition Regions and 8% in More Developed Regions.

#### *Monitoring and evaluation*

Looking at the governance of monitoring and evaluation (M&E), the findings show that **stakeholder engagement in M&E is centred on the public sector.** Public authorities consistently occupy the leading position in these processes – as to be expected – while other stakeholder groups, such as **academia and research organisations, tend to participate at a moderate level but do not take a central role in the process.** Public sector involvement in M&E is strong across all development levels, rising from 74% in Less Developed Regions to 80% in Transition Regions and reaching 81% in More Developed Regions. Academia and research institutions maintain moderate engagement, peaking at 52% in Transition Regions, with slightly lower participation in Less Developed (48%) and More Developed (45%) Regions.

**As regions become more developed, cluster organisations and industry associations become increasingly involved in M&E.** Cluster organisation engagement rises sharply with development, from 23% in Less Developed to 47% in transition and 49% in More Developed Regions. Similarly, industry associations and chambers of commerce show a steady increase in involvement, from 20–23% in Less Developed, 23–25% in Transition, to 28–38% in More Developed Regions.

**In contrast, SMEs and large enterprises remain peripheral on the governance of M&E processes.** SME involvement is highest in Less Developed Regions (25%), drops significantly in Transition Regions (14%), and only partially recovers in More Developed Regions (21%). Large enterprises are marginally engaged, with participation at 14% in both Less Developed and Transition Regions and rising slightly to 18% in More Developed Regions. **Civil society is consistently the least involved group.** It displays minimal engagement across all levels of development – ranging from 10% to 12%.

#### **Stakeholder engagement intensities: Comparison across the S3 policy cycle and synthesis**

The Figure 47 synthesises the results from the EU-wide stakeholder survey, displaying for each cohesion category the **involvement of primary actor groups in the three core phases of the S3 policy cycle**, i.e., prioritisation and decision-making, implementation, and monitoring & evaluation. Table 12 provides a summary of their average participation across all phases. The survey respondents were invited to score each group on a five-point Likert scale ("not involved" = 0 to "highly involved" = 4). The mean ratings for each stakeholder type, phase and development level were then calculated.

**The data reveal a clear hierarchical structure** when assessed on a 0-4 scale. Governmental bodies demonstrate the highest levels of engagement, with a mean score of 3.00–3.42. Academia and research institutions follow, with a mean score of 2.35–3.11. Business-oriented actors, including cluster organisations, chambers, industry associations, SMEs and large firms, occupy the middle range, with a mean score of approximately 1.5–

2.8. Civil society demonstrates the least engagement, with a mean score that rarely exceeds 1.7. This finding aligns with the conclusions of previous studies, which have also identified a peak in involvement during the prioritisation and decision-making phases (e.g., in academia, the range is 2.76–3.11). There is a decline in involvement during the implementation phase (range 2.69–3.10), and involvement is at its lowest in the monitoring and evaluation phase (range 2.35–2.56). However, the government maintains high levels of participation throughout, which reflects its coordinating mandate.

**Figure 47: Mapping stakeholder engagement patterns throughout the S3 policy cycle**

|                                    | Less developed                   |                |                         | Transition                       |                |                         | More developed                   |                |                         |
|------------------------------------|----------------------------------|----------------|-------------------------|----------------------------------|----------------|-------------------------|----------------------------------|----------------|-------------------------|
|                                    | Prioritisation & Decision-making | Implementation | Monitoring & Evaluation | Prioritisation & Decision-making | Implementation | Monitoring & Evaluation | Prioritisation & Decision-making | Implementation | Monitoring & Evaluation |
| Government and public sector       | 3,30                             | 3,00           | 3,16                    | 3,39                             | 3,14           | 3,22                    | 3,42                             | 3,14           | 3,22                    |
| Academia and research institutions | 3,11                             | 2,84           | 2,40                    | 3,08                             | 3,10           | 2,56                    | 2,76                             | 2,69           | 2,35                    |
| Cluster organisations              | 2,24                             | 1,93           | 1,64                    | 2,52                             | 2,30           | 2,24                    | 2,84                             | 2,58           | 2,40                    |
| Industry associations              | 2,41                             | 1,83           | 1,74                    | 2,18                             | 1,77           | 1,65                    | 2,36                             | 1,97           | 1,95                    |
| Chambers of commerce               | 2,38                             | 1,78           | 1,72                    | 2,34                             | 1,80           | 1,67                    | 2,16                             | 1,78           | 1,90                    |
| SMEs                               | 2,23                             | 2,43           | 1,71                    | 1,84                             | 2,04           | 1,50                    | 1,99                             | 2,21           | 1,71                    |
| Large enterprises                  | 2,14                             | 1,97           | 1,55                    | 2,10                             | 2,00           | 1,59                    | 2,14                             | 1,91           | 1,66                    |
| Civil society                      | 1,65                             | 1,33           | 1,33                    | 1,67                             | 1,55           | 1,44                    | 1,52                             | 1,20           | 1,31                    |
|                                    | n = 97                           |                |                         | n = 51                           |                |                         | n = 76                           |                |                         |

Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Notes: Type of respondents: all. Number of valid answers: ranging from 226 to 238 based on the option. Note: Likert-scale responses were converted into numerical scores (0-4), and the figure displays the averaged values for each stakeholder group, policy phase, and development category.

**The overall structure of engagement is remarkably consistent across development categories.** However, there are subtle shifts: academia and research organisations are slightly less involved in More Developed Regions (e.g., prioritisation: 2.76 in More Developed Regions vs. 3.11 in Less Developed Regions), while cluster organisations become more prominent as development advances (e.g., prioritisation: 2.84 in More Developed Regions vs. 2.24 in Less Developed Regions). Despite these variations in absolute scores, the relative ranking of stakeholder groups remains stable: government and academia lead, business groups occupy the middle (with cluster organisations generally ahead of other business actors), and civil society consistently lags behind. This suggests that the observed engagement patterns reflect systemic characteristics of S3 governance rather than context-specific features.

**Table 12: Engagement patterns by stakeholder and policy phase**

| Stakeholder group                   | Highest engagement phase           | Lowest engagement phase | Relative rank (Overall) |
|-------------------------------------|------------------------------------|-------------------------|-------------------------|
| Government and public sector        | Prioritisation and decision-making | Implementation          | 1st (3.22)              |
| Academia and research organisations | Prioritisation and decision-making | M&E                     | 2nd (2.77)              |
| Cluster organisations               | Prioritisation and decision-making | M&E                     | 3rd (2.30)              |
| Industry associations               | Prioritisation and decision-making | M&E                     | 4th (1.98)              |
| SMEs                                | Implementation                     | M&E                     | 5th (1.96)              |

|                      |                                    |                    |            |
|----------------------|------------------------------------|--------------------|------------|
| Chambers of commerce | Prioritisation and decision-making | M&E                | 6th (1.95) |
| Large enterprises    | Prioritisation and decision-making | M&E                | 7th (1.90) |
| Civil society        | Prioritisation and decision-making | Implementation/M&E | 8th (1.44) |

Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Notes: Type of respondents: all. Number of valid answers: ranging from 226 to 238 based on the option. Note: Likert-scale responses were converted into numerical scores (0-4), and the figure displays the averaged values for each stakeholder group, policy phase, and development category.

The role of cluster organisations is worthwhile to highlight further as the **contribution of cluster organisations to S3 varies significantly with regional development** (Table 13). In Less Developed Regions, their engagement diminishes following the priority-setting phase, coinciding with less developed cluster management structures where two-thirds of cluster organisations operate with very small management teams ( $\leq 5$  FTE), i.e. limited managerial and specialist knowledge. Conversely, in Transition Regions, and even more so in More Developed Regions, their involvement persists throughout the policy cycle, supported by progressively larger teams. The proportion of medium-to-large organisations ( $\geq 10$  FTE) increases from 15% in LDRs to 25% in TRs and 46% in the MDRs. This pattern implies that less-developed territories struggle to harness the benefits of cluster organisations within the S3 policy cycle, especially regarding the EDP, supporting interregional collaboration and investments in industrial transformation.

**Table 13: Team sizes of cluster organisations across Cohesion groups**

| Team size (FTE) | Less developed (N = 94) | Transition (N = 83) | More developed (N = 55) |
|-----------------|-------------------------|---------------------|-------------------------|
| 0 – 5           | 58 (61.7 %)             | 40 (48.2 %)         | 16 (29.1 %)             |
| 6 – 9           | 22 (23.4 %)             | 22 (26.5 %)         | 14 (25.5 %)             |
| 10 – 19         | 10 (10.6 %)             | 14 (16.9 %)         | 15 (27.3 %)             |
| $\geq 20$       | 4 (4.3 %)               | 7 (8.4 %)           | 10 (18.2 %)             |
| <b>Total</b>    | 94                      | 83                  | 55                      |

Source: Prognos AG/CSIL (2025). Own elaboration based on data from the European Cluster Panorama (2024) and the European Cluster Collaboration Platform.<sup>58</sup>

<sup>58</sup> European Cluster Collaboration Platform (2024). European Cluster Panorama 2024, [https://www.clustercollaboration.eu/sites/default/files/document-store/Cluster\\_Panorama2024.pdf](https://www.clustercollaboration.eu/sites/default/files/document-store/Cluster_Panorama2024.pdf)

## 3.4 Embeddedness of interregional cooperation in the S3 policy design

### KEY FINDINGS ON S3 AND INTERREGIONAL COOPERATION

- **Robust empirical evidence confirms that interregional collaboration is widely considered essential for achieving S3 objectives:** 86% of S3 and ERDF managing authorities, as well as nearly 90% of other stakeholders, endorse this view. Furthermore, all S3 strategies for the period 2021-2027 – along with their associated ERDF programmes – explicitly reference interregional collaboration, thereby fully complying with the enabling-condition requirements (see Section 3.4.1).
- **The strategic design of provisions for interregional collaboration varies significantly in terms of coherence and level of detail:** Although three quarters of S3 strategies explicitly refer to funding sources for interregional innovation projects (mainly national or regional ERDF programmes), detailed specifications on measures and initiatives (e.g., macroregional strategies, Important Projects of Common European Interest (IPCEIs), Interreg projects and S3 Thematic Platforms) vary across strategies. While 35% of the strategies include seven or more measures to support interregional collaboration, for 29% no concrete measures were identified (see Section 3.4.1).
- **Furthermore, the analysed ERDF programmes provide no information on planned budgets for interregional collaboration or on the planned conditions or incentives to encourage such collaboration:** This suggests that there is untapped potential under Article 63.4 of Regulation (EU) 2021/1060, which permits the financing of operations outside the programme territory (see Section 3.4.2).
- **The uptake of structured engagement remains limited; loose, ad hoc collaboration still dominates:** Only one third of survey respondents (covering both stakeholders and S3 authorities) report frequent, structured interregional collaboration. Meanwhile, 46% collaborate occasionally or informally, and 18% do not collaborate at all (see Section 3.4.3).
- **The existing measures foreseen within the S3 strategies are considered moderately effective by the surveyed S3 authorities in facilitating interregional collaboration,** although opinions differ depending on the level of collaboration referred to: Current S3 measures are considered effective in establishing interregional partnerships (54%) and fostering existing value chains (46%). However, challenges remain in the commercialisation of R&I results and the creation of new value chains, as the S3 measures are deemed less effective in these areas (see Section 3.4.3).
- **Survey evidence also reveals a maturity gap in the perceived effectiveness of interregional collaboration measures:** S3 officials in Innovation Leader regions rate most instruments as very or effective, whereas their counterparts in Emerging Innovator areas rate them as only slightly or not effective. This is particularly the case for instruments targeting joint interregional investments and commercialisation (43% and 39% rate these as only slightly or not effective respectively; see Section 3.4.3).

- **The main obstacles to interregional collaboration are capacity shortages and limited awareness of the benefits:** These issues were cited by 63% of public authorities and 60% of stakeholders. Other obstacles include difficulty in identifying mutually advantageous themes (51%) and low visibility of opportunities (47%). Funding issues exacerbate the problem: 63% of respondents noted a lack of funding instruments, 62% struggled to access existing funds and 60% saw weak promotion of them. While More Developed Regions tend to face strategic coordination issues, Less Developed Regions struggle more with foundational challenges such as capacity deficits and limited access to funding (Section 3.4.3).
- **The S3 Thematic Platforms play a significant supporting role in fostering interregional collaboration,** with almost 68% of S3 authority respondents affirming the support provided by the various Thematic Platforms, particularly the Thematic Platform on Industrial Modernisation (Section 3.4.3). However, they remain limitedly integrated into S3 strategies, with only around 40% of strategies mentioning them explicitly (Section 3.4.1).

This chapter presents the findings on the role of S3 in driving interregional innovation investments during the 2021-2027 period. The following research questions are explored: To what extent is interregional collaboration for R&I integrated into the ERDF programmes under shared management? Furthermore, it seeks to identify the successes observed in enhancing interregional collaboration for R&I investments under cohesion policy. Finally, it will examine which conditionality mechanisms, specific measures and/or reforms can be implemented to strengthen cooperation in complementary S3 areas along value chains.

**The European Commission’s High Level Group Report on the Future of Cohesion Policy (2024) underscored the strategic importance of interregional cooperation as a catalyst for knowledge transfer, innovation, and investment across the EU.**<sup>59</sup> This perspective is echoed in recent publications that highlight interregional collaboration as a crucial enabler of technological development and industrial competitiveness<sup>60</sup>, particularly in building and expanding European value chains. In high-tech sectors such as semiconductors, where radical innovation and the adoption of emerging technologies are imperative, both intra- and interregional networking play a pivotal role.<sup>61</sup> Furthermore, cross-regional spillovers help foster technological diversification, supporting regional high-tech development through external knowledge acquisition and collaboration mechanisms like technology transfer and interregional agreements.<sup>62</sup>

**The 2021-2027 programming period marked a notable shift towards an outward-looking approach in the development and implementation of S3.** This approach emphasises the significance of identifying niches, clusters, and value chain connections to

<sup>59</sup> Forging a sustainable future together. Cohesion for a competitive and inclusive Europe: report of the High-Level Group on the Future of Cohesion Policy, February 2024. Available online: [Forging a sustainable future together - Publications Office of the EU](#).

<sup>60</sup> Tripll, M., Soete, L., Kivimaa, P., Schwaag Serger, S., Koundouri, P., Pontikakis, D. (2024). Addressing the regional dimension of open strategic autonomy and European green industrial policy. New perspectives and pathways for impact. JRC, European Commission. Available [online](#). See also Bachtrögler-Unger, J., Balland, P.-A., Boschma, R., Schwab, T. (2023). Technological capabilities and the twin transition in Europe. Opportunities for regional collaboration and economic cohesion. Bertelsmann Stiftung. Available [online](#).

<sup>61</sup> Huggins R., Jonston A., Munday M. and Xu C. (2023). Competition, open innovation, and growth challenges in the semiconductor industry: the case of Europe’s clusters. *Science and Public Policy*, 50(3), 531-547. Available [online](#).

<sup>62</sup> Sergio, I., Iandolo S., Ferragina, A. M. (2023). Inter-sectoral and inter-regional knowledge spillovers: The role of ICT and technological branching on innovation in high-tech sectors. *Technological Forecasting and Social Change*, Vol. 194., 122728, ISSN 0040-1625, <https://doi.org/10.1016/j.techfore.2023.122728>. Available [online](#).

establish a region's competitive advantage in global markets and to identify partners for delivering new solutions and addressing common challenges. EU regions are encouraged to explore opportunities for interregional collaboration, particularly in areas where complementary strengths are identified through mapping exercises. The current S3s need to prioritise international collaboration in order to meet the enabling condition for the good governance of national or regional smart specialisation strategy. This involves fulfilling seven criteria, one of which is identifying measures to enhance cooperation with partners outside a given MS in the priority areas supported by the S3.<sup>63</sup>

**It is important to note that the S3s and ERDF Programmes include a range of legal provisions that address interregional collaboration.** As delineated in criterion 7 of the enabling condition, interregional cooperation is defined as measures to enhance cooperation with partners outside a given MS in the priority areas supported by the S3. Programmes intending to receive funding under SO 1.1 and SO 1.4 are obligated to fulfil criterion 7. Within the scope of ERDF programmes, the term "interregional cooperation" encompasses interregional, cross-border, and transnational initiatives, as delineated in point (d)(vi) of Article 22(3) CPR. This principle is applicable to all specific objectives where relevant. A direct link is not established between these two legal provisions. In terms of investment, Article 63.4 of Regulation (EU) 2021/1060 permits the implementation of ERDF-funded activities to be undertaken beyond the confines of a specific Member State.

**Against this background, this study has examined the role of S3 in driving interregional innovation investments during the 2021-2027 period.** It presents evidence on current approaches to interregional cooperation in policy design and its implementation. This section is structured as follows:

- Section 3.4.1 and Section 3.4.2 explore how interregional collaboration for R&I is integrated into strategic documents. It hence presents the findings of the analysis of S3 strategic documents in S3 and ERDF national/regional programmes.
- Section 3.4.3 assesses how interregional collaboration is implemented in practice under S3 and ERDF deriving insights on the effectiveness and success factors to strengthening cooperation in S3 areas. It primarily builds on the insights derived from the stakeholder survey as well as the conducted case studies on the Innovation Scheme Express and the Joint Investment Plan Galicia and Norte.

### 3.4.1 Role of interregional collaboration in the S3 documents

**The objective of this analysis in this section was to understand the degree to which interregional cooperation has been embedded into the current S3 strategies** and how this was followed through in national and regional ERDF Programmes for the 2021-2027 programming period. The present study employed LLM-powered Natural Language Processing (NLP)<sup>64</sup> techniques to extract information from the S3 strategies and ERDF Programmes. Initially, the documents were methodically analysed page by page using a LLM. Paragraphs deemed relevant for the analysis of interregional cooperation were

<sup>63</sup> European Commission (2022): The role of Smart Specialisation in the cohesion policy 2021-2027, [https://ec.europa.eu/regional\\_policy/sources/policy/communities-and-networks/s3-community-of-practice/The\\_role\\_of\\_the\\_Smart\\_Specialisation\\_in\\_the\\_cohesion\\_policy\\_2021\\_2027.pdf](https://ec.europa.eu/regional_policy/sources/policy/communities-and-networks/s3-community-of-practice/The_role_of_the_Smart_Specialisation_in_the_cohesion_policy_2021_2027.pdf).

<sup>64</sup> NLP enables computers to read, understand, interpret, and generate human language in a meaningful way. It works by recognising patterns, relationships, and structures within the language data, extracting knowledge and concepts, and mapping them into concept maps. Knowledge extraction algorithms extend beyond text and semantic analysis, which serve to understand the meaning of text by analysing word semantics, context, and co-occurrence patterns. They also identify schemes and topics, along with related concepts within the reviewed documents. These algorithms aim to convert unstructured data into structured formats that can be easily analysed and interpreted. The algorithms may require a training process using a sample of programmes to validate results and enhance accuracy.

extracted, while those pages lacking classified content were discarded. In a subsequent step, the identified paragraphs were subjected to further analysis with a LLM, utilising the predefined parameters.

The parameters were operationalised as questions to a LLM about a certain aspect of interregional collaboration, i.e. if the document contains references to the parameter. If that question was answered with yes, the document was further analysed, for example, with respect to which S3 area was mentioned. The parameters used in the analysis were: geographical coverage, type of collaboration, references to shared or complementary S3 areas and value chains, references to ERDF programmes or other funding sources, references to EU macroregional strategies, interregional initiatives and networks, the type of joint actions and type of involved partners. A detailed overview on the used parameters and their description is provided in Table 30 and Table 31 of Annex 6. Where suitable, the results of the document analysis were supplemented by examples as well as insights from the conducted survey and case studies.

For the identification of interregional collaboration measures an LLM was further asked to extract concrete measures from the previously selected S3 strategy paragraphs. Technically, this meant that numerous iterations of tests were run to guarantee a high quality of extraction from each S3 strategy document. The extracted measures were then categorised using a well fine-tuned prompt and eventually went through a manual verification (human-in-the-loop) process to ensure a high-quality standard.

### Funding and stakeholders for interregional collaboration in S3 strategies

**On an overarching level, the analysis reveals a generally high level of alignment of the S3 documents and the dimension of interregional collaboration.** The present analysis encompassed a total of 167 S3 documents<sup>65</sup>, the findings of which are structured in accordance with the selected parameters outlined above. The high alignment is evident in the mentions of the parameter's geographical coverage, i.e. cooperation with partners outside a given Member State, and type of collaboration, for example, bilateral, cross-border or transnational, that amount to 164 (98%) of the 167 S3s.

**Of the S3 strategies examined, a significant proportion (143, constituting 86%) refer to various measures supported by ERDF**, thereby suggesting a high level of regulatory alignment between S3 and ERDF. In 123 cases (74%), specific funding sources for interregional collaboration projects are indicated. The most prominent of these are national or regional ERDF programmes, followed by Horizon Europe. Of the 123 programmes, 53% refer to the Interreg programmes. To a lesser degree, the Innovation Fund and the I3 are also referenced in the S3 documents. The reduced scope of I3 may be attributable to its status as a recent policy innovation, with the inaugural I3 calls being initiated in November 2021.<sup>66</sup>

The table below provides an overview of the main funding sources:

<sup>65</sup> There are 171 S3s in the database, however, four strategies have been excluded from the analysis due to technical issues.

<sup>66</sup> European Commission (2021): Commission launches the €570 million interregional innovation investment instrument, [Inforegio - Commission launches the €570 million interregional innovation investment instrument](#).

**Table 14: Overview on the main funding sources mentioned in S3 documents 2021-2027 for interregional collaboration**

| Programme/Initiative      | No. of S3s covered                | Objectives  |
|---------------------------|-----------------------------------|---|
| ERDF-supported programmes | 117 (95%) out of 123 S3 documents | Promote economic, social, and territorial cohesion across the EU and reduce disparities between regions by supporting innovation, digitalisation, and low-carbon economies            |
| Horizon Europe            | 112 (91%) out of 123 S3 documents | Strengthen the EU's science and technology base and foster innovation through research, improving European competitiveness on a global scale  |
| Interreg                  | 65 (53%) out of 123 S3 documents  | Enhance territorial cooperation across borders within the EU supporting projects that address common regional challenges and strengthen European integration                          |
| Innovation Fund           | 25 (20%) out of 123 S3 documents  | Support the commercial demonstration of innovative low-carbon technologies with the focus on areas such as energy-intensive industries, renewable energy, carbon capture, and storage |
| I3                        | 24 (20%) out of 123 S3 documents  | Stimulate interregional cooperation for scaling up innovative projects and support promotion of value chains across regions, focusing on smart specialisation priorities              |
| EUREKA                    | 28 (23%) out of 123 S3 documents  | Facilitate transnational cooperation for market-driven R&I and innovation projects and enhance competitiveness and innovation of businesses through collaborative projects            |

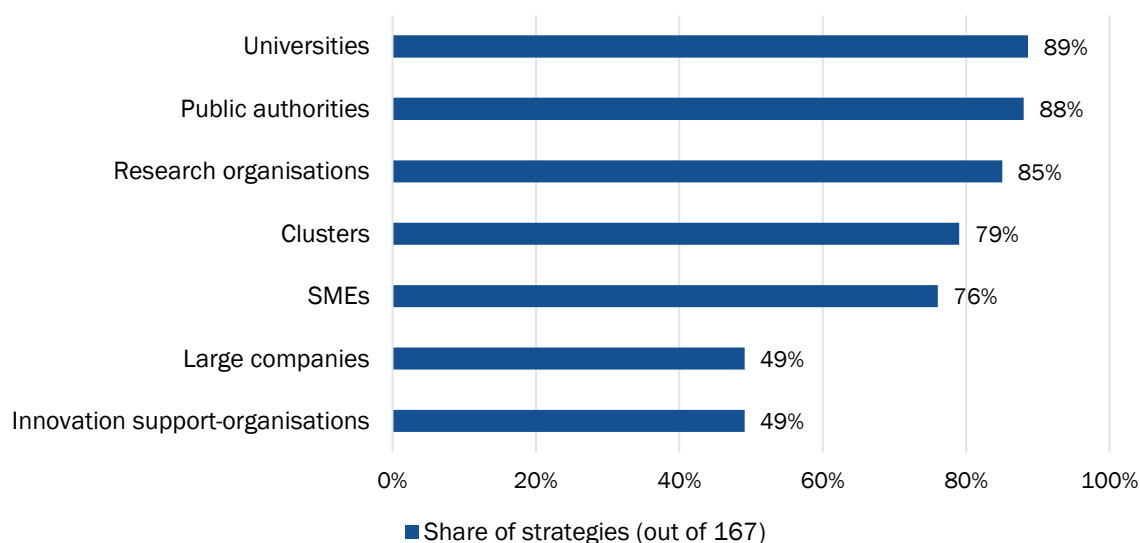
Source: Prognos AG/CSIL (2025) based on a semi-automated analysis of S3 documents for the 2021-2027 programming period.

The subsequent illustration exemplifies the **case of a well-aligned S3 and ERDF regional programme** with regard to interregional collaboration: the case of Wallonia, Belgium. The region provides financial support for training activities and vouchers for interregional collaboration, as well as subsidy schemes and higher funding rates for internationalisation.

**In the majority of cases (96%), the S3 documents refer to specific S3 areas in which joint activities are focused.** These include digitalisation, health, mobility, sustainable manufacturing and nanotechnology. The analysis further underscores the strategic intent of enhancing specific value chains, as evidenced by the explicit mention of these value chains in 98% of the S3 documents, encompassing agri-food, energy, industrial modernisation, and health. These findings are reflected and supplemented by the survey results, which demonstrate that the share of interregional collaboration is particularly high in the S3 areas or areas of value chains such as renewable energy and green technologies, digitalisation, advanced manufacturing, health and agrifood.

**Finally, in the majority of S3 documents, the intended partners to be involved in interregional collaboration are specified** (see Figure 48). The S3 strategies primarily focus on universities (91%), public authorities (90%), research organisations (87%), clusters (81%) and SMEs (78%). Approximately 50% of the relevant strategies pertain to large companies and innovation support organisations.

**Figure 48: References to type of partners for interregional collaboration in the S3 strategies**



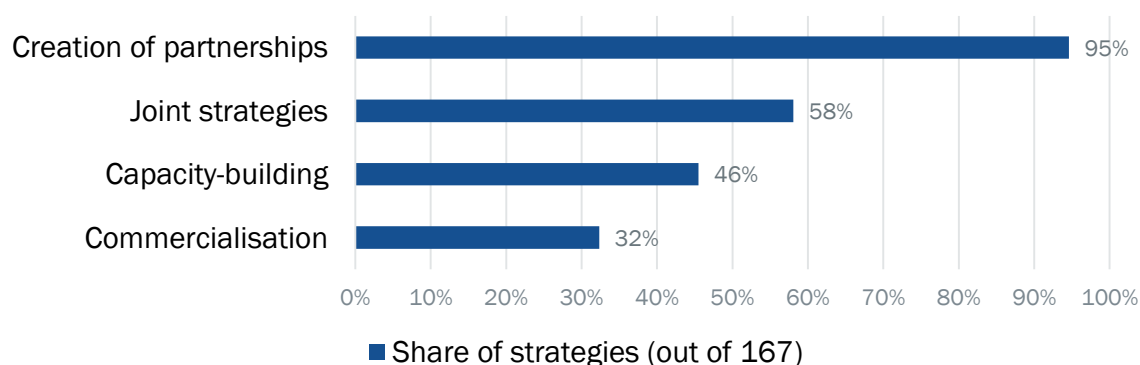
Source: Prognos AG/CSIL (2025) based on a semi-automated analysis of S3 documents for the 2021-2027 programming period.

### Measures for interregional collaboration in S3 strategies

The following paragraphs analyse specific measures for interregional collaboration in S3 strategies. The integration of the S3s in further (macro-)regional strategies, as well as dedicated calls or projects, is instrumental in supporting interregional collaboration. Finally, capacity-building measures are assessed, considering the acknowledged challenges in building interregional partnerships across EU regions.

**Generally, the overwhelming majority of the S3 documents (95%) make explicit reference to the form of interregional collaboration between partners**, which is measured through the parameter of joint activities (see Figure 49). The most frequently mentioned form of interregional collaboration is that of partnerships (158 out of 167, 95%), followed by joint strategies (58%) and capacity-building (46%). Commercialisation activities are least prominent in S3 strategies, with only 32% of S3 referencing these close-to-the-market activities, indicating untapped potential.

**Figure 49: References to joint activities in the S3 Strategies**



Source: Prognos AG/CSIL (2025) based on a semi-automated analysis of S3 documents for the 2021-2027 programming period.

*S3 in (macro-)regional strategies and pan-EU initiatives*

The document analysis also considered parameters that focus on the embeddedness of interregional collaboration on a more strategic level, **with 25% of the 167 S3 documents referring explicitly to macroregional strategies such as the Baltic Sea region, the Danube Region and the Alpine Region. Furthermore, in 58% of the relevant S3 strategies, joint activities are referred to on a more strategic level with the establishment of joint strategies.** Examples of joint interregional strategies include the macro-regional joint S3 cooperation within the Alpine Strategy and the S3 strategy Galicia-Norte:

- **Cross-border joint S3 strategy Galicia-Norte together with Joint Investment Plan plus Implementation Plan:**<sup>67</sup> The Joint Investment Plan and the Implementation Plan are two documents which have been developed with the aim of aligning the research and innovation priorities of both regions under the Euroregion framework. Utilising their cultural, linguistic and historical affiliations, Galicia (Spain) and Norte (Portugal) have integrated their smart specialisation strategies to promote sustainable and innovative economic growth. The Joint Investment Plan is centred on the pursuit of shared objectives, the optimisation of resources, and the alignment of strategic initiatives with European objectives, including Horizon Europe. The Implementation Plan is intended to ensure the practical execution of the strategy, by coordinating efforts across both political and technical levels, with a view to overcoming governance disparities. This joint S3 underscores the potential of cross-border cooperation in achieving enhanced competitiveness and stakeholder engagement while addressing regional challenges and opportunities.
- **Macro-regional joint S3 cooperation within the Alpine Strategy (EUSALP):** The European Union Strategy for the Alpine Region (EUSALP) is a cross-border and transnational framework integrating 48 regions across seven countries (Austria, France, Germany, Italy, Slovenia, Switzerland, and Liechtenstein). The initiative is organised around Regional S3, which are grouped into Thematic Action Groups that focus on innovation, sustainable mobility, and natural resource management. The overarching objective of the EUSALP initiative is to foster cooperation among EU and non-EU Alpine regions, thereby facilitating the optimisation of resources, the development of joint innovation ecosystems, and strategic alignment with EU policy goals. These EU policy goals include those under Horizon Europe and cohesion policy. The strategy encompasses a dedicated governance model, comprising a General Assembly, an Executive Board, and thematic Action Groups, thereby ensuring coordinated implementation and multi-level stakeholder engagement. The EUSALP initiative serves as a prime example of the enhanced benefits that can be realised through macro-regional collaboration in addressing shared territorial challenges and promoting competitive, sustainable growth through the alignment of RIS3 strategies.

**Furthermore, specific interregional initiatives are mentioned in 107 (64%) of the S3s.** The most frequently mentioned initiatives are Important Projects of Common European Interest (IPCEI) (77%). The S3 Thematic Platforms and Thematic Smart Specialisation Partnerships (TSSPs)<sup>68</sup> are mentioned to a lesser extent, with shares of 45% and 43%, respectively, which is somewhat surprising given their prominence on the S3 Communities of Practice platform.

<sup>67</sup> See [Cross-Border Smart Specialisation Strategy of the Galicia - Northern Portugal \(RIS3T\) 2021-2027](#), p. 10.

<sup>68</sup> European Commission (2025): Interregional partnerships, [Interregional partnerships - European Commission \(europa.eu\)](#).

Finally, **interregional networks, which foster a more strategic collaboration, play a comparatively smaller role in the S3 strategies** and are mentioned in slightly less than half of the documents (47%). Evidence suggests that the most significant networks among those mentioned are the Enterprise Europe Network (EEN) and the Vanguard Initiative.

#### *Specific measures to support interregional collaboration in S3*

In addition to the parameter-based document analysis, specific measures supporting interregional collaboration were extracted from the S3 strategic documents. **A total of 1,022 measures supporting interregional collaboration were identified across 167 S3 strategies.** The measures that have been identified can be grouped into different categories. It is evident that the strategies encompass concrete interregional innovation projects. It is evident that other categories are more closely associated with measures that facilitate the establishment and strengthening of interregional collaboration activities. Such measures may include, but are not limited to, joint policy coordination and activities that promote knowledge exchange.

**The number of measures identified is subject to variation across the strategies,** indicating heterogeneity in terms of level of detail. While 35% of the strategies indicate seven or more measures, no concrete measures to support interregional strategies were identified in 29% of the S3 strategies. The data indicates that 19% of the strategies incorporate between one and three measures, while 17% comprise between four and six measures.

**The preceding analysis has been structured into six groups of measures,** including joint strategy and governance platforms, interregional collaborative R&I, and interregional policy learning (see Table 15 below). As demonstrated by the analysis, 57% of the analysed S3 strategies specify measures categorised as joint (interregional or macroregional) strategies and governance platforms, and 54% specify interregional collaborative R&I and pilot lines, respectively. Approximately 40% of the S3 strategies encompass interregional policy-learning and peer-review networks. Hence, a substantial proportion of the identified measures are of a joint nature, encompassing interregional and macroregional strategies and governance platforms. These measures are characterised by partnerships that are underpinned by a shared strategic framework. Within this category, approximately 36% of the measures are directly linked to S3 through the Thematic S3 Platforms and/or the Thematic S3 Partnerships.

**In order to encourage interregional collaboration, regions place considerable reliance on frameworks established by the European Commission,** such as Horizon and Interreg (at least 71% of the identified measures are linked to the ERDF or central EU programmes), thereby underscoring the added value of EU-wide programmes. It is evident that only a limited number of measures are regionally driven, as evidenced by the collaboration with the German Fraunhofer Society in Turku, Finland.

**Table 15: Shares of S3 strategies by types of measures and examples**

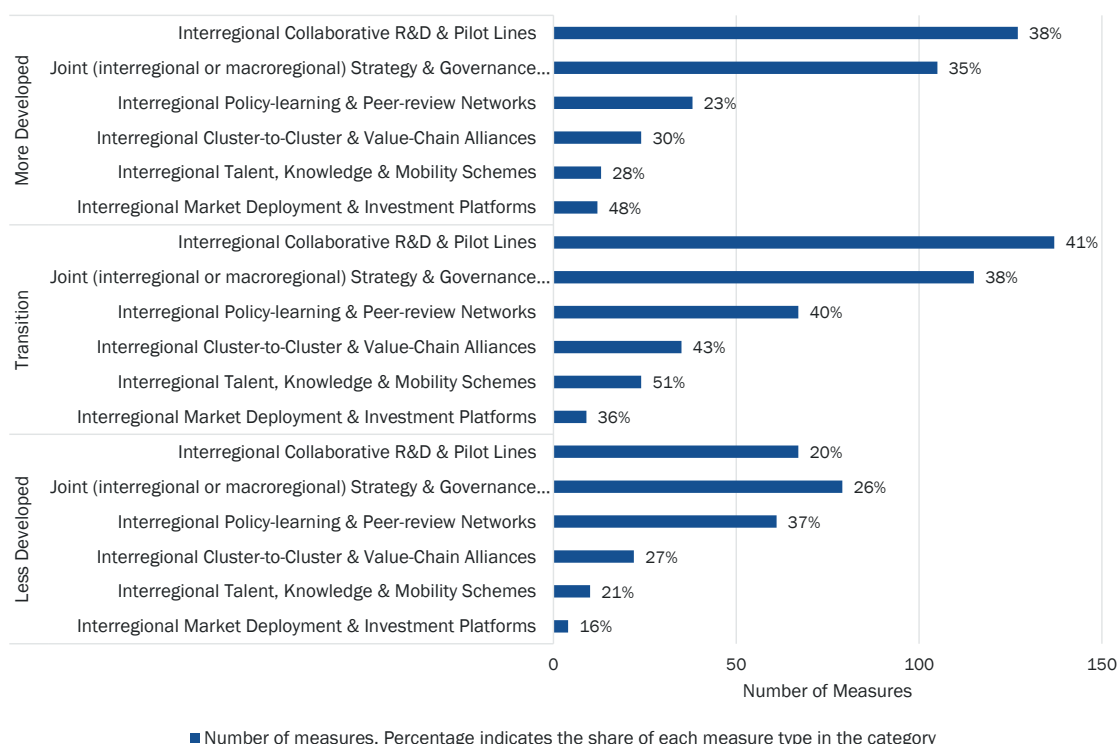
| Group of measures  | No. of S3s covered         | Examples  |
|--|----------------------------|---|
| Joint (interregional or macroregional) Strategy and Governance Platforms | 95 (57%) of 167 strategies | <ul style="list-style-type: none"> <li>Piemonte (Italy): S3 Thematic Partnership Medical Technologies</li> <li>Baden-Württemberg (Germany): EUSDR – European Strategy for the Danube Region</li> <li>Cantabria (Spain): European Clean Hydrogen Alliance</li> </ul> |

|  |                            |   |
|--|----------------------------|---|
| Interregional Collaborative R&I and Pilot Lines            | 91 (54%) of 167 strategies | <ul style="list-style-type: none"> <li>• Flanders (Belgium): Interregional Innovation (I3) Instrument HIGHFIVE – enHancing dlgital and Green growth in the Food processing industry via Interregional innoVation invEstments</li> <li>• Emilia-Romagna (Italy): Vanguard Initiative – pilot project on Artificial Intelligence</li> <li>• South Nederland (Netherlands): RegMed XB – Regenerative Medicine Crossing Borders</li> <li>• Varsinais-Suomi (Finland): Cooperation with German Fraunhofer Society</li> </ul> |
| Interregional policy-learning and peer-review networks     | 66 (40%) of 167 strategies | <ul style="list-style-type: none"> <li>• Pays de la Loire (France): Interreg CLIPPER</li> <li>• Ireland (Ireland): ECRIN ERIC – European Clinical Research Infrastructure Network</li> </ul>  |
| Interregional cluster-to-cluster and value-chain alliances | 51 (31%) of 167 strategies | <ul style="list-style-type: none"> <li>• Regiunea Nord-Est (Romania): TEX4IM – Textile clusters for industrial modernisation</li> <li>• Województwo Małopolskie (Poland): EIT InnoEnergy (Knowledge and Innovation Community)</li> <li>• Bourgogne (France): FOODPACKLAB 2.0 Innovation in Food Security</li> </ul>   |
| Interregional talent, knowledge and mobility schemes       | 31 (19%) of 167 strategies | <ul style="list-style-type: none"> <li>• Normandy (France): Horizon 2020 SOPRANO – Socially-Acceptable and Trustworthy Human-Robot Teaming for Agile Industries</li> <li>• Rhineland-Palatinate (Germany): FORTHEM Alliance – Fostering Outreach within European Regions, Transnational Higher Education and Mobility</li> </ul>  |
| Interregional market deployment and investment platforms   | 19 (11%) of 167 strategies | <ul style="list-style-type: none"> <li>• Halland (Sweden): IUC Halland (Market Boost)</li> <li>• Kanta-Häme (Finland): Häme Goes for Growth</li> </ul>  |

Source: Prognos AG/CSIL (2025) based on a semi-automated analysis of S3 documents for the 2021-2027 programming period. Categorisation based on own elaborations and extracted measures.

**Overall, in the S3 strategies of More Developed Regions and Transition Regions, there seems a higher emphasis on interregional activities**, as shown in Figure 50 below. In comparison with More Developed Regions, Less Developed Regions focus more strongly on capacity-building measures, such as interregional policy learning and peer review networks (34%). Activities and measures with a closer connection to commercialisation and the fostering of value chains, such as collaborative pilot lines, cluster-to-cluster and value chain alliances, as well as market deployment and investment platforms, are more prominent in More Developed Regions and Transition Regions.

**Figure 50: Types of measures to support interregional collaboration identified in the S3 strategic documents**



Source: Prognos AG/CSIL (2025) based on a semi-automated analysis of S3 documents for the 2021-2027 programming period. Categorisation based on own elaborations and extracted measures. N = 1,022 measures.

### Capacity-building measures to support interregional collaboration in S3

**Analyses of the S3 documents reveal that 46% of them explicitly mention capacity-building activities for interregional collaboration.** For instance, the Lombardy region places significant emphasis on the enhancement of international collaboration among businesses, research and technology organisations, and innovation hubs to address significant challenges. This underscores the region's strategic focus on capacity building. Baden-Württemberg references the promotion of mobility for researchers, students, and professionals in companies, which is a key aspect of capacity building in the context of international collaboration. Moreover, in Halland (Sweden), the necessity for increased emphasis on the stimulation of new company formation and the attraction of business establishments is emphasised. This is evidenced by the collaboration with existing companies in the region, indicating an effort to enhance capacity. In the Spanish region of La Rioja, there is a discourse on the necessity of enhancing public sector capabilities to operationalise a science, technology, and research policy that is more ambitious and resilient. The emphasis is placed on capacity building within governments to foster innovation.

**As noted before, the commercialisation of research outcomes is addressed in a limited number of documents, with only 32% of identified S3 strategies referencing this aspect.** However, the importance of interregional collaboration for integrating research results into promising sectors, with a focus on market uptake, is clearly illustrated in the case of the Wallonia region. Initiatives such as the Wagrallim Competitiveness Cluster and Strategic Innovation Initiatives (IIS) have been implemented to foster commercialisation by aligning innovation efforts with industrial value chains and using cascade funding mechanisms to support SMEs in piloting and validating new technologies. As another

example from Flanders highlights, commercialisation is embedded in TRL-focused programmes such as the IRVA projects run by Flanders Make. These projects connect industrial research (TRL 4–5) with follow-up application projects (TRL 5–6), involving SMEs through co-financing and contract-based cooperation. Furthermore, initiatives such as HIGHFIVE and Value4Pack, which are supported by the I3 instrument and S3 partnerships, have been instrumental in promoting the adoption of innovation through the utilisation of interregional voucher schemes and demonstration pilots.

### *Interim conclusions on interregional collaboration in S3*

**The analysis indicates that interregional collaboration is embedded in the current S3 strategies to a high degree. However, the level of detail and clarity varies.** It is evident that the high alignment is particularly applicable to the parameters that delineate the geographical coverage, the nature of the collaboration, the specific S3 areas and value chains, and the joint activities. It is evident that the majority of documentation alludes to potential funding sources, with a particular emphasis on those associated with the European Regional Development Fund (ERDF), national/regional programmes, and Horizon Europe. However, the quality of the references varies, with 25% of the strategies including no specific measures to foster interregional collaboration. In the context of parameters delineating the strategic level of international collaboration, including interregional initiatives and networks, there exists a range of levels of concretisation. For instance, according to the referencing in the S3 strategies, the utilisation of S3 Thematic Platforms is found to be quite heterogeneous across various geographical regions. Interregional collaboration is not specifically structured within S3 strategies, which further limits the level of concretisation.

### 3.4.2 From S3 to programmes: The role of interregional collaboration in national/regional ERDF programmes

In the current programming period, the EU's commitment to interregional collaboration, understood as collaboration with partners outside a given MS in priority areas supported by the S3, has been reinforced through the ERDF 2021-2027, as outlined above. The CPR stipulated that each programme (whether national or regional) needed, where relevant, to delineate for each specific objective the interregional, cross-border and transnational actions with beneficiaries located in at least one other Member State or outside the Union.<sup>69</sup> This suggests that specific activities designed to facilitate interregional collaboration need to be outlined – if applicable – in each ERDF programme for each policy and specific objective.<sup>70</sup> Furthermore, Article 63.4 of Regulation (EU) 2021/1060 permits the utilisation of ERDF funds for operations outside of a given MS, thereby also supporting interregional projects at the level of investments. The focal point of this section is the examination of interregional, cross-border and transnational initiatives that have been meticulously scheduled under the purview of Specific Objective 1.1 and Specific Objective 1.4. These initiatives are of particular significance as they encompass measures that have been meticulously designed to align with the S3 priorities. A total of 183 ERDF programmes<sup>71</sup> were encompassed within the analysis, with the findings being organised according to various parameters that encompass interregional collaboration activities.

<sup>69</sup> According to the point 3d (vi) of Article 22 (*Content of programmes*) of the Common Provisions Regulation: [Regulation - 2021/1060 - EN - EUR-Lex \(europa.eu\)](#).

<sup>70</sup> This also applies to the activities programmed under the Policy Objective 1 "A smarter Europe by promoting innovative and smart economic transformation" that is supported by all Member States and regions. This support should be based on building capacities for smart specialisation strategies, delineating priorities at either the national or regional level, or both, aiming to enhance competitive advantages by aligning research and innovation strengths with business requirements and essential skills.

<sup>71</sup> See European Commission (2025): Programmes, [Info regio - Programmes](#). The national and regional ERDF programmes considered for this analysis were selected in March 2025.

**The majority of ERDF programmes (97%) refer to collaboration with partners situated beyond the geographical boundaries of the Member State.** In the vast majority of ERDF programmes, the form of collaboration is specified. In 99% of cases, the nature of collaboration is documented as either bilateral, cross-border or transnational.

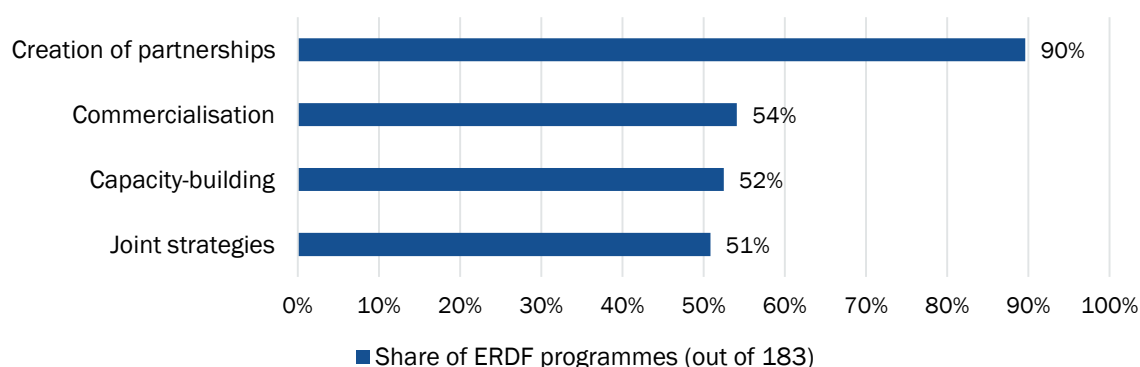
**The majority of the ERDF programmes refer to specific S3 areas (96%) and value chains (94%).** The vast majority of programmes explicitly indicate diverse ERDF-supported initiatives. 66%, i.e. 121 programmes, refer to specific funding sources for interregional collaboration. Examples for ERDF-funded regional funding measures supporting interregional collaboration include:

- **Care AI Network** (Schleswig-Holstein, Germany): The INTERREG 5A project Care AI Network under ERDF enhances German Danish cooperation in home care using AI.
- **AKKE** (Päijät-Häme, Finland): The AKKE programme under ERDF includes an interregional collaboration conditionality in the funding sources for projects and the possibility to apply for funding for preparing interregional collaboration projects.
- **Frontrunners for Sustainable Innovation** (Stockholm, Sweden): This EU-funded project, operating under ERDF, serves as a transnational initiative aimed at facilitating exchanges and collaboration in the Baltic Sea region, underscoring the commitment to fostering sustainable innovation and interregional partnerships.

A substantial proportion of these 121 programmes refer to INTERREG programmes, with a 95% representation. Furthermore, Horizon Europe is cited in the majority of the programmes. Other sources, such as the Innovation Fund and I3, are mentioned to a lesser extent, with shares of 17% and 9%, respectively.

**The majority of the analysed ERDF programmes (92%) reference the type of activity intended to implement interregional collaboration,** see Figure 51. The most frequently cited joint activity is the establishment of partnerships. Approximately 50% of the documents pertain to commercialisation and capacity-building initiatives, in addition to joint strategies. A slightly higher proportion of respondents refer to capacity-building activities.

**Figure 51: References to joint activities in the ERDF programmes 2021-27**



*Source: Prognos AG/CSIL (2025) based on a semi-automated analysis of 2021-2027 ERDF programmes. Note: Percentages indicate the share of ERDF programmes that include at least one mention of the category, calculated over the total number of ERDF programmes.*

**The primary objectives of the intended commercialisation activities include the fostering of knowledge transfer and the application of research results in businesses.** For instance, in the Czechia, ERDF documents outline plans to enhance

mobility and knowledge transfer through collaborative projects that integrate entrepreneurs and research organisations. This will facilitate the transfer and direct application of research findings within businesses, thereby highlighting a commitment to commercialising research outcomes. In Poland's Kujawsko-Pomorskie region, the primary focus is on the networking of R&I services and the commercialisation of technology through collaboration with regional business environment institutions. This approach underscores the pivotal function of knowledge transfer and the pragmatic implementation of scientific research to catalyse economic growth. In a similar manner, in Galicia, the documents under discussion emphasise the necessity of supporting market-oriented R&I projects that address the challenges and priorities outlined in the S3, with a particular emphasis on the commercialisation of research results and the facilitation of market uptake.

**With regard to the intended partners to be involved in interregional collaboration, the identified ERDF documents primarily focus on SMEs (91%), research organisations (87%), public authorities (84%) and clusters (72%).** A significant proportion of the relevant documentation pertains to universities, accounting for approximately two-thirds of the total. Large companies constitute a substantial segment, comprising 55% of the sample, while innovation support organisations represent 38%.

**Of the 183 ERDF programmes examined, 55% pertain to the EU macroregional strategies, while 56% reference interregional initiatives.** Of the 103 interregional initiatives referenced, the most prevalent is the IPCEI (76%). For instance, in Czechia, the programme refers to support for implementing significant projects of common European interest, as notified to the European Commission under IPCEI. This underscores the initiative's role in promoting cross-regional cooperation. In a similar manner, within the Attica region, IPCEI is recognised as a pertinent initiative with the capacity to stimulate collaboration between regions and countries, particularly with regard to the alignment of shared S3 priorities and cross-border initiatives. Moreover, in the Bourgogne-Franche-Comté region, the IPCEI is regarded as a pivotal initiative, particularly in the hydrogen sector, underscoring its significance in promoting collaboration both domestically and internationally through the alignment of strategic objectives.

**S3 Thematic Platforms and S3 Partnerships are less prominent in ERDF programmes, with shares ranging from 31 to 38%.** The ERDF documents were also analysed with respect to the references to regional networks, which 34% explicitly referred to. It is evident from the 62 documents under consideration that the most significant networks are the Vanguard Initiative and EEN, with each network accounting for 45% of the total. This is followed by ERRIN, which accounts for 32% of the total. The descriptions of the interregional collaboration activities in the ERDF documents present a certain degree of specificity, which is not always clearly defined. While the relevant activities are readily identifiable in the programmes (under SO 1.1 and 1.4, as well as within the justification for criterion 7 of the enabling conditions), they are frequently delineated with disparate levels of detail across the ERDF programmes. It is notable that parameters referring to specific funding sources, strategies, initiatives and networks are mentioned to a lesser extent.

**As a preliminary observation, it is important to highlight that the analysed ERDF programmes provide no information on the planned budget for interregional activities.** Moreover, despite the fact that ERDF regulations permit them (Article 63.4 of the CPR 1060/2021), ERDF programmes do not include joint funding programmes in their planning. Consequently, the budgetary clarity and planning of conditional mechanisms for interregional collaboration are limited. This finding suggests that cross-border fund transfers have not yet been utilised by the relevant Managing Authorities. A notable exception is the case of Norte (Portugal), where interregional collaboration is explicitly incentivised through follow-up grants for joint R&I projects and enabling joint investments with partner regions such as Galicia (Spain) using ERDF funds, coordinated via a dedicated Joint Financial Committee. Furthermore, there are a number of examples of successful implementation of

interregional incentives, such as in North-East Romania, where projects receiving support from the European Regional Development Fund (ERDF) and aiming at external collaboration receive additional points. An additional illustration of this phenomenon is provided by the AKKE programme in Pääjät-Häme, Finland. This programme encompasses an interregional collaboration incentive in the funding sources for projects, as well as the possibility to apply for funding for the preparation of interregional collaboration projects. It appears that the incentives for interregional collaboration are predominantly implemented at the project level, with less emphasis placed on a strategic level.

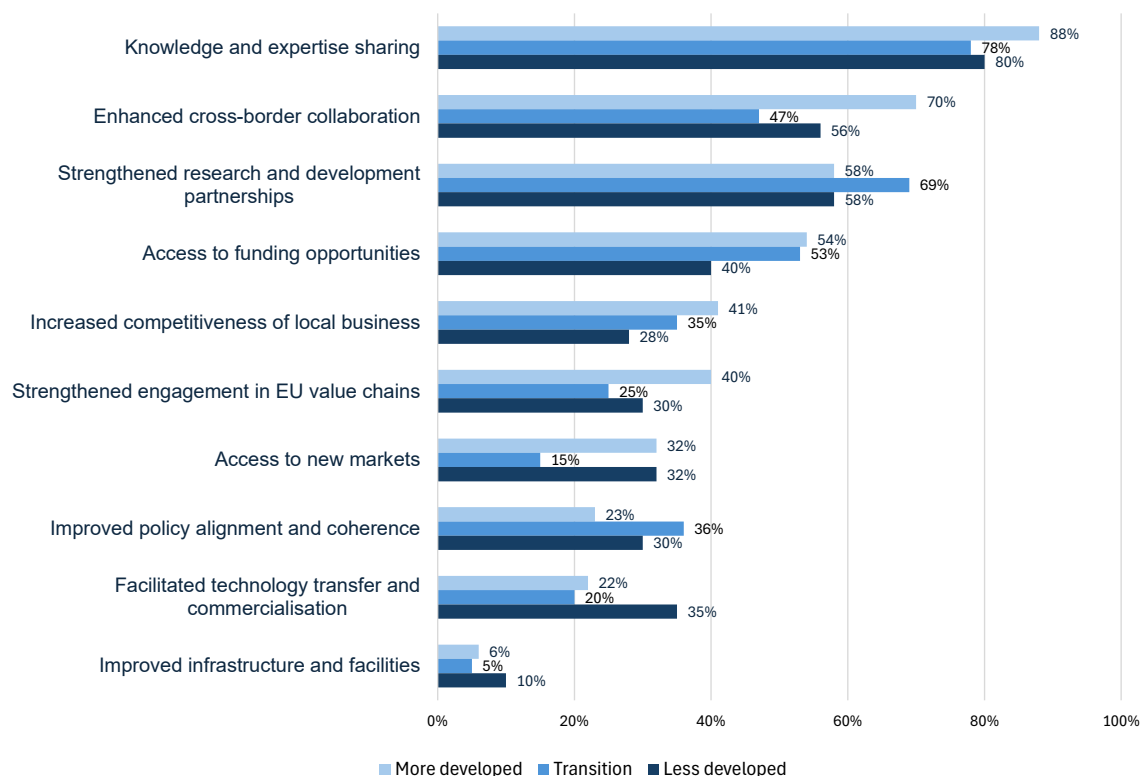
### 3.4.3 Interregional cooperation in practice: on the current role of S3 in fostering interregional cooperation for innovation

This section examines the effectiveness of current S3 measures in driving diverse aspects of interregional cooperation, with a particular emphasis on their potential to enhance value chain development and commercialise research outcomes.

**The survey findings of this study reinforce the notion that interregional collaboration has gained in importance: A substantial majority of public authorities (86%) and stakeholders (89%) recognise interregional cooperation as being fundamental to achieving the objectives of S3.** Conversely, more than 30% of the respondents consider weak interregional linkages as a barrier to the mobilisation of R&I investments (see Figure in section 3.1.4). This consensus spans all types of cohesion regions, reflecting a shared understanding of its value, with Less Developed Regions being particularly aware of the importance of overcoming weak interregional linkages. The most widely acknowledged benefits include (1) the exchange of knowledge and expertise, (2) strengthened research and innovation partnerships, and (3) enhanced cross-border collaboration. The findings are supported by the insights gained from the case study interviews. Interviewees from the “Innovation Scheme Express” and the “Joint Investment Plan Galicia-Norte” highlight the access to broader communities and competencies allowing the leverage of external expertise. Especially business can benefit from a more expanded reach to potential customers and networks. The interviewees further suggest that on a more strategic level, aligning projects with smart specialisation approaches contributes to meeting regional and possibly broader European objectives, regardless of whether these projects are co-funded by ERDF or supported through other funding sources.

**However, also region-specific benefits emerged, as shown in Figure 52 below: Less Developed Regions particularly seem to see benefits from facilitated technology transfer (35%),** Transition Regions value improved policy alignment and governance (38%), while More Developed Regions highlight strengthened engagement in EU value chains (40%). These insights already indicate the need for tailored policy instruments that address regional contexts, while promoting broader benefits of interregional collaboration to accelerate the EU’s innovation capacity.

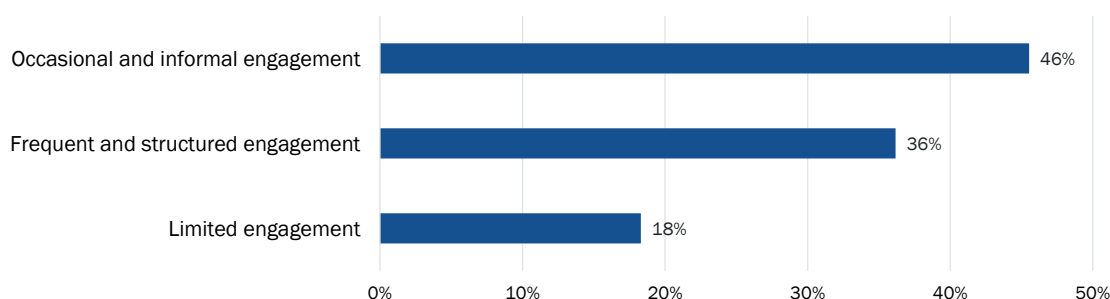
**Figure 52: What are, in your experience, the primary benefits of interregional cooperation for your national/ regional S3 priority areas? By Cohesion Regions.**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all. Number of valid answers: 237 referring to 138 regional/national strategies.

Furthermore, the EU-wide survey of stakeholders and public authorities reveals that occasional and informal engagement remains the most prevalent approach within interregional collaboration, with 46% of respondents identifying it as their preferred method (see Figure 53). Frequent and structured engagement is reported by 36% of respondents, while 18% report limited interaction with peers in other regions. The findings indicate that, although structured cooperation plays an important role, informal and ad hoc exchanges remain the dominant mode of interaction. This underscores the necessity for the establishment of more formalised and sustained cooperation mechanisms, with the objective of enhancing the consistency, depth, and impact of interregional collaboration and mutual learning within the S3 framework.

**Figure 53: How do you engage with your peers in other regions to foster interregional cooperation and mutual learning in the development and implementation of S3?**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: all. Number of valid answers: 235 referring to 136 regional/national strategies.

In view of these initial findings, the subsequent section undertakes a discussion of the perceived effectiveness of existing S3s, with a view to identifying factors conducive to successful implementation. The text goes on to explore the implementation of interregional collaboration in S3 sectors and value chains, as well as the main EU funding sources. Furthermore, the section emphasises the pivotal challenges and barriers to implementing joint innovation investments aligned with S3, acknowledging that these impediments vary according to stakeholder type and regional context. This assertion is supported by insights derived from a comprehensive review of the extant literature, responses to surveys, and case studies. In instances where relevant, the survey responses are categorised according to cohesion group or innovation performance.

### Effectiveness of existing S3 measures in facilitating interregional cooperation

According to the surveyed public authorities, **existing S3 measures are generally perceived as only moderately effective in supporting cooperation across regions**, with differences observed according to the level of interregional cooperation being referred to. Evidence suggests that the current S3 measures have proven effective<sup>72</sup> in establishing interregional partnerships (54%) and fostering existing value chains (46%). Conversely, challenges pertaining to the commercialisation of research outcomes and the establishment of novel value chains persist, with S3 measures being evaluated as deficient in these domains.

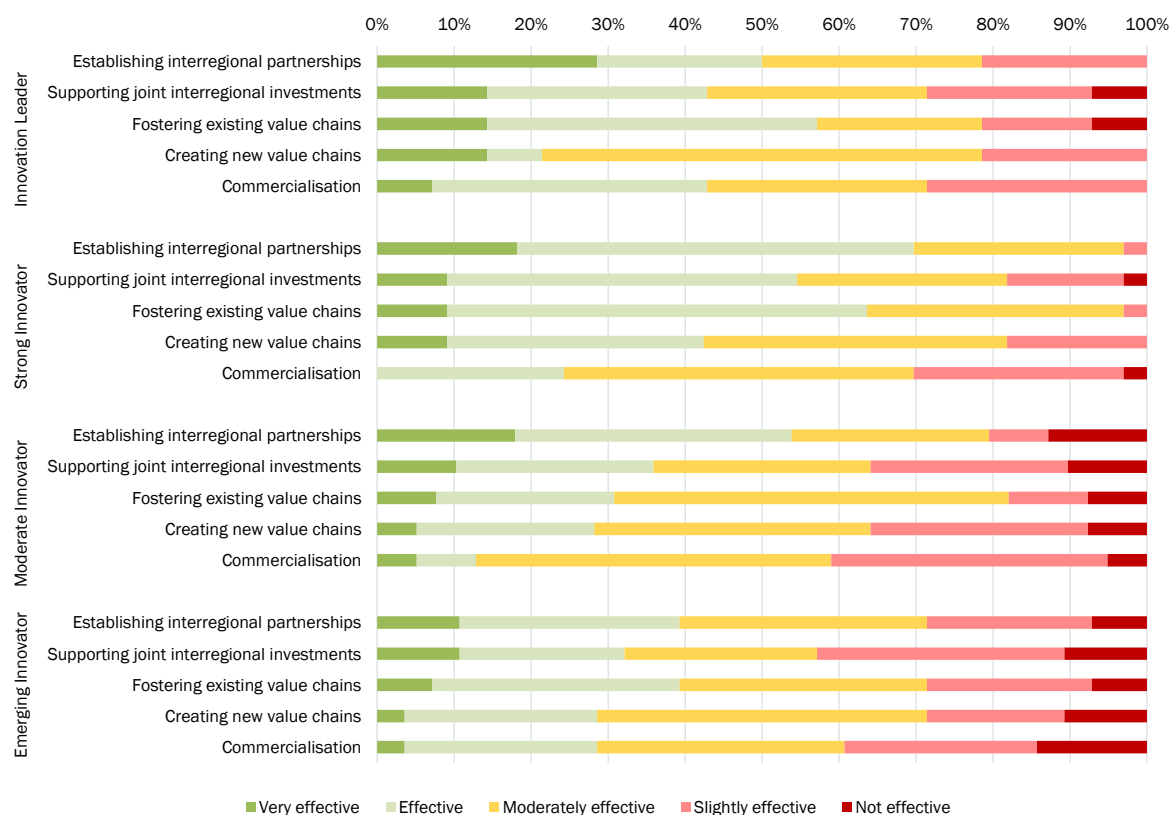
**The perceived effectiveness of S3 measures for interregional collaboration is positively correlated with innovation performance** (see Figure 54 below). This finding aligns with the previously outlined pattern, whereby effectiveness peaks in the initial stages of interregional collaboration and declines as innovation progresses towards commercialisation. In the context of the commercialisation of research outcomes, 43% of Innovation Leaders regard S3 measures as being very effective, in comparison to a mere 13% of Moderate Innovators. The creation of new value chains is regarded as highly effective by 42% of Strong Innovators, in comparison to 29% of Emerging Innovators, 28% of Moderate Innovators, and 21% of Innovation Leaders. The analysis of the data according to cohesion group reveals a similar pattern, with effectiveness ratings being higher in More Developed Regions than Less Developed Regions.

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<sup>72</sup> Summary of very effective and effective responses.

**Figure 54: How effective are the measures planned under the current S3 in your Member State or region in facilitating interregional cooperation?**

Respondent type: Public Authorities. By Performance Group.



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: Public authorities. Number of valid answers: 114 referring to 136 regional/national strategies.

The successful implementation of interregional collaboration is subject to several factors. These factors were surveyed and discussed in the case study interviews.

**A substantial proportion of public authorities and stakeholders identify analogous success factors for interregional collaboration:** The most significant of these are the engagement of diverse stakeholders (50% to 57%) and access to funding (e.g. ERDF, I3) (29% to 34%). The importance of engaging diverse stakeholders is supported by the findings of the case study interviews. The pivotal function of intermediaries, such as cluster managements, is recognised, emphasising the significance of dedicated entities to facilitate partnerships and efficaciously communicate with target groups from the private sector and research. The existing literature further highlights the strengthening of interregional innovation chains through the involvement of multinational enterprises<sup>73</sup>, either directly or indirectly through the participation of clusters. Cross-border innovation has been demonstrated to enhance the technological performance of multinational enterprises. This is achieved by engaging in a wider scope of international co-invention, developing a broader technological scope, and drawing more on basic science and technology than other firms.<sup>74</sup>

<sup>73</sup> See for example Branstetter et al., 2014 and Crescenzi et al., 2019.

<sup>74</sup> Turkina, E., Van Assche, A. and Mudambi, R. (2025): Cross-border innovation for global value chain orchestration, in: International Business Review, retrieved from: [Cross-border innovation for global value chain orchestration - ScienceDirect](#)



## The case of the Innovation Express Scheme

### Use of national/ regional ERDF funding to support interregional innovation investments (advanced TRLs)



This case study assesses how national and regional ERDF resources are utilized to support interregional innovation investments at advanced Technology Readiness Levels (TRLs). By promoting cross-regional collaboration, these funds play a critical role in scaling up innovations and accelerating market entry, thereby strengthening regional innovation ecosystems and bridging research and commercialisation gaps across Europe.

#### Key success factors, challenges and transferability of the learnings summary

The Innovation Express call, used in projects like INNOBIOVC, highlights the potential of synchronizing regional funding schemes to enhance cross-border collaboration. Key success factors include the adaptability of regional programs, such as Bavaria's bio-economy scale-up, which leverages ERDF funds to boost cooperation. Brandenburg's participation in initiatives like the Phoenix Calls demonstrates the importance of established networks and strong intermediary roles in coordinating funding and aligning projects with regional S3 strategies. However, several challenges persist, including reluctance to allow ERDF funds to cross borders due to weak political commitment, complicated administrative and regulatory barriers, and the need for precise coordination. The scalability and transferability of these approaches depend on overcoming these hurdles and embracing open funding policies. Adapting this model in other regions requires shifting mindsets to value interregional cooperation and ensuring businesses are motivated to participate.

#### Conclusion

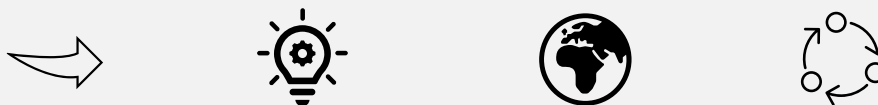
Effective use of ERDF funding for interregional innovation relies on adaptive governance, clear communication, and active intermediary involvement. Brandenburg and Bavaria illustrate how synchronized calls and agreements successfully employ ERDF resources to advance TRLs across borders. Key lessons underscore the importance of reducing bureaucratic obstacles, enhancing program visibility, and ensuring strategic alignment. Moving forward, creating environments that foster cooperation and simplifying funding schemes can significantly enhance the role of ERDF in supporting interregional innovation.

**In accordance with the survey results (18% to 21%), the case studies emphasise the significance of the political commitment of the involved parties to a successful collaboration**, as evidenced by the Joint Investment Plan Galicia-Norte. It is vital to allocate sufficient time for relationship-building and to tailor funding programmes to align with regional industry strengths if interregional collaboration is to be strengthened. The S3 working group on interregional collaboration has identified political commitment and willingness to engage as crucial success factors.



## The case of the Joint Investment Plan Galicia and Norte S3 fostering interregional investments

### Galicia and Norte



This case study examines successful joint S3 initiatives that enhance interregional investments, focusing on the Joint Investment Plan between Galicia, Spain, and Norte, Portugal. By integrating interregional dynamics into policy design, the plan serves as a model for cross-border collaboration in R&I, addressing both successes and challenges in governance and resource allocation. The study highlights strategies like financing interregional innovation through mainstream programs, offering lessons for other regions aiming to strengthen cooperation and build interconnected economies across the EU.

#### Key success factors, challenges, and transferability of the learnings summary

Key success factors behind the Joint Investment Plan between Galicia and Norte include strong political commitment, clear alignment of strategic objectives through a joint smart specialisation strategy (RIS3T), and robust stakeholder engagement facilitated by effective multi-level governance structures such as the GNP-EGTC (Galicia-North Portugal European Grouping of Territorial Cooperation), the Cross-Border Innovation Council, and a Joint Financial Committee. These bodies facilitate coordinated efforts in sectors such as health, agri-food, creative industries, and the sea economy, effectively linking regional strategies to European programs like Horizon Europe. Innovative mechanisms, such as the adaptation of joint financing instruments for cross-border projects using ERDF funds, further strengthen the collaboration. However, challenges persist, particularly due to differences in governance models—Spain's decentralised system compared to Portugal's centralised approach—which complicate joint decision-making and create administrative asymmetries. Limited access to harmonized cross-border funding and differing capacities also hinder full integration. Despite these challenges, the initiative is highly transferable, especially in contexts with shared cultural or linguistic ties, and offers a scalable governance and funding template for other EU regions seeking to enhance interregional cooperation. Success in replicating the model, however, depends on sustained political commitment, administrative flexibility, and alignment of innovation agendas.

#### Conclusion

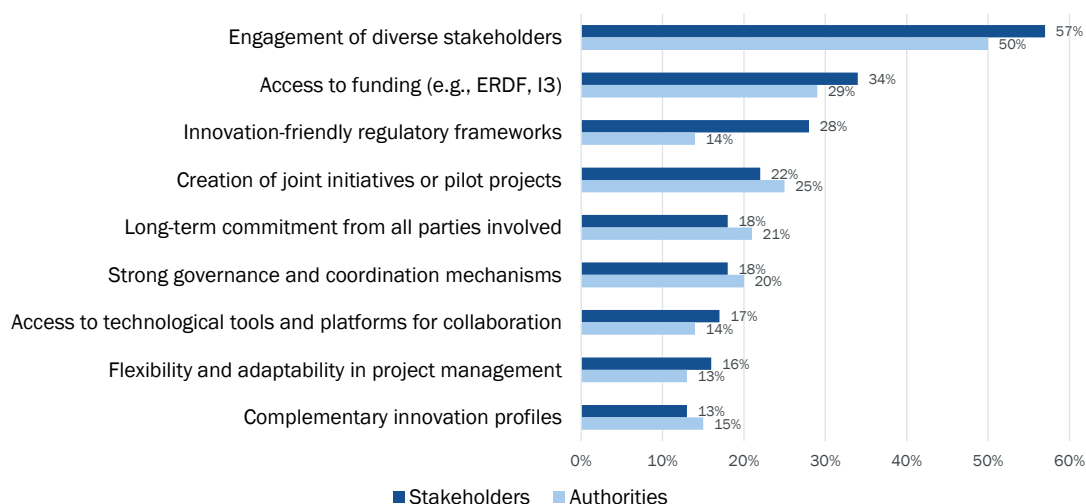
The Joint Investment Plan between Galicia and Norte serves as a blueprint for interregional cooperation under smart specialisation. It illustrates that strategic alignment, strong political will, and inclusive governance can overcome structural and administrative barriers. As EU regions strive to foster connected innovation ecosystems, this case shows that cultural proximity, shared vision, and coordinated tools are critical enablers of long-term success. Going forward, reinforcing administrative convergence and adapting governance mechanisms will be essential to sustain and expand such pioneering models of regional integration.

**The assessment of stakeholders and public authorities differs with regard to the factor of innovation-friendly regulatory frameworks.** The survey of stakeholders revealed that 28% of respondents identified this as a significant success factor. In comparison, only 14% of authorities expressed a similar perspective. It is asserted that the provision of adequate flexibility within funding structures, for example by means of the possibility of offering grants in lieu of loans for specific developments, has the potential to provide an attractive incentive to businesses.

As demonstrated in the accompanying Figure 55, no significant discrepancies are apparent when differentiating the assessments by regional development level. **It is important to note that one exception to this is the factor of strong governance and coordination mechanisms.** This is especially important in Transition Regions.

**Figure 55: What specific factors, in your experience, contribute to the success of interregional cooperation in shared or complementary S3 areas?**

Respondent Type: Public Authorities and Stakeholders.



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: Public authorities. Number of valid answers: 226 referring to 133 regional/national strategies.

**The assessment of the success factors is more diverse when considering the innovation performance.** As innovation performance improves, access to technological tools and platforms for collaboration becomes a less significant factor. This suggests that regions categorised as Innovation Leaders or Strong Innovators already have these in place. In contrast to other innovation performance levels, Innovation Leader regions also regard complementary innovation profiles as an important success factor. The case study on the Innovation Express Scheme attributes an important role to supporting entities in the effective exploitation of complementarities, for example, through networking and matchmaking services.

### S3 priorities/value chains of collaboration and role of S3 Thematic Platforms

**Across all S3 priorities and areas of value chains regions are involved in interregional collaboration.** According to the surveyed public authorities, the S3 priority or area of value chains with the largest share of interregional collaboration is renewable energy and green technologies, followed by ICT and digitalisation as well as advanced manufacturing and smart industry.

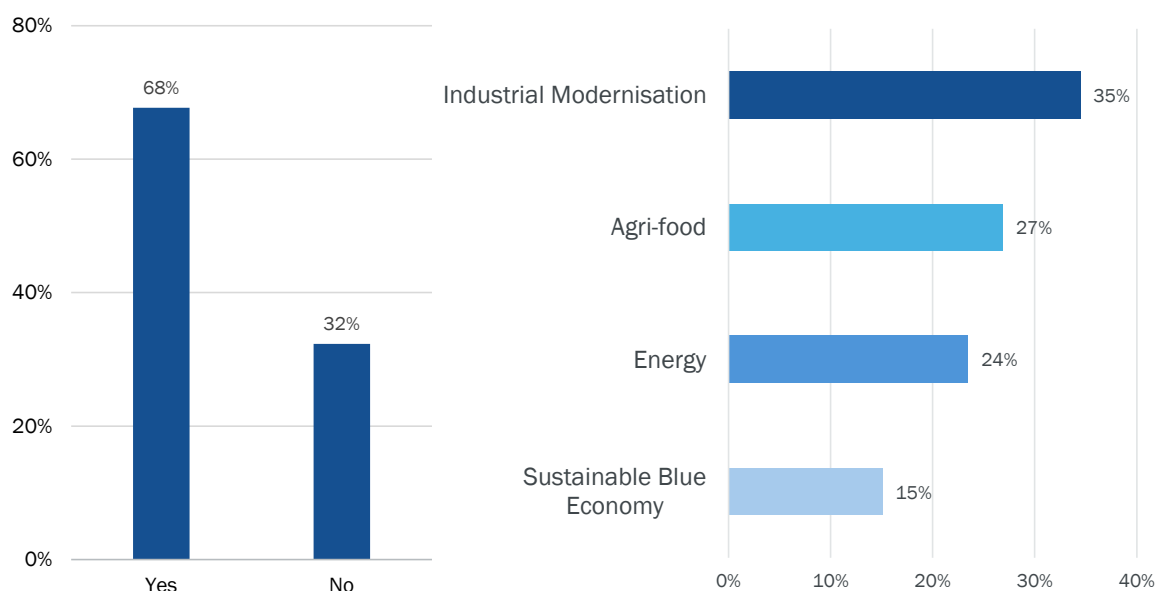
**The proportion of interregional collaboration in the S3 priorities and areas of value chains generally increases with the regional development level.** In comparison with More Developed Regions, there is a conspicuous underrepresentation of Less Developed and Transition Regions in the domains of transport and logistics. However, it is notable that Less Developed Regions account for the largest share in terms of blue economy, as well as tourism and cultural heritage.

**With regard to innovation performance, the proportion of interregional collaboration in S3 priority areas and areas of value chains also tends to increase in line with better performance.** For instance, higher innovation performance has been found to correlate with a higher share of interregional collaboration in sectors such as advanced manufacturing and smart industry, as well as ICT and digitalisation. It is evident that Emerging Innovator regions constitute the predominant proportion of the blue economy, tourism and cultural heritage when the regions' innovation performance is grouped. In the context of agrifood and sustainable food production, the level of interregional collaboration across innovation performance is balanced.

**As previously mentioned, the EU has established multiple initiatives to encourage interregional cooperation in key areas, guided by S3 strategies across Member States and regions.** The S3 Thematic Platforms and Thematic Smart Specialisation Partnerships function as pivotal instruments for establishing connections between regional innovators who possess analogous or complementary strengths and priorities, as delineated by the New European Innovation Agenda (NEIA).<sup>75</sup> The NEIA explicitly identifies smart specialisation strategies as a key instrument for reinforcing regional innovation ecosystems, thereby enhancing their capacity to stimulate and sustain economic growth.

**Public authorities have acknowledged the instrumental role of S3 Thematic Platforms in promoting interregional collaboration.** The survey results pertaining to the question *"Is interregional cooperation in complementary S3 areas or value chains supported through S3 Thematic Platforms?"* indicate a positive outlook among authorities on the role of the S3 Thematic Platforms, with nearly 68% of respondents affirming the support provided by the S3 Thematic Platforms, and 32% indicating otherwise (see Figure 56 below). With regard to the sectoral focus, Industrial Modernisation is identified by 35% of respondents as the key area of cooperation within the S3 Thematic Platform. This is followed by Agri-food (37%), Energy (24%), and Sustainable Blue Economy (15%).

**Figure 56: Is interregional cooperation in complementary S3 areas or value chains supported through S3 Thematic Platforms?**



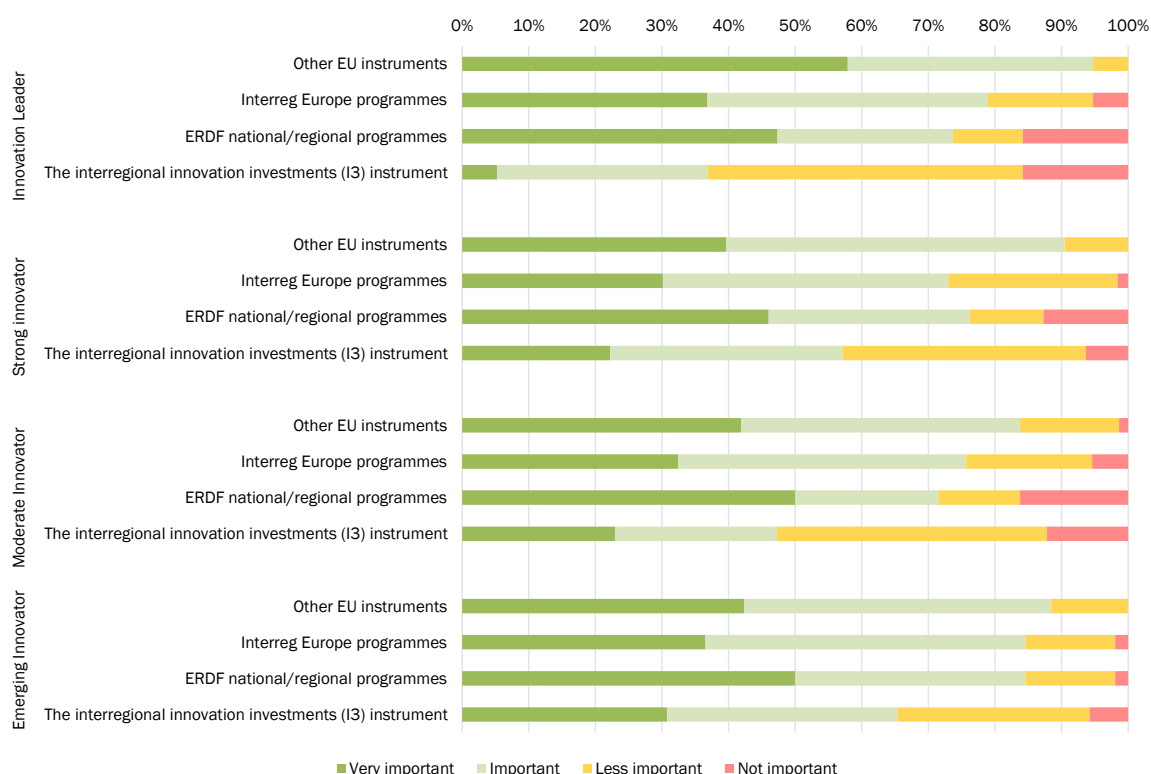
Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: Public authorities. Number of valid answers: 99 (left) and 67 (right) referring to 83 regional/national strategies. The right chart reflects responses only from those who answered 'Yes' on the left chart. Multiple answers were allowed.

<sup>75</sup> [EUR-Lex - 52022DC0332 - EN - EUR-Lex](#).

### Utilised EU funding sources for interregional cooperation in S3 2021-2027

The survey responses indicate that national and regional ERDF programmes are the most significant funding sources for financing interregional investment projects, with 48% of respondents designating them as very important (see Figure 57). Figure 57 The second most significant source of funding is constituted by other EU instruments, which 42% of respondents regard as being of considerable importance. INTERREG is considered to be of moderate but steady importance across all regions. This assessment concurs with the conclusions of the S3 document analysis in Section 3.4.1, which indicates that ERDF-supported instruments are regarded as a catalyst for fostering collaboration.

**Figure 57: How important are the following EU funding sources in your Member State or region for financing interregional investment projects in shared or complementary S3 areas? By Performance Group.**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: Public authorities. Number of valid answers: 208 referring to 134 regional/national strategies.

The I3 instrument shows a stronger appeal in Less Developed Regions with 28% of the respondents assessing the instrument as very important, compared to 19% in transition and More Developed Regions. The S3 Working Group on Interregional Collaboration highlights the strong lever of I3 in developing the international perspective of S3. However, it remains limited in its funding capacity. In the survey it is overall seen as the least important programme, which is possibly due to its newer or more targeted nature.

### Challenges to implementing interregional cooperation within S3

Despite the recognised benefits, EU regions struggle to effectively integrate interregional cooperation into their S3. In the implementation of interregional collaboration, EU regions are confronted with several challenges revealing structural obstacles to interregional collaboration but also unrealised potential.

**Limited capacities, especially regarding human resources, is the number one challenge identified by public authorities (63%) and stakeholders (60%) in the survey (see Figure 58).**

**Stakeholders primarily grapple with funding issues, such as (perceived) inadequate funding opportunities (63%), difficulties in accessing available funds (62%) and a lack of promotion for available opportunities (60%).** The challenges regarding the access to funding are also reflected in the case studies. In the case of Norte-Galicia this associated with limited available funds for cross-border projects. In the case of the Innovation Express Scheme this issue is also traced back complex funding regulations that create uncertainty and complicate resource management.

Figure 58 **For public authorities, further challenges include limited understanding of the benefits from collaboration across regional stakeholders (51%), difficulties in identifying mutually beneficial areas for partnerships (51%), and insufficient promotion or visibility of interregional cooperation opportunities (47%).** These factors contribute to information barriers that challenge coordination efforts which were also identified in the position papers by the Vanguard Initiative<sup>76</sup> and the S3 Working group<sup>77</sup>. The literature supports the assessment of the survey respondents and consistently highlights that insufficient focus is placed on using interregional cooperation to access complementary capabilities essential for diversification, with many regions lacking coherent strategies to fully leverage shared knowledge and resources.

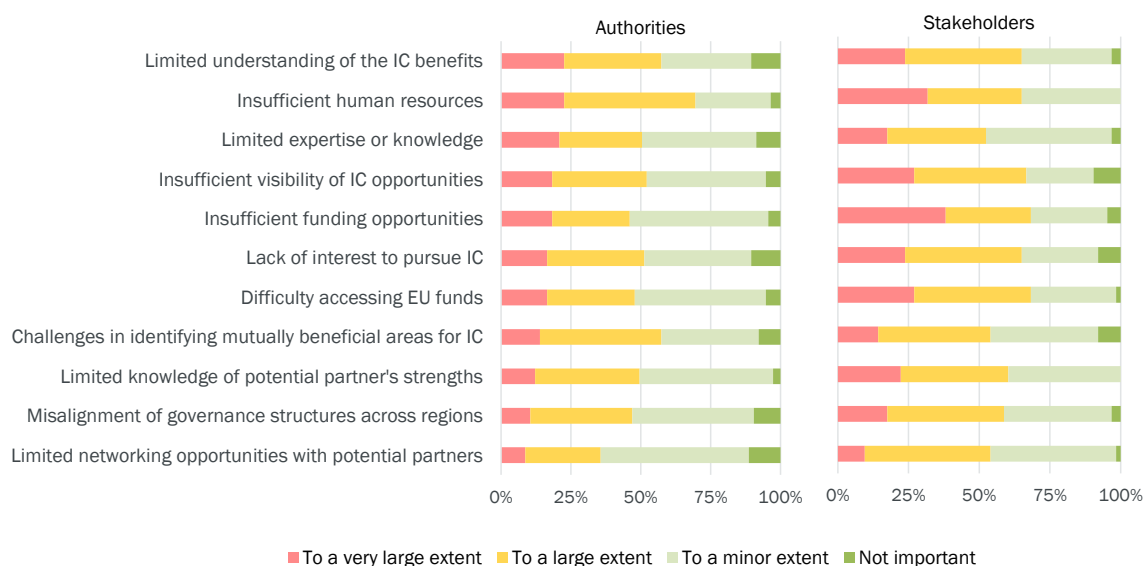
**Stakeholders primarily grapple with funding issues, such as (perceived) inadequate funding opportunities (63%), difficulties in accessing available funds (62%) and a lack of promotion for available opportunities (60%).** The challenges regarding the access to funding are also reflected in the case studies. In the case of Norte-Galicia this associated with limited available funds for cross-border projects. In the case of the Innovation Express Scheme this issue is also traced back complex funding regulations that create uncertainty and complicate resource management.

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<sup>76</sup> Vanguard Initiative (2024) : The Vanguard Initiative calls for an integrated EU industrial & innovation policy based on interconnected regional ecosystems, [https://www.s3vanguardinitiative.eu/system/files/2024-06/VI%20Position%20paper%202024%20Final\\_0.pdf](https://www.s3vanguardinitiative.eu/system/files/2024-06/VI%20Position%20paper%202024%20Final_0.pdf).

<sup>77</sup> S3 CoP Working Group (2025) : Leveraging funding for Interregional Collaboration, [https://ec.europa.eu/regional\\_policy/sources/policy/communities-and-networks/s3-community-of-practice/S3\\_COP\\_WG\\_Interregional\\_Collaboration\\_Input\\_note\\_1\\_final.pdf](https://ec.europa.eu/regional_policy/sources/policy/communities-and-networks/s3-community-of-practice/S3_COP_WG_Interregional_Collaboration_Input_note_1_final.pdf).

**Figure 58: What are the main challenges in your Member State or region affecting the implementation of interregional investments under the S3 framework? Respondent Type: Public Authorities and Stakeholders.**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: Public authorities and stakeholders. Number of valid answers: 178 referring to 136 regional/national strategies.

**Funding challenges further arise from a policy focus that favours local over international collaboration.** This is, for example, evident in the Innovation Express Scheme, where regions are hesitant to allow their financial resources, including ERDF funds, to be utilised across borders. This reluctance is rooted in established national and regional financial structures and priorities that emphasise keeping funds within local boundaries. The inward-looking policy focus is further highlighted by the S3 Working Group, concerning especially the ERDF funds supporting the implementation of S3. Although under article 63.4 ERDF funding can be used for interregional projects, it remains largely unused.<sup>78</sup> Not only does this limit funding opportunities but also contributes to limited aspirations for interregional investments. A resulting lack of interest to pursue interregional collaboration is visible in the survey responses by the stakeholders (around 65%) and is also addressed in the case study interviews.

**Furthermore, the literature highlights that attracting private investors for cross-border funding remains a significant challenge,** limiting the expansion of interregional efforts, especially those regarding commercialisation of innovation (higher TRLs). Also, the initial years of implementing the I3 instrument have shown that while interregional collaboration can result in coordinated investments and the formation of new value chains, it requires significant EU support to gain traction.

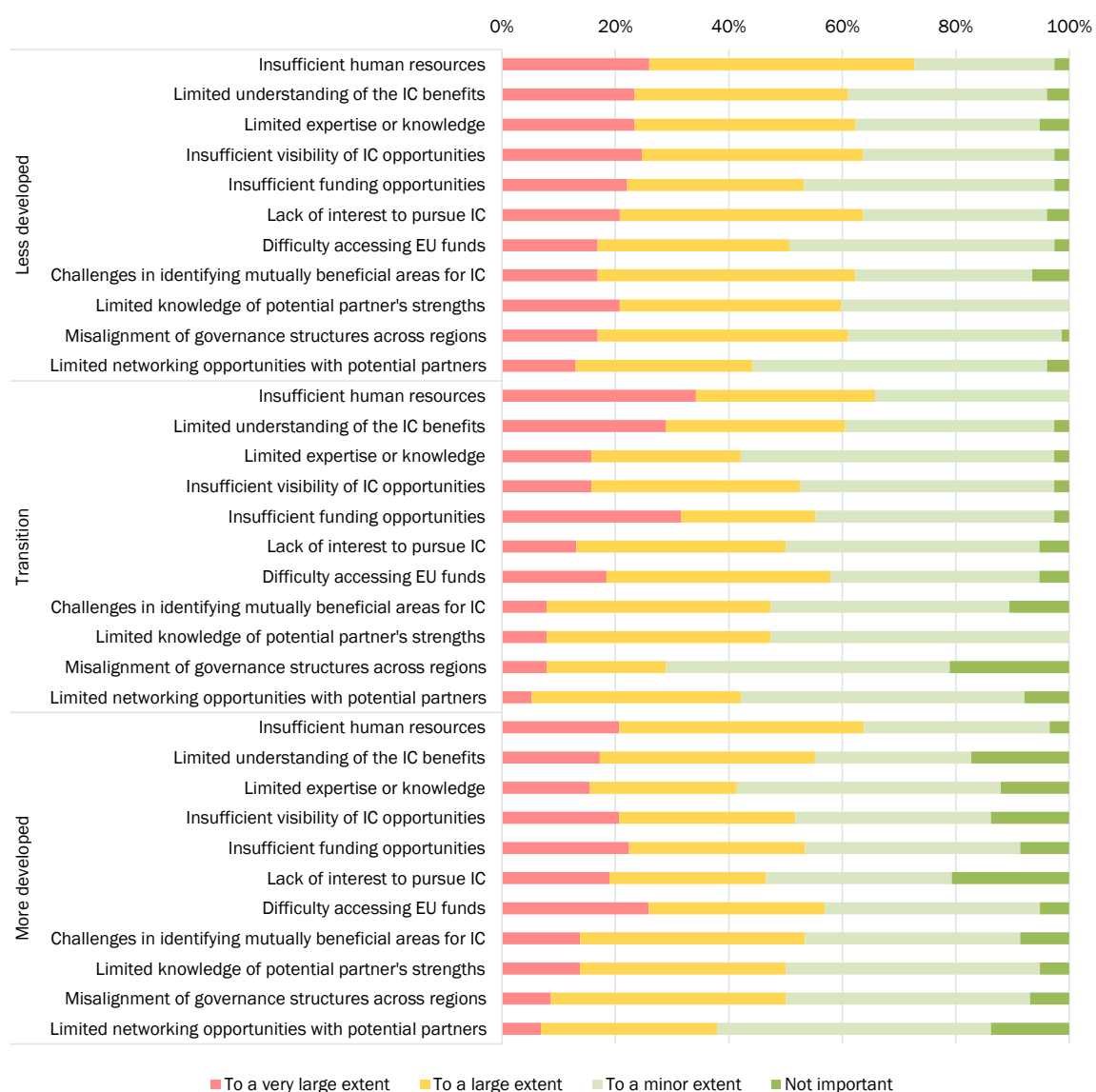
European regions face significant disparities in innovation resources and capacities, which affect their ability to engage in European value chains and build strategic industrial ecosystems. The survey results (see Figure 59), indicate that the impact of challenges varies by region development level, with More Developed Regions facing strategic coordination issues, while Less Developed Regions struggling with many foundational challenges (for example, deficits in capacity and skills, access to funding). The different

<sup>78</sup> S3 CoP Working Group (2025) : Leveraging funding for Interregional Collaboration, [https://ec.europa.eu/regional\\_policy/sources/policy/communities-and-networks/s3-community-of-practice/S3\\_COP\\_WG\\_Interregional\\_Collaboration\\_Input\\_note\\_1\\_final.pdf](https://ec.europa.eu/regional_policy/sources/policy/communities-and-networks/s3-community-of-practice/S3_COP_WG_Interregional_Collaboration_Input_note_1_final.pdf).

regional needs depending on the development level can pose further challenges for a seamless cooperation. As is mentioned in the case study on the Innovation Express Scheme, differences in expertise and infrastructural capabilities may lead to an unequal distribution of project responsibilities.

**Figure 59: What are the main challenges in your Member State or region affecting the implementation of interregional investments under the S3 framework?**

By Cohesion Region.



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Note: Type of respondents: Public authorities and stakeholders. Number of valid answers: 178 referring to 136 regional/national strategies.

**Time constraints present significant hurdles to establishment of trust and collaboration between new partners hindering partnership sustainability.** Public consultations on the I3 initiative have identified the lack of long-term financial support as challenge to collaboration. The case study on the Innovation Express Scheme further underlines the need for extended periods of support to strengthen long-term partnerships. Many initiatives are dependent on short-term EU funding, leading to stagnation without clear post-project strategies.

Next to long-term perspectives, the minimisation of information asymmetries for effective collaboration requires robust monitoring and evaluation systems. This aspect was mentioned in the case study on Galicia-Norte adding another dimension to the coordination efforts necessary.

**Another source of complexity arises from variations in institutional structures and governance models.** This aspect was particularly highlighted in the case studies on Galicia-Norte and the Innovation Express Schemes. In the survey, around 50% of the public authorities and 60% of the stakeholders consider this an obstacle to interregional collaboration. Political and administrative responsibilities can be distributed differently, for example, depending on whether a region has its own regional government or regional innovation agency. The structural differences do not necessarily preclude cooperation but may require additional coordination efforts. Political changes may further lead to altered priorities, impacting the continuity of programmes.

## 3.5 On the role of reforms in S3 in the 2021-2027 period and beyond

### KEY FINDINGS ON S3 AND REFORMS

- **Reforms designed to change how innovation and industrial ecosystems operate**, and to improve their performance, can contribute to the implementation of S3 investments. This perspective is consistent with the increased focus on reforms within the EU policy context in recent years (see Section 3.5.1).
- **The S3 framework only implicitly addresses reforms, giving stakeholders ample flexibility on whether and how to incorporate them into their S3.** This reflects the diversity of EU regions, particularly with regard to the distribution of competencies among different levels of government (see Sections 3.5.1 and 3.5.2).
- **A majority of S3s mention reforms in their strategies. More than half of the survey respondents consider that their S3 addresses reforms.** However, there are significant disparities between Member States and regions (see Section 3.5.2).
- **The reforms cited in the S3 vary in scope, content, level of ambition and delivery mechanisms.** An in-depth review of a sample of 32 S3s shows that the reforms range from minor administrative adjustments to far-reaching strategies targeting multiple components of their ecosystems (52% of the S3s in the sample). In general, reforms tend to focus on specific parts of the ecosystem, particularly the business environment, governance, and education and research systems. In terms of delivery modalities, reforms are often implemented through strategies, organisational changes, and legislation and regulation. The review reveals no clear geographical or economic development patterns (see Section 3.5.2).
- **Reforms are associated with S3 in three main ways.** In most cases, **'contextual reforms'** are mentioned as part of the broader background or framework for the strategy and are cited for strategic alignment. **'Enabling reforms'** are designed outside of the S3, at other levels of governance or in different policy domains. However, they are expected to support the S3's objectives and facilitate the implementation of its investments. In a minority of cases, **'catalysed reforms'** are specifically planned within the S3 framework. These reforms are initiated by the S3 and are closely tied to its goals and timing to ensure their effectiveness (see Section 3.5.2).
- **The rationale underpinning reforms varies.** As the case studies show, the objective may be to ensure that basic framework conditions are in place, which requires a programme of reforms to be defined at the start of the programming period. Alternatively, the approach may be to improve governance mechanisms and promote flexible adjustment processes. Reforms can also be implicitly mobilised, i.e. not acknowledged as a distinct category from investments, or they can form an explicit and fully-fledged component of the strategy (see Section 3.5.3).

- **Based on the example of the RRF, it is expected that a system of milestones could encourage a performance-based approach to S3.** However, evidence from the RRF and similar initiatives suggests that such approaches have several practical limitations, casting doubt on their true performance orientation. Implementation difficulties include limited flexibility in revising milestones and cumbersome verification procedures. Furthermore, the effective functioning of a conditionality mechanism requires conditions that are too demanding in the context of S3 (see Section 3.5.4).
- **At this stage, there seems to be limited interest in supporting the implementation of reforms as they are not an explicit priority in the current S3 framework.** However, some existing schemes could be mobilised for this purpose or could inspire reflection on the desirable characteristics of targeted support for reforms in an S3 context. For example, consideration could be given to the full lifecycle of the reform, stakeholder engagement at multiple levels and ownership of the reform (see Section 3.5.5).

**Smart specialisation has initially placed significant emphasis on the identification and alignment with local strengths. However, the S3 framework has gradually evolved over time to encompass additional components.** Reforms constitute an integral component of this process, despite the fact that they have thus far received only limited explicit attention in the S3 context.

**As is evident from the extant literature, the focus has hitherto been on the prioritisation dimension of S3, with scant attention paid to reforms.** In particular, the available literature has not yet explored the potential for mobilising reforms within the S3 themselves, constituting a notable evidence gap.

**This chapter presents an analysis of the role of reforms in the S3 during the 2021-2027 period.** Firstly, an examination of the context and policy rationale underpinning the linkage of reforms and investments is provided (Section 3.5.1). The ensuing sections undertake an assessment of the present status of the S3 in the context of the ongoing reform process (Section 3.5.2). Moreover, these sections adopt a forward-looking perspective, exploring the feasibility of implementing a system of milestones for reforms within the S3 framework (Section 3.5.4). Finally, the issue of support measures related to reforms is discussed in Section 3.5.5.

### 3.5.1 Linking reforms and investments: context and policy rationale

#### Potential benefits in linking reforms and investments

**There is growing recognition across the EU policy landscape that investment alone is not sufficient to ensure structural transformation or sustainable economic performance.** While investments can provide the necessary means to foster innovation, enhance competitiveness, and support transitions, their effectiveness is often contingent on the presence of a conducive policy and regulatory environment (see, e.g., Ministry of Economic Affairs and Employment of Finland, 2022).<sup>79</sup> This has led to a renewed emphasis on reforms and how they can be interlinked with investments.

<sup>79</sup> Ministry of Economic Affairs and Employment of Finland (2022), Sustainable growth requires not only RDI investments, but also an efficient RDI system, more skills and smart capital. Retrieved from <https://tem.fi/en/-/sustainable-growth-requires-not-only-rdi-investments-but-also-an-efficient-rdi-system-more-skills-and-smart-capital>

**The rationale for linking reforms with investments is grounded in both theoretical and empirical considerations:** From a theoretical perspective, reforms can improve the absorptive capacity and efficiency of investments, enhance long-term outcomes, and increase policy credibility. Investments, in turn, can facilitate the implementation of reforms by easing adjustment costs, building capacity, and generating stakeholder buy-in. In this performance-oriented perspective, the synergies between reforms and investments are seen as mutually reinforcing.

**The linkage between investments and reforms has gained particular relevance in the recent policy context.** This perspective has notably long been pushed by the European Semester, which highlights the importance of structural reforms to favour growth and development, although with some implementation issues in translating these theoretical benefits into reality. The Recovery and Resilience Fund (RRF) introduced in response to the COVID-19 crisis, represents a landmark attempt to operationalise this logic. It explicitly tied financial support to the implementation of coherent packages of reforms and investments, including in key areas such as research and innovation (R&I), green and digital transitions, and industrial ecosystems. In the following, we detail some main features characterising the experience of the RRF in combining reforms and investments, the objective being to place the S3 developments in this area into perspective.

### Recent policy experience: insights from the RRF

**One of the key novelties of the RRF is the combination of reforms and investments.** Based on Regulation (EU) 2021/241 establishing the RRF, National Recovery and Resilience Plans (NRRPs) had to address, through both reforms and investments, all or a significant subset of country-specific recommendations (CSRs) adopted as part of the European Semester, with the general goal of promoting the Union's economic, social and territorial cohesion. Under the term "reform", different types of policy interventions are included under the RRF. These range from ambitious and structural changes in key policy sectors at the legislative level (not necessarily linked to investments) to the adoption of new strategies or the simplification of administrative procedures. In their most ambitious form, reforms under the RRF have the potential to introduce disruptive innovations at the legislative level, overhaul the governance of entire policy sectors, and address bottlenecks or hurdles to socio-economic development.

In general, in the NRRPs, the combination of reforms and investments can take different forms, among which:

- **Reforms conceived as enablers for investments** (for instance in the area of permitting, especially under REPowerEU components of RRFs);
- **Reforms introducing a new legislative framework, governance or strategy** in a specific policy sector, paving the way for a new effectiveness of investments;
- **Reforms designed to safeguard** the correct and efficient use of EU funds;
- **Reforms designed to facilitate access to funding** for national stakeholders (for instance encouraging participation in EU or international funding programmes);
- **More traditional structural reforms** (for instance in the area of justice and public administration) having an indirect and not immediate effect facilitating public investments.

**In the R&I sector, reforms within the RRF framework were generally designed to create an enabling environment for R&I activities**, while investments provide the capital

required to put forward and strengthen research initiatives.<sup>80</sup> NRRPs encompass, among other things, simplifying regulatory frameworks, enhancing intellectual property rights protection, promoting collaboration between academia and industry, and establishing favourable conditions to motivate stakeholders to engage in scientific and innovation programmes. Such reforms are expected to pave the way for more efficient utilisation of investments, ensuring that research initiatives can flourish. Allocations for R&I investments under the RRF are directed, among other things, towards building state-of-the-art research facilities, supporting cutting-edge projects, and nurturing talent through education and training programmes.<sup>81</sup>

**Ultimately, the degree to which countries linked reforms to investments for R&I was variable, due to different needs.** Generally, Member States with a lower innovation performance (as per European Innovation Scoreboard) have indeed tended to include in their RRFs R&I-related reforms as well as investments (for instance, Croatia and Slovakia), in line with respective CSRs. On the contrary, Member States with a leading innovation performance have generally used their RRF as a “top-up” to their well-established R&I policy approach (for instance, Denmark and Finland), further expanding their ambition and not introducing major reforms. This reflects the RRF’s aim to grant the possibility of tailoring each RRF’s mix of reforms and investments to the national context, thereby promoting consistency across measures, and ownership of Member State authorities.

The **financial incentive linked to reforms** was a major factor explaining the willingness to move towards the reforms. While the RRF has shown that such an approach can drive ambition and accelerate structural change for research and innovation, it has also highlighted practical difficulties, such as administrative burden, coordination challenges, and varying national capacities as analysed in more details below (see Chapter 3.5.4).

Overall, the experience of the RRF in linking reforms and investments is perceived as positive by the relevant stakeholders. According to the RRF’s mid-term evaluation issued in 2024, different types of stakeholders (among which the European Commission, national authorities, the Committee of the Regions and the Economic and Social Committee) see the fact that the RRF supports not only investments, but also reforms addressing structural problems of the economy or facilitating the absorption of funds as a crucial asset, filling a policy gap compared to the previous status quo.<sup>82</sup> The inclusion of reforms and investments in a single plan pushed Member States to reflect simultaneously on both dimensions, thereby facilitating the adoption of coherent policy approaches. Moreover, the RRF mid-term evaluation reported that 59% of national RRF stakeholders surveyed believed that integrating reforms and investments under a single instrument enhanced efficiency, simplifying coordination and coherence.

These recent experiences and policy discussions offer useful insights for Smart Specialisation Strategies. As S3 seek to evolve into a more performance- and impact-oriented policy, interconnection between reforms and (prioritised) investments, particularly those enabling R&I ecosystems, may be key to unlocking its full potential. At the same time, the risks and limitations observed in previous policies, including the RRF, must be carefully considered.

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<sup>80</sup> European Commission (2024). Recovery and Resilience Scoreboard: Thematic analysis Research and Innovation. Retrieved from [https://ec.europa.eu/economy\\_finance/recovery-and-resilience-scoreboard/assets/thematic\\_analysis/scoreboard\\_thematic\\_analysis\\_research\\_and\\_innovation.pdf](https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/assets/thematic_analysis/scoreboard_thematic_analysis_research_and_innovation.pdf)

<sup>81</sup> *ibid.*

<sup>82</sup> Corti, F., Nigohosyan, D., Pancotti, C., Millard, S. (2023). Study supporting the Mid-term evaluation of the RRF, Final Report. Prepared by ECORYS, CEPS, CSIL, NIESR, and Wavestone for the European Commission, Directorate-General for Economic and Financial Affairs, December 2023. [https://commission.europa.eu/document/download/7fff9205-b77a-4a3f-ad85-8a4c88cb6503\\_en?filename=study-supporting-the-mid-term-evaluation-of-the-recovery-and-resilience-facility\\_0.pdf](https://commission.europa.eu/document/download/7fff9205-b77a-4a3f-ad85-8a4c88cb6503_en?filename=study-supporting-the-mid-term-evaluation-of-the-recovery-and-resilience-facility_0.pdf)

## 3.5.2 Reforms in the 2021-2027 S3: state of play

### Tracking reforms in the S3: definition and sources

**The present study adopts a broad definition of the concept of reforms, which is not restricted to changes in formal rules** (such as laws or regulations). Rather, it refers to any changes in the way innovation and industrial ecosystems operate, which lead to an overall improvement in their performance. However, a clear distinction is drawn between reforms and investments, in the sense that reforms do not consist in the mere deployment of funding to fund specific projects without modifying how things are designed or carried out.<sup>83</sup>

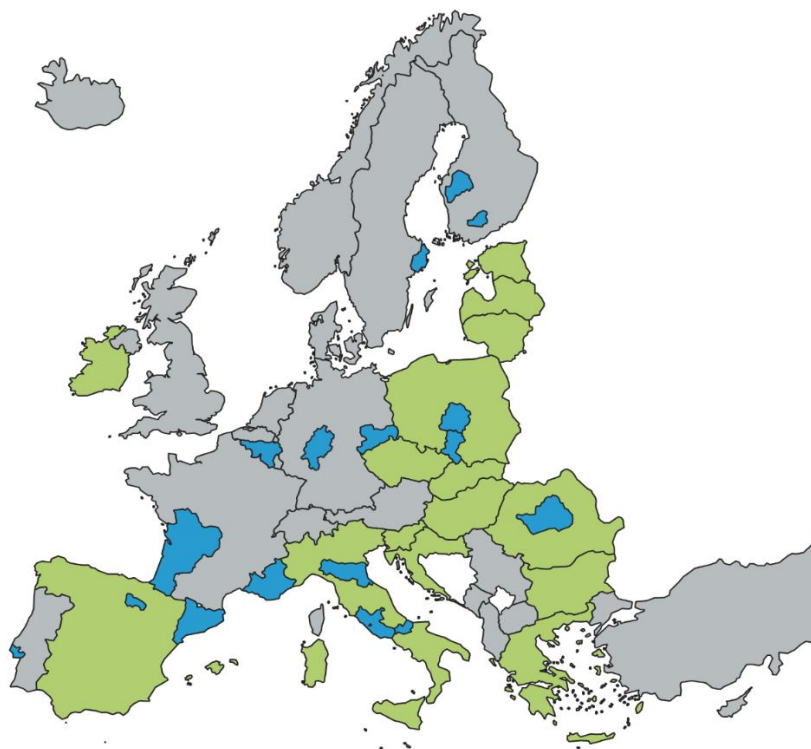
In this interpretation, **reforms can be delivered by different modalities**, including regulatory or legislative processes, but also by more "hands-on" interventions, such as reorganisation of governance, streamlining of administrative processes, etc. It is evident that reforms have the capacity to address structural deficiencies in one or more component(s) of the innovation and industrial ecosystems. The development of conceptual categories was undertaken for the purpose of classifying S3 reforms. These categories were based on the components of the ecosystem to which they addressed, and their delivery modalities. The categories under discussion are defined in the Annex (see Annex 6). This definition of reforms is largely consistent with those of other organisations, including the OECD or the World Bank, but also of the Resilience and Recovery Facility (RRF) experience. This definition also implies that the S3 may include reforms (under this conceptual approach) even without using this specific term.

The linkages between reforms and the S3 has not been extensively studied in the literature at this stage. It probably stems from the relatively low profile of this issue when compared to other aspects of the S3 (e.g., prioritisation), as well as the fact that this study was performed relatively early in the programming cycle. It means that primary evidence was collected during this study to analyse reforms in the S3 context.

The present study drew upon a **combination of sources**:

- **Survey data on reforms**, with a particular focus on stakeholders involved in the S3 / ERDF management
- **Case studies on the integration of reforms in the S3**, including one with national S3 (Croatia, Slovakia) and the other regional S3 (Emilia-Romagna, Wallonia)
- **Database of indicators on the bottlenecks faced by the S3**, derived from multiple sources (e.g., Eurostat, OECD...) and aligned with our categorisation of reforms.
- **Detailed analysis of the reforms mentioned in a sample of 32 S3**. This sample was created to select strategies with a high probability for the presence of reforms. Three different methods were used to assess this probability, namely the presence of the keyword "reform" in the S3, the results of an automated search for reforms using a LLM, and the presence of S3 priorities linked to the improvement of the ecosystem (see Section 3.1 on S3 prioritisation approaches). The resulting sample allowed a balanced representation between regional/national S3 and from a geographical perspective, as shown in the map below:

<sup>83</sup> However, it should be acknowledged that the distinction can be blurred in some cases, notably for education/training-oriented interventions which can blend reforms and funding.

**Figure 60: Sample of S3 for a detailed analysis of reforms***Blue: Regional S3, Green: National S3*

*Source: Prognos AG/CSIL (2025) based on a combination of methods (presence of keyword “reform” in the S3 document, automated identification of reforms using a LLM, presence of relevant S3 priorities linked to the improvement of the ecosystem)*

This sample of S3 was then manually analysed, by extracting the different reforms and categorising them across different variables (e.g. components of the ecosystem addressed, modes of delivery, linkages between the reform and the S3, etc.). This combination of methods allows for the preliminary analysis of the situation and potential for reforms in the context of the S3. It is important to note that the various sources offer the possibility of triangulation, for example between the survey and the analysis of the S3 sample. However, it is imperative to acknowledge the inherent limitations of this approach. The analysis of reforms in the S3 context necessitated a detailed examination of the documentary evidence, which was conducted on a subsample of S3. This approach gives rise to certain limitations in terms of generalisation, despite the fact that the sample was selected to encompass a wide range of situations and to focus on S3, which is characterised by a high probability of containing reforms. Furthermore, the evidence contained in documents was given significant weight, despite the possibility that it did not fully reflect certain policy developments. This limitation was mitigated by the use of survey data and interviews, which were able to confirm or challenge some elements related to reforms found in the S3 documents. This approach enables a comprehensive overview of the diversity of reforms present in the S3, with an emphasis on the illustration of said diversity.

### **A significant but heterogeneous attention to reforms in the S3 context**

Despite a lack of explicit institutional emphasis on reforms in the S3 context, many strategies mention them. However, these mentions can cover multiple realities regarding the actual influence of the S3 in mobilising reforms to improve their innovation and industrial ecosystems.

*A limited institutional emphasis on reforms in the S3 context*

The scope of the S3 has tended to broaden over time (see e.g., Section 3.2 on Smart Specialisation and its role for industrial transformation), but this has led to a partial emphasis on reforms at this stage. Since the introduction of the concept and its inclusion in Cohesion Policy, S3 are indeed primarily considered by academics and policymakers as a strategic framework to identify and prioritise the relevant areas of focus related to research, development and innovation for given territorial areas (see, e.g., Foray et al, 2009, cited in European Commission, 2023c). As the concept was enshrined in public policy in relation to ERDF funding, it is also a tool to steer investments (ERDF and non-ERDF ones in some cases) towards these priorities.

**From a regulatory perspective, reforms to improve the ecosystems under which the S3 operate are only implicitly considered**, leaving ample room for the attention granted to this issue. Indeed, in the 2021-2027 programming period, the Common Provisions Regulation introduced an enabling condition related to the S3 to ensure their good performance, namely “1.1. Good governance of national or regional smart specialisation strategy”. This enabling condition does not explicitly mention reforms, but implicitly addresses the issue. Indeed, one of the fulfilment criteria for this enabling condition relates to “5. Actions necessary to improve national or regional research and innovation systems, where relevant.” (EUR-LEX, 2024). This situation ensures some flexibility in the degree of attention to reforms. In practice, Managing Authorities typically tackled this criterion in their ERDF Programmes through references to pre-existing documents and not through a specific analysis of past/potential reforms in their S3. For instance, some French Managing Authorities made references to their work in the context of their economic and innovation development strategies (SRDEII) to fulfil this criterion. Mentions of the fulfilment criterion in the S3 themselves are rare in our sample of 32 S3, though it can happen. For instance, in the Polish national S3 for 2021-2027, a dedicated section assesses past reforms of different types linked to the S3.

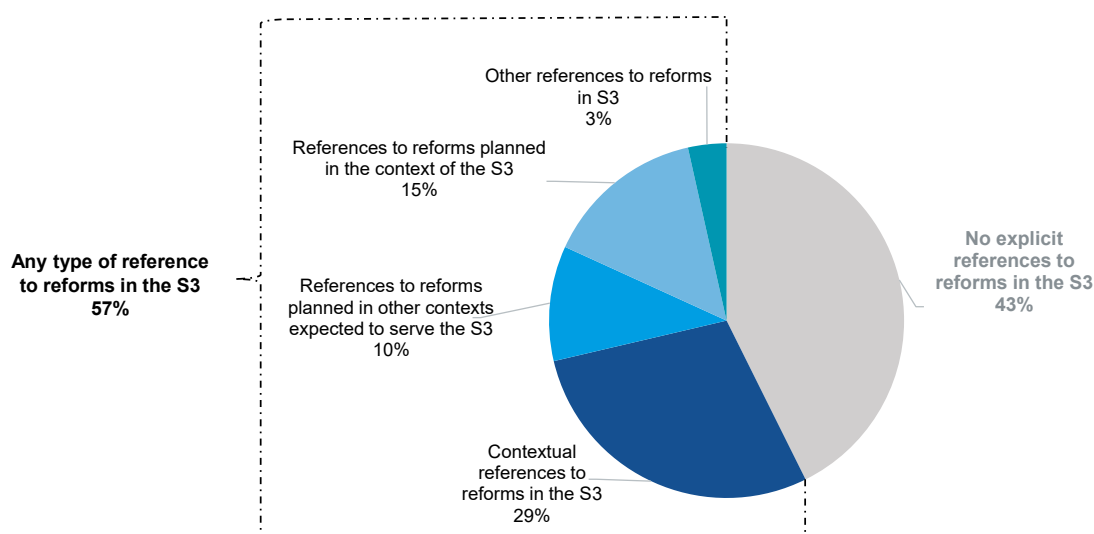
*A substantial attention to reforms in the S3 in practice*

**In practice, the evidence shows that reforms were mentioned in several S3 during the 2021-2027 period.** Indeed, in the survey performed in this study on a large sample of respondents tasked with S3 coordination and/or ERDF/JTF management for 2021-2027, more than half (57%) reported some references to reforms in their S3, corresponding to about the same share of the covered S3 (59% of the S3 of respondents to the survey). These mentions could cover different realities, ranging from contextual references to reforms to references to reforms planned in the context of the S3 itself (see Figure 61 below).

The findings of the survey were largely consistent with those derived from other sources of evidence. In particular, our analysis of the entire universe of S3 documents revealed that about 60% of S3 had a reasonable probability of containing reforms<sup>84</sup>.

<sup>84</sup> Defined as having at least 2 out of three methods identifying potential reforms. These methods were 1. Identification of the term “reform” in the S3 document, 2. Presence of reforms detected by a Large Language Model, and 3. Presence of priorities linked to the improvement of the ecosystem (see Section 3.1).

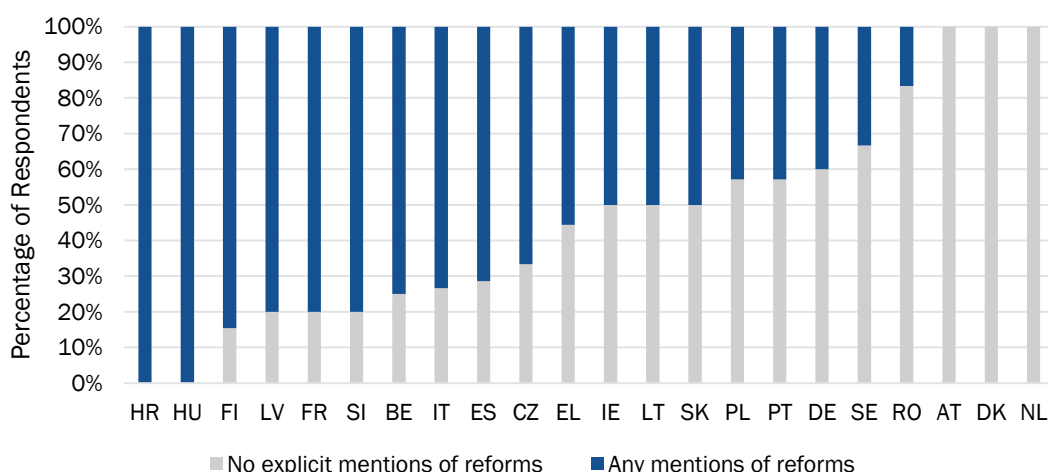
**Figure 61: Survey Answers to question D2 "Are reforms explicitly mentioned in the current S3 (2021-2027)? If so, what are the types of linkages between the S3 and these reforms?" (Percentage of respondents)**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Type of respondents: Actors tasked with S3 coordination, ERDF programming and/or JTF implementation. Number of valid responses: 143 referring to 114 distinct Member States/regions.

However, the mentions of reforms in the S3 were very heterogeneous (see Figure 62). In particular, important disparities between countries can be noted. In the survey, respondents from some Member States (e.g., Croatia, Hungary, Finland) were much more likely to mention references to reforms in their S3 compared to other countries (e.g., Austria, Denmark, the Netherlands).

**Figure 62: Survey Answers by Member State to question D2 "Are reforms explicitly mentioned in the current S3 (2021-2027)? If so, what are the types of linkages between the S3 and these reforms?" (Percentage of Respondents)**



Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Type of respondents: Actors tasked with S3 coordination, ERDF programming and/or JTF implementation. Number of valid answers: 143 referring to 114 distinct Member States / regions.

### Three different ways of associating reforms to S3

As indicated by the fact that a considerable proportion of S3 makes references to reforms, it can be posited that these mentions may reflect a wide range of influence levels of these reforms on the ecosystems. It is possible to distinguish between three distinct categories of relationship between the S3 and the reforms they cite, as illustrated in the following table:

**Table 16: Relationships between reforms and S3**

| Relationship between the S3 and the reform | Description  | Examples of reforms from the S3   |
|--|--|---|
| Contextual reform                          | Reforms of this type form the broader background/context for the S3. They are typically cited to signal alignment/consistency with the S3, but often without an explicit discussion of implications regarding the S3 implementation. Contextual reforms often cover strategies or plans, especially those at a higher level of governance. | <ul style="list-style-type: none"> <li>Hungary S3: National Digitalisation Strategy (national strategy for the development of information and communication strategies and their integration into multiple policies)</li> <li>Molise S3: EU Green Deal (EU-wide strategy to tackle climate change and other environmental issues)</li> </ul>  |
| Enabling reform                            | Reforms of this type are not designed/started by the S3 but are nevertheless expected to facilitate the implementation of its investments. It includes reforms planned outside the S3 (e.g., in the framework of other RDI strategies).  | <ul style="list-style-type: none"> <li>Bulgaria S3: National model for the development of research universities (creation of a functioning model allowing higher education institutions to move to a next stage of their development and become fully fledged players in the research and innovation ecosystem)</li> <li>Lazio S3: Simplification of environmental authorisation (accelerating the pace to obtain the authorisations for the green economy priority)</li> </ul> |
| Catalysed reform                           | Reforms of this type are initiated/triggered by the S3 or at least closely tied to its goals and timing to ensure its effectiveness. They can be planned as an integral component of the strategy or outside of it. It notably includes reforms linked to the S3 itself (e.g., adjustment of its governance), but not only.                | <ul style="list-style-type: none"> <li>Slovenia S3: New Strategic Research and Innovation Partnerships (SRIPs are long term public private partnerships in the different S2 domains)</li> <li>Emilia-Romagna S3: Professional training and education, and apprenticeship in the S3 areas (increase of the flexibility of the training provided regarding the different S3 areas)</li> </ul>   |

Source: Prognos AG/CSIL (2025) based on the review of a sample of 32 S3 documents.

**In practice, most S3 focus on contextual reforms**, as documented by the survey and the analysis of the sample of S3 documents. Indeed, 29% of respondents to the survey (i.e., 50.8% of those mentioning the presence of reforms) reported that reforms were cited as

part of the contextual analysis of their S3. In the sample of S3 documents, on average 58% of the reforms of each S3 were considered contextual, based on the way they were mentioned. However, other relationships between reforms and S3 are also present. As such, 28% of reforms were assessed as enabling in the sample, and 14% as catalysed. As contextual reforms may not imply direct consequences for the improvement of the S3 implementation, it can be useful to zoom on non-contextual reforms in some further analyses.

### Components of the ecosystem targeted and modes of delivery: examples of reforms

The detailed analysis of our sample of 32 S3 suggests that these strategies cover a diverse range of reforms, from the point of view of the components of the ecosystem they target, but also regarding how they are delivered.

**A striking feature is that the breadth of mentioned reforms is very high**, ranging from broad strategies (e.g., references to EU-level strategies as contextual basis for alignment of the S3, such as EU2020 or the EU Green Deal) to very specific adjustments in the ecosystems (e.g., reform of the Intellectual Property Box Credit in the Polish national S3 giving preferential taxation for new or improved intellectual property, reform of the Entrepreneurial Discovery Process governance in the Catalonia S3).

#### *Components of the ecosystem targeted by reforms*

Most reforms of the sample under study (52%) targeted multiple components of the ecosystem. It is notably the case for complex strategies. For instance, digitalisation strategies can serve Business Environment, Infrastructures, Education and Research System, etc, contemporaneously. Reforms are diverse, but the S3 tend to concentrate their reforms on Business Environment (59%), Governance (41%) and Education and Research Systems (37%).<sup>85</sup> The following Info box 9 zooms on some reforms in these critical components of regional ecosystems.



#### **Info box 9: Examples of reforms related to the most commonly targeted components of the ecosystem**

##### **Business Environment - Establishment of pilot innovation areas with regulatory flexibility (Latvia)**

This reform aims at building a specific regulatory framework to favour the smart mobility S3 priority. Concretely, it involves the creation of Pilot and Innovation Areas with temporary regulatory exemptions. The rationale for this reform is to reduce bureaucratic burdens and to facilitate the experimentation of innovative solutions by local and international companies, as well as research institutions in the field of urban transportation.

##### **Governance – Łukasiewicz Research Network (Poland)**

The reform consisted of the launch of a wide network of research institutes in Poland to better connect the different components of the ecosystem (including academia and businesses). The main goal of the network is to promote cooperation and to favour the commercialisation of research results.

<sup>85</sup> Since reforms can target multiple components, the percentage sum up to more than 100%.

**Education and Research System – Saxon School Act (Saxony, Germany)**

This regional law overhauls the school system of Saxony, by clarifying the scope of the education system, its overarching organisation and functioning.

*Source: Prognos AG/CSIL (2025). Note: Authors based on database of the sample of 32 S3 with reforms*

When the analysis is restricted to non-contextual reforms, the importance of Business Environment reforms tends to diminish, and of Governance reforms to increase.

**The subsequent table provides illustrative examples of reforms targeting each component.** The relative abundance of these elements within the sample of 32 S3 is the basis upon which they are ranked. In each case, distinctive examples were selected, with due consideration given to achieving geographical coverage and the level of the retained S3 (i.e. regional or national).

Table 17: Examples of reforms by components of the ecosystem

| Components of the Ecosystem                            | Examples of reforms from the S3  | Average Percentage of reforms in a S3 of the sample   |
|--|--|---|
| Business environment                                   | <ul style="list-style-type: none"> <li>Poland S3: Robotisation tax credit (Financial incentive to promote robotisation in companies)</li> <li>Latvia S3: Pilot Innovation Areas for smart mobility (creation of areas with regulatory flexibility to test mobility innovations)</li> <li>Croatia S3: Review of the regulatory framework (A more agile modernisation of the regulatory framework for shaping the digital economy to provide clear guidance on market opportunities for developers of new technologies)</li> <li>Greece S3: Spin Off Support Act (Legal institutionalisation of incentives for researchers to build spin offs)</li> </ul>  | <ul style="list-style-type: none"> <li>All reforms: 59%</li> <li>Excluding contextual reforms: 37%</li> </ul> |
| Governance, collaboration and stakeholders' engagement | <ul style="list-style-type: none"> <li>Saxony S3: Initiatives from intra-region convergence (collaboration between regional and local governments to develop region-specific innovation strategies)</li> <li>Estonia S3: Launch of a R&amp;I Coordination Council (new structure to coordinate sectoral R&amp;I more efficiently)</li> <li>Catalonia S3: Restructuring of the Governance of the EDP</li> <li>Greece S3: New Innovation Agency</li> </ul>   | <ul style="list-style-type: none"> <li>All reforms: 41%</li> <li>Excluding contextual reforms: 42%</li> </ul> |
| Education and Research system                          | <ul style="list-style-type: none"> <li>Romania S3: Establishment of a Performance Assessment System for Public R&amp;I Institutions (National system will assess public R&amp;I institutions through regular external evaluations based on standardized indicators, ensuring performance comparability and guiding institutional funding)</li> <li>Saxony S3: Saxon School Act (Regional law framing the functioning of the educational sector)</li> <li>Estonia S3: Reform the academic career model (ensuring balance between flexibility and stability, and following key principles such as gender equality)</li> <li>Slovakia S3: Adjustment of the school curriculum to better align with labour market's needs (focus on skills regarding management, creativity, strategy...)</li> </ul> | <ul style="list-style-type: none"> <li>All reforms: 37%</li> <li>Excluding contextual reforms: 33%</li> </ul> |
| Labour Market  | <ul style="list-style-type: none"> <li>Bulgaria S3: National Employment Strategy 2021-2030</li> <li>Hame S3: Incentive plan for labour migration (promotion of the attraction of foreign talent)</li> <li>Slovakia S3: National Strategy for the Labour Mobility of Foreigners in the Slovak Republic Until 2020 With a View to 2030</li> <li>Italy S3: Plan for the Mobility of researchers</li> </ul>  | <ul style="list-style-type: none"> <li>All reforms: 21%</li> <li>Excluding contextual reforms: 14%</li> </ul> |

| Components of the Ecosystem  | Examples of reforms from the S3  | Average Percentage of reforms in a S3 of the sample  |
|------------------------------|--|--|
| Infrastructures              | <ul style="list-style-type: none"> <li>Ireland S3: New Research Infrastructures Roadmap</li> <li>Greece S3: Interconnection of research infrastructures with ESFRI networks</li> <li>La Rioja S3: Digital Agenda of La Rioja 2017-2021</li> <li>Slovakia S3: ESFRI Roadmap (identification and prioritisation for research infrastructures)</li> </ul>   | <ul style="list-style-type: none"> <li>All reforms: 19%</li> <li>Excluding contextual reforms: 4%</li> </ul> |
| Access to Finance            | <ul style="list-style-type: none"> <li>Wallonia S3: Improving the link between the S3 and Horizon Europe (Activate synergies to secure additional funding for stakeholders in the region)</li> <li>Hungary S3: Restructuring of the RDI funding system (institutional revision of the funding model, dual system of grants shifting to a "spectrum logic", new aid types, result orientation model...)</li> <li>Lodzkie S3: Providing an integrated system of financing innovation (coherence between funding sources, common guidelines...)</li> <li>Slovakia S3: Support access to ERDF RDI funding for hospitals (Ad hoc solution to develop clinically relevant RDI using ERDF funding)</li> </ul> | <ul style="list-style-type: none"> <li>All reforms: 16%</li> <li>Excluding contextual reforms: 7%</li> </ul> |
| Demand for Innovation        | <ul style="list-style-type: none"> <li>Czechia S3: Supporting the innovative demand for smart solutions by public administration</li> <li>Hungary S3: Revision of Public Procurement Legislation and System for RD</li> <li>Lodzkie S3: Building awareness within the environment that supports the implementation of innovation (including through the development of a broad innovation culture)</li> <li>South Ostrobothnia S3: Reform the public procurement approach to promote innovation</li> </ul>   | <ul style="list-style-type: none"> <li>All reforms: 7%</li> <li>Excluding contextual reforms: 5%</li> </ul>  |
| Capabilities of Stakeholders | <ul style="list-style-type: none"> <li>Czechia S3: Improvement of the Quality of research organisation management</li> <li>Croatia S3: Support the improvement of governance practices (notably management capabilities) in SMEs</li> <li>Emilia-Romagna S3: New foresight models for skills (development of models to anticipate linkages between skills and technological development in the future)</li> <li>Poland S3: Academy of Innovation Managers (Development of a curriculum of training and advisory services centred on management and innovation capabilities for companies)</li> </ul>   | <ul style="list-style-type: none"> <li>All reforms: 5%</li> <li>Excluding contextual reforms: 5%</li> </ul>  |

Source: Prognos AG/CSIL (2025) based on an analysis of 674 reforms across the 32 S3 of the sample. The percentages correspond to the average share of reforms targeting each component in the S3. As reforms can target multiple components, the percentage sum up to more than 100%.

## Modalities of delivery of reforms

**Reforms are delivered through several modalities**, but strategies are by far the most common way reforms are considered, reaching an average of almost 60% of cited reforms in the S3 of the sample. This can largely be explained by the important share of reforms which are citations of strategies as background documents. Other major delivery modalities for the reforms include legislation/regulation and organisational changes (about 20% each) followed by capacity-building and administrative reforms (about 10% each). Other modalities are much more marginal.

Even more than for the components of the ecosystem, the picture is different when we exclude contextual reforms. Strategies are far less common (23%), being overtaken by organisational reforms (42%) and legislation or regulation (32%). Other approaches, such as administrative reforms and capacity-building are also much more common than for all reforms. Table 18 provides illustrative examples of reforms adopting each delivery modality. They are ranked based on their relative abundance in the sample of 32 S3. Distinctive examples were selected in each case, while balancing the geographical coverage and level of the retained S3 (i.e., regional or national).

**Table 18: Examples of reforms by delivery modality**

| Delivery modalities       | Examples of reforms from the S3  | Average Percentage of reforms in a S3 of the sample   |
|---------------------------|--|---|
| Strategy                  | <ul style="list-style-type: none"> <li>Bulgaria S3: EU industrial policy</li> <li>Emilia-Romagna S3: Data valley Bene Comune (Regional Digital Strategy)</li> </ul>  | <ul style="list-style-type: none"> <li>All reforms: 58%</li> <li>Excluding non-contextual reforms: 23%</li> </ul> |
| Organisation              | <ul style="list-style-type: none"> <li>Silesia S3: Continuous Entrepreneurial Discovery (Highlighted as unique in Poland due to its continuous nature and reliance on multiple studies and bodies)</li> <li>Greece S3: National Technology Initiatives (Public Private Partnerships to directly use the results of research in high value-added products)</li> </ul>   | <ul style="list-style-type: none"> <li>All reforms: 20%</li> <li>Excluding non-contextual reforms: 42%</li> </ul> |
| Regulation or legislation | <ul style="list-style-type: none"> <li>Slovenia S3: New Government of the Republic of Slovenia Act (Reorganisation of the competences in the field of innovation policy, also considering the recommendations of the EC-funded project Reform)</li> <li>Latvia S3: Biobank Act (The act involves establishing legal requirements for a Latvian Health Open Data Cloud and integrate it into the European Open Data Cloud, supporting research and innovation projects in precision medicine, digital health, and ICT.</li> </ul> | <ul style="list-style-type: none"> <li>All reforms: 20%</li> <li>Excluding non-contextual reforms: 32%</li> </ul> |
| Administrative reform     | <ul style="list-style-type: none"> <li>Greece S3: Adjustment of RTDI management cycle and funding procedures (Improvement of the administrative procedures to meet businesses' needs)</li> <li>Wallonia S3: Reform of research aid (Restructuring of existing schemes supporting research to streamline them and make them more visible to potential beneficiaries)</li> </ul>   | <ul style="list-style-type: none"> <li>All reforms: 9%</li> <li>Excluding non-contextual reforms: 18%</li> </ul>  |

| Delivery modalities         | Examples of reforms from the S3   | Average Percentage of reforms in a S3 of the sample   |
|-----------------------------|---|---|
| Capacity-building           | <ul style="list-style-type: none"> <li>Ireland S3: New and Enhanced Skills support (support of the S3 to the identification of relevant skills for innovation)</li> <li>Emilia-Romagna S3: Digital, green and soft skills for all (New curricula and teaching methods that include a minimum standard of digital, green and transversal skills)</li> </ul>  | <ul style="list-style-type: none"> <li>All reforms: 9%</li> <li>Excluding non-contextual reforms: 16%</li> </ul>    |
| Incentives                  | <ul style="list-style-type: none"> <li>Hame S3: Incentive plan for labour migration (pull factor to attract foreign talent)</li> <li>Poland S3: Intellectual Property Box Credit (Preferential taxation at 5% of revenues generated from generated or improved qualified intellectual property rights)</li> </ul>   | <ul style="list-style-type: none"> <li>All reforms: 2%</li> <li>Excluding non-contextual reforms: 3%</li> </ul>     |
| Awareness-raising           | <ul style="list-style-type: none"> <li>Lodzkie S3: Building awareness of regional specialisation</li> <li>Greece S3: Awareness raising campaigns on standardisation (Information diffusion regarding industry 4.0 standards)</li> </ul>   | <ul style="list-style-type: none"> <li>All reforms: &lt;1%</li> <li>Excluding non-contextual reforms: 2%</li> </ul> |
| Standards or certifications | <ul style="list-style-type: none"> <li>Ireland S3: Innovation Scorecard (New standards-based innovation scorecard to support SMEs and enterprises in their innovation journey. It includes best practice guidance on different topics such as IP management, idea management, innovation partnership...)</li> <li>Greece S3: Accreditation system for business support institutions (two-tier accreditation system to ensure quality of business support services)</li> </ul> | <ul style="list-style-type: none"> <li>All reforms: &lt;1%</li> <li>Excluding non-contextual reforms: 1%</li> </ul> |

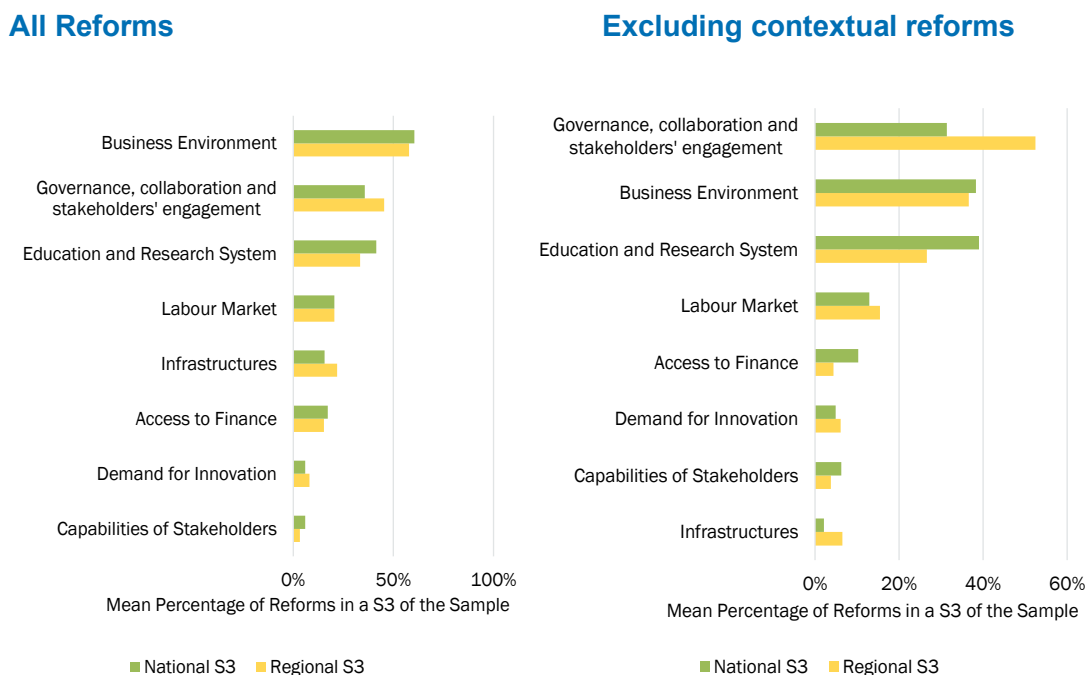
Source: Prognos AG/CSIL (2025). Note: Authors based on an analysis of 674 reforms across the 32 S3 of the sample. The percentages correspond to the average share of reforms using each delivery modality in the S3. As reforms can be delivered through a combination of modalities, the percentage sum up to more than 100%.

### Patterns between reforms and characteristics of the S3

Even though there are some limitations due to the sample size, some patterns between the reforms mentioned in the S3 and their characteristics can be deduced from our sample. These patterns notably depend on the level of governance of the S3 (and, to a lesser extent, on other characteristics, such as the level of development of the targeted territories).

**Indeed, the targets of the reforms mentioned in the S3 differ depending on whether they are national or regional.** These differences largely persist when considering all reforms or only non-contextual ones, as shown in Figure 63 below. National S3s are particularly likely to refer to reforms of capabilities of stakeholders, access to finance and, to a lesser extent, education and research systems. By contrast, regional S3 place much more emphasis on infrastructure and governance reforms. Governance reforms are the clear frontrunner when it comes to absolute differences between national and regional S3s. In fact, 45% of regional S3 reforms target this component, compared to 35% of national S3 reforms. Focusing on non-contextual reforms, these figures are 52% and 31%, respectively.

**Figure 63: Average Percentage of Reforms by Component of the ecosystem and Level of the S3**

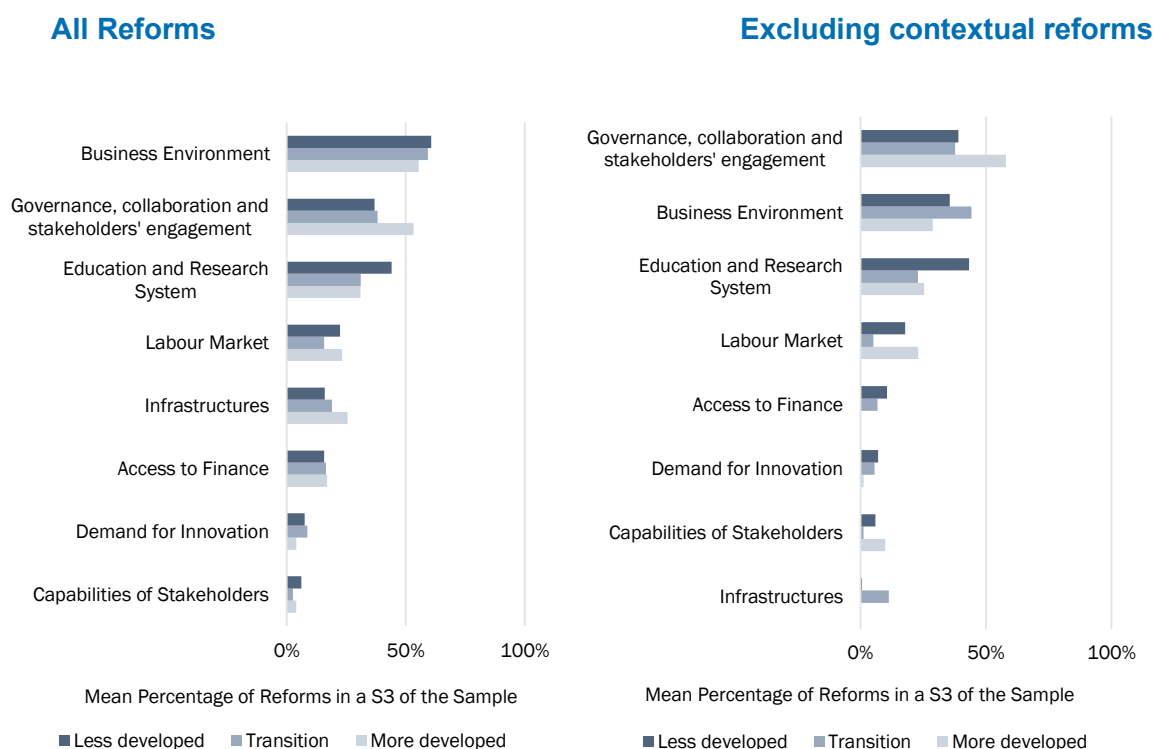


Source: Prognos AG/CSIL (2025) based on an analysis of 674 reforms across the 32 S3 of the sample. The percentages correspond to the average share of reforms targeting each component in the S3. As reforms can target multiple components, the percentage sum up to more than 100%.

Different hypotheses may be put forward to explain these patterns, such as the differences in distribution of competences across level of government, as well as the fact that national S3 in our sample tend to be more represented in Southern and Eastern Member States.

**Differences are also present depending on the level of development of the territories served by the S3**, though they are less clear-cut and more prone to variations due to sample size. The major patterns include the fact that S3 focusing on More Developed Regions prioritised governance reforms, while the ones targeting Less Developed Regions put a strong emphasis on Education and Research Systems (see Figure 64). Patterns based on innovation scores (i.e., Regional Innovation Scoreboard categories) yield similar results.

**Figure 64: Average Percentage of Reforms by Component of the ecosystem and Level of Development of the S3 territories**



Source: Prognos AG/CSIL (2025) based on an analysis of 674 reforms across the 32 S3 of the sample. The percentages correspond to the average share of reforms targeting each component in the S3. As reforms can target multiple components, the percentage sum up to more than 100%.

### 3.5.3 S3 approaches to reforms: stylised facts

#### Groups of S3 by types of reforms

**Different approaches to how reforms are mobilised in the S3 of the sample can be identified.** First, the centrality of reforms and the way in which cited reforms are associated to S3 can be assessed quantitatively. We used our database of reforms to carry out a cluster analysis of the S3, based on the shares of contextual, enabling and catalysed reforms. We identified three main types of S3, based on these shares, as follows:

- **S3 where reforms are mostly contextual:** In these S3, a high share of the reforms belong to the contextual type (on average 83%), with other types of reforms less emphasised. It corresponds to the largest cluster, with 50% of the analysed sample of S3 belonging to this category. It includes cases such as Stockholm, Ireland or Catalonia.
- **S3 where reforms planned in other contexts fuel the implementation of the S3:** In these S3, the dominant type of reform is the enabling one (56% on average), complemented by a mix of contextual and catalysed ones. The reforms are typically designed in other strategies, with the S3 benefitting from this work for the implementation of its investments. It covers 37.5% of the sample, with cases such as Poland or Provence Alpes Cote d’Azur.

- **S3 where reforms are largely catalysed by the S3:** In these S3, the strategy is itself a major document in designing and implementing reforms directly leading to improvement in the implementation of its investments. Only 12.5% of the S3 of the sample falls under this class, with cases such as Croatia, or South Ostrobothnia.

These models are ideal types, with significant differences between the S3 within each category.

### Underlying rationale and explicit vs implicit reference to reforms

A distinguishing feature between the S3 of the sample was found during the qualitative analysis of the S3, regarding the rationale underlying the mobilisation of reforms and the approach to reforms. The case studies reveal that in some cases, the main objective of reforms is to have the right framework conditions in place like for example in Croatia. In other cases, S3 reforms are to instil a dynamic of change, adaptation and experimentation as illustrated in Emilia-Romagna and Wallonia (see Box below).

Another difference concerns the fact that S3 can mobilise reforms either implicitly or explicitly. In many cases of the sample, the S3 do not highlight the importance of reforms, or identify them as such. It does not mean that reforms are not present or important. For instance, in Emilia-Romagna, the concept of reforms is not cited, but the region adopted a flexible approach to introduce changes in the ecosystem in relationship to the S3. These “implicit” reforms are called “modus operandi”. By contrast, in the Slovak S3, there is an explicit recognition of the fact that investments alone are not sufficient and that accompanying reforms are a necessary condition for the success of the ecosystem. Several reforms are also mentioned in the S3, with direct potential effects on investments prioritised in line with the S3. For instance, a reform allowing regional governments to access the management systems of secondary schools is evoked. This reform aims at allowing regions to contribute to the strategic development of S3 and R&I, by linking better education, the needs of the local/regional labour markets and S3 priorities.

**i**

Reforms and S3: case studies

Insights from the two case studies on reforms in the S3

(national-level S3 and regional-level S3)

**Croatia, Slovakia (national S3), Emilia-Romagna, Wallonia (regional S3)**

Four national and regional S3 were analysed through two case studies to understand their approaches towards reforms. The evidence illustrates different dimensions and criteria that can be used to describe possible approaches to the mobilisation of reforms within S3.

- **Croatia: A major integration of reforms through the collaboration of different Ministries**

Croatia sees the S3 as its umbrella strategy regarding Research Development and Innovation. The country carried out a major analytical survey and benefited from a World Bank report in 2018-2019, which enabled it to identify priority

reforms. Collaborations between Ministries (notably of the Economy and Research) ensured the inclusion of relevant reforms in the S3. In this context, reforms are explicitly integrated into the S3 and aim at improving the entire research and innovation ecosystem (not restricted to S3-specific issues).

- **Slovakia: An explicit identification of the importance of reforms, though they are mostly tackled by the national RDI strategy**

Slovakia explicitly recognises the importance of reforms to support the investments in its S3 and mentions several of them in a way that credibly connects the proposed changes with implementation on the ground. However, its national RDI Strategy is the key document designing and implementing reforms, which can then benefit S3 investments. The S3's core focus is the identification of the priorities.

- **Wallonia: The S3 is primarily seen as a strategic framework oriented towards reforms**

Most of the reforms are explicitly acknowledged as distinct and complementary to investments. The S3 is seen as an opportunity to take an experimental approach to reform the regional policy mix and the S3 governance. Other reforms are identified in other components of the ecosystem.

- **Emilia-Romagna: A flexible experimental approach based on “modus operandi”**

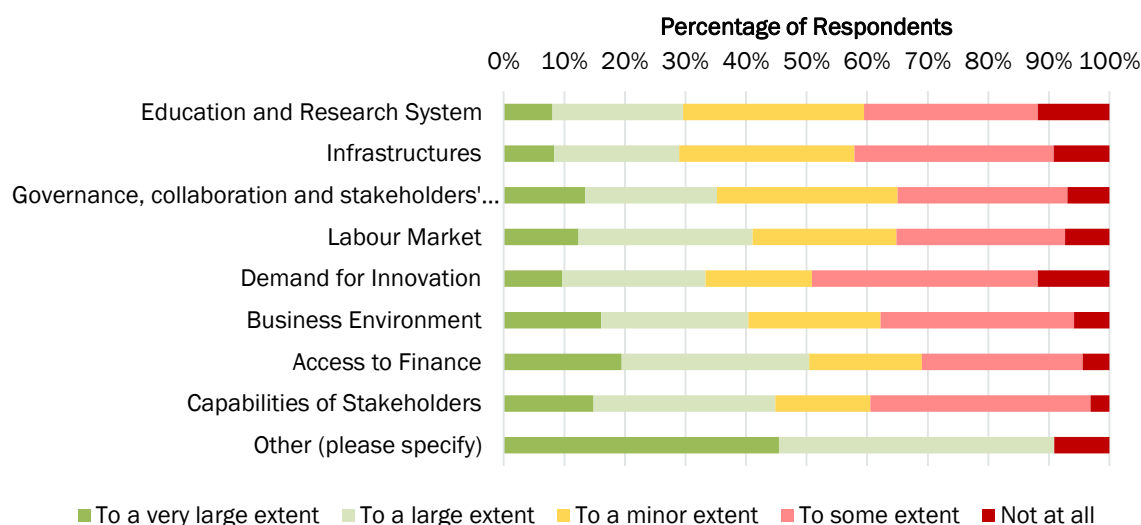
There is no sharp distinction between “reforms” and “investments”. Both are seen as an integral part of the S3 strategy and are different versions of the “ways of doing things” that are specific to the region. A truly integrated, participatory, organic and bottom-up approach is nurtured. This approach is geared towards achieving maximum flexibility making possible fast adjustments to changing needs and circumstances. This is possible thanks to a high level of administrative capacity and efficient governance mechanisms (vertical and horizontal coordination).

### Alignment between reforms and bottlenecks in ecosystems

One could reasonably expect that reforms in S3 are mentioned in relation to the components of the ecosystem where the performance is weak. Overall, however, reforms mentioned in S3 do not align very well with the major bottlenecks identified by stakeholders in the survey (see Section 3.1.4). Indeed, the bottlenecks identified by the respondents of the survey include capabilities of stakeholders, access to finance and the business environment (see Figure 65 below). Of this list, Business Environment is the only component also targeted by reforms in the sampled S3. Governance/education and research systems are common areas for reforms in the sample of S3, but they are perceived as less critical to respondents.<sup>86</sup>

<sup>86</sup> Even though there are overlaps between Capabilities of Stakeholders and the Education and Research System

**Figure 65: Question D1. What are the main bottlenecks in your innovation and industrial ecosystem, which affect the implementation of S3 investments? (Recategorized by broad bottlenecks)**



Source: Prognos AG/CSIL (2025) based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Type of respondents: all stakeholders. Number of valid answers: 242 referring from 144 distinct Member States / regions. Answers were recategorized by components of the ecosystem.

This lack of alignment may be explained in different ways and should not be over-interpreted. Firstly, in many cases, the S3 may not be used as the primary document for the identification/mentions of reforms. As a consequence, a lack of alignment between bottlenecks and reforms may not imply a lack of attention. Secondly, there are significant methodological challenges to document this alignment, among which the size of the S3 sample.

### Linkages between S3 priorities and reforms

To further characterise the approach of S3 to reforms, we explored possible links between the mobilisation of reforms and the types of S3 priorities analysed in Section 3.1. In some cases, anecdotal evidence indeed shows that reforms were clearly linked to specific S3 priorities, either explicitly or implicitly. For instance, in Latvia, the establishment of the Biobank Act can be linked to the biomedicine, medical technology, pharmacy S3 priority.

More in general, S3 with priorities that target the innovation ecosystem (as defined in Section 3.1) could be expected to also mobilise reforms since both reforms and priorities pursue the same objective. However, only a limited number of S3 (14 out of the total) adopt such priorities and there is almost no overlap with the sample of S3 selected for their high probability of mobilising reforms. That said, according to the survey, respondents indicating the presence of these ecosystemic priorities in their S3 indeed tended to place stronger emphasis on reforms (57% had some references to reforms) than other S3, as shown in the table below.

**Table 19: Examples of strategies including specific sector/technology priorities**

| S3 by type of priorities   | Percentage of S3 with any references to reforms | Percentage of S3 with no references to reforms |
|--|---|--|
| Strategies with Priorities focused on innovation ecosystems improvement  | 57%   | 43%  |
| Strategies with Priorities related to cross-sectoral societal challenges | 30%   | 70%  |
| Strategies with Priorities related to cross-sectoral transformations     | 37%   | 63%  |
| Strategies with Sectoral/technology specific priorities                  | 34%   | 66%  |

Source: Prognos AG/CSIL (2025), own elaboration based on the analysis of S3 documents and the survey to respondents.

However, beyond the survey and other anecdotal evidence, a clear and systematic link could not be established, which calls for further analyses.

### 3.5.4 Milestones and Targets for a performance-based approach to S3, linking reforms and investments

This section explores the possibility of adopting a system of milestones and targets (M&T) to track the implementation of reforms jointly with investments and fuel a performance-based approach to S3. Milestones and Targets recently rose in prominence in the policy discussion due to their use in the context of the Resilience and Recovery Facility (RRF). In the following paragraphs, we first explore general considerations on how M&T can contribute to a performance-based approach and delve into the specific experience of the mobilisation of M&T in the RRF context. We then draw the lessons for S3 and examine the potential role of M&T in three different scenarios and assess how conditions of effectiveness apply in these scenarios.

#### General principles for establishing a system of M&T

**Milestones are administrative and procedural steps towards achieving a measure** (a reform, or an investment). They are typically qualitative and relate to specific phases of implementation. In contrast, targets are linked to the expected results of a measure and are typically quantified to track progress; for this reason, they are less relevant in the case of reforms<sup>87</sup>.

**Milestones and targets are expected to bring several benefits**, such as guiding policies towards clear objectives and incentivising results-oriented behaviours. Specifically, M&T "help explore patterns of change while building a collective understanding of potential challenges and opportunities amid uncertainty". (See JRC Action Book, Bianchi et al., 2024). Moreover, M&T can lay the foundation for a conditionality mechanism, where payments depend on meeting predefined criteria tied to M&T achievements. In this scenario, the M&T system takes performance orientation a step further, potentially increasing its incentive effects. Such an opportunity to implement a financing non linked to cost (FNLC) approach is also expected to simplify procedures and alleviate the administrative burden that affect beneficiaries and MA in Cohesion policy.

<sup>87</sup> For this reason, it is more appropriate to refer only to "milestones" in relation to reforms. However, in the rest of the document we tend to indistinctively use "milestones" and "milestones and targets" or "M&T", since the latter refer to a notion commonly acknowledged in the policy debate.

**However, past and current experiences highlight several challenges in implementing M&T systems, despite the anticipated benefits.** For example, in the field of R&I, setting targets can conflict with the serendipity principle—the inherent uncertainty of innovation outcomes. This may discourage experimental or riskier approaches, as the unpredictability of results does not align with rigid target-setting. When conditional payments are involved, more stringent conditions must be met to ensure the desired incentive effects are achieved. These conditions include setting adequate targets, establishing efficient measurement systems, ensuring stakeholder ownership, and having accountable agents in place. In general, successful M&T adoption requires strong administrative capacity.

Specifically, when considering conditionality mechanisms, the literature offers mixed conclusions and urges caution in setting realistic expectations for result-based systems using indicators and conditionality (Moynihan et al., 2011; Moynihan, 2009). A 2016 study by the World Bank found that there was "a general pattern of disappointment with the results of performance budgeting, balanced by a strong belief in the underlying logic," which led to a "gap between promise and practice." This study highlighted a focus on legal and financial compliance, rather than the intended outcomes, and pointed out the surprising lack of attention to this experience when designing the RRF (Zeitlin et al., 2023). This has led to concerns about "gaming," "creaming," "cherry-picking," and a focus on short-term goals at the expense of long-term results.

### **An example of an M&T system linking reforms and investments: lessons from the RRF**

To promote the integration of reforms and investments, the Recovery and Resilience Facility introduced an M&T system that represents a major innovation: making disbursement of funds conditional on the achievement of pre-agreed milestones and targets. In contrast to traditional cost-based payment systems, this outcome-based approach is seen as especially appealing for Cohesion Policy funding, as it addresses several persistent shortcomings while advancing long-standing objectives. According to Zeitlin et al. (2023)<sup>88</sup>, there are three types of advantages associated to this approach. First, it offers an alternative to the burdensome cost-reimbursement model typical of CP. Second, it seeks to enhance the performance orientation of interventions, shifting the focus away from mere fund absorption. Third, by emphasising outcomes, the system provides a potential response to the reputational challenge faced by CP – namely, the difficulty of demonstrating its contribution to EU-wide objectives. Consequently, there has been significant interest in drawing lessons from the RRF for the future of CP.

While promising in design, the RRF experience reveals a more nuanced reality, highlighting both the benefits and limitations of an M&T-linked conditionality system. Although the mechanism has helped steer Member States (MS) toward ambitious reform-investment packages, its effectiveness in delivering tangible results remains uneven. Several key issues emerge: the conditionality associated with M&T is not the sole incentive driving the adoption of integrated programmes of reforms and investments, and other conditions seem to apply; the extent to which M&T are genuinely results-focused is debatable; and implementation challenges abound, including the rigidity of targets, limited stakeholder participation, and administrative burdens. These issues are explored in detail below.

**M&T as an incentive for combining reforms and investments.** The system of payment based on the achievement of M&T was seen as one major factor explaining the relative overall success of the RRF in promoting a joint approach to investments and reforms, but as highlighted above, there is much variation in the capacity of NRRPs to balance reforms and investments.

<sup>88</sup> Zeitlin, J., Blokhorst, D., and Eihmanis, E. (2023). Rethinking the governance and delivery of the cohesion policy funds: Is the Recovery and Resilience Facility (RRF) a model? *Journal of European Public Policy*.

The CSR conditionality attached to the NRRPs has pushed some Member States to put in place reforms for which previously there had been insufficient political capital. In addition, “putting a price tag” on reforms has acted as an incentive: the link with financial support is a highly relevant factor explaining the RRF's contribution to the introduction of reforms.<sup>89</sup> Furthermore, the ex-ante definition of a strict timeline, accompanied by milestones and targets the fulfilment of which is a condition for payment disbursement, has been a key factor in some Member States in accelerating the political discussion on reforms which would otherwise have taken a much longer time to be adopted.

According to the RRF mid-term evaluation, the added value of RRF support to reforms has been higher in those Member States that are the largest beneficiaries of the RRF. Spanish authorities interviewed as part of the RRF mid-term evaluation recognised the role of the RRF in accelerating wide-ranging reforms such as the labour market and the pension reforms that were adopted in consultation with social partners in a short timeframe. Similarly, according to Italian national authorities, it would hardly have been possible, without the RRF, to adopt within a short time horizon public administration, justice (civil justice, criminal justice, insolvency framework and tax courts) and competition reforms (to update the regulatory framework to attract both public and private investment).

By contrast, in other Member States, the reforms introduced with RRF support are not of the same magnitude. In some countries, for instance Germany, reforms were in fact already foreseen in the government coalition programme or introduced only relatively minor changes. This notwithstanding, also in Member States with relatively lower financial incentives (like Germany), the RRF in part contributed to accelerating the introduction of important reforms, such as a joint programme at national and regional level to tackle investment bottlenecks.<sup>90</sup>

This suggests that there are other facilitating factors or conditions that consolidated the incentive effect of M&T. In particular, the RRF generated a “momentum” effect deriving from the novelty of the programmes and underlying delivery and funding mechanisms as well from the sheer amount of budget made available, which has increased the incentive impact of M&T (Zeitlin et al., 2023). The amount of available budget has provided the RRF with a strong leverage effect in overcoming domestic obstacles to reforms. The RRF commitment was deliberately presented as an external constraint to push the reform process through.<sup>91</sup> Also, the EC had an effective role in pushing the adoption of reforms, which it endorsed even if it was not foreseen in the legal texts.

**Real performance orientation and selected indicators.** The extent to which NRRPs' M&T are truly performance-oriented has also been discussed.<sup>92</sup> A closer look at the type of indicators actually utilised shows that the vast majority is about input and output rather than results.<sup>93</sup> In the specific case of reforms, milestones were generally used, with typical fulfilment indicators stipulating the passage and entry into effect of a legislative or

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<sup>89</sup> Corti F., Pedralli, M., Pancotti C. (2024). The Recovery and Resilience Facility: Key Innovations and the Interplay with Cohesion Policy, Discussion Paper 06/2024, <https://ftp.zew.de/pub/zew-docs/dp/dp24040.pdf>

<sup>90</sup> *ibid.*

<sup>91</sup> Examples include the liberalisation of closed professions in Portugal and pension reform in Slovakia, both of which were pushed through parliament on the eve of an impending payment request. In some countries like Italy, national officials see the RRF's performance-based financing and monitoring system as a valuable lever for accelerating the approval and implementation of investment projects, including by other levels of government. See Zeitlin et al., 2023.

<sup>92</sup> European Court of Auditors (2023) The Recovery and Resilience Facility's performance monitoring framework – Measuring implementation progress but not sufficient to capture performance Special report 26/202. Available at: <https://www.eca.europa.eu/en/publications?ref=sr-2023-26>

<sup>93</sup> A comparative study for the European Parliament of NRRPs in six Member States (France, Germany, Italy, the Netherlands, Romania, Spain) found that only in two of these (Italy and Romania) did results indicators comprise more than 15% of the total number of indicators for target fulfilment, with Spain just above the 10% level, and a negligible share in the other three countries. See Darvas and Weslau 2023.

administrative measure, but not the achievement of specific results to which the measure is expected to contribute. Process indicators are the most common candidates to track progress in the implementation of reforms as evidenced by an analysis of fulfilled M&Ts based on an extraction from the RRF Scoreboard (March 2025). They are M&Ts focused on enabling factors, procedural steps and inputs, as opposed to outputs and results of the measures put in place. The table below illustrates examples of milestones that can be defined as process indicators, categorised by type.

Overall, M&T are useful for tracing implementation records but not to really document the achievements of results. Indeed, the ECA has assessed the RRF’s performance monitoring framework as capable of measuring implementation progress, but not sufficient to capture performance. One reason identified for such a focus on input and output is the risk that choosing result indicators would represent. A study for the European Parliament attributes the limited focus on result indicators in the NRRPs to concerns that the wider use of such indicators “would introduce uncertainty for Member States, since the achievement of results might not necessarily follow from the completion of outputs, partly due to risks beyond the control of those who implement the projects.”<sup>94</sup>

**Table 20: Examples of process-oriented fulfilled milestones in RRF reform measures**

| Category  | Examples of actual milestones   |
|---|---|
| <b>Legislation</b>                                  | <ul style="list-style-type: none"> <li>• Entry into force of the Royal Decree on the reorganisation of Public Research Organisations</li> <li>• Entry into force of the Law on Business Creation and Growth</li> <li>• Draft legislation to encourage business extroversion</li> </ul>  |
| <b>Strategy/plan/programme</b>                      | <ul style="list-style-type: none"> <li>• Update of the guidelines for the strategy for technological and business innovation for Portugal 2030</li> <li>• Spanish Strategy on Circular Economy (EEEC)</li> <li>• National Digital Skills Strategy</li> </ul>  |
| <b>Administrative steps/Implementing agreements</b> | <ul style="list-style-type: none"> <li>• Conclusion of the cooperation agreement stipulating conditions for cooperation between SA Kredex/Enterprise Estonia and county development centres</li> <li>• Agreement between the Federal Government and the Länder to provide learning support for learners with pandemic learning backlogs</li> <li>• Completion of individual agreements between the lead department and the lead Land</li> </ul>   |
| <b>Feasibility studies/Evaluations</b>              | <ul style="list-style-type: none"> <li>• Carry out a consultation process of social partners on the potential for collective agreements and conduct a comprehensive study on the potential role of a single labour contract to bring new flexibility and security in the Polish labour market</li> <li>• Study on the feasibility of developing early childhood education infrastructure in municipalities</li> <li>• Finalisation of the study on the reinforcement of the regime applicable to trust and company service providers</li> </ul> |

Source: Prognos AG/CSIL (2025). Note: Authors based on RRF Scoreboard database.

**Non-aggregability of indicators.** In principle, the aggregability of indicators contributes to performance orientation by making it possible to assess overall progress towards general EU goals. However, RRF M&T are highly heterogeneous because they are closely linked to the underlying measures. Crucially, the design of the RRF prioritised the tailoring of indicators aimed to align with the specific needs of Member States and with the project features. At the same time, this heterogeneity significantly hampers the possibility to aggregate values across measures and countries, which in turn is a relevant element to

<sup>94</sup> Darvas, Z. and Weslau L. (2023). First lessons from the Recovery and Resilience Facility for the EU economic governance framework, study for the European Parliament.

ensure overall transparency and accountability, but also policy evaluation and learning. For this reason, the result-orientation can only apply at measure level.

**Limited consultation and involvement of stakeholders** is another feature characterising the establishment of M&T system which is relevant from the CP and S3 perspective. The RRF is not formally subject to the partnership principle. Governance is more centralised and less participatory. Yet, in principle, the bottom-up definition of milestones ensures stakeholders' ownership and avoid triggering a compliance approach. It makes it possible to set targets at an appropriate level, which is both relevant and realistic (for example not too low to have an effective incentive effect). The exclusion of key stakeholders, especially local and regional authorities but also societal actors is an issue both for the quality of the values of the indicators, but also for the eventual political buy-in by local stakeholders.

**Little flexibility in revising M&T.** M&T in NRRPs are fixed over a six-year period, which prevents from using them as a tool to adapt to changing (external) circumstances or to lessons learnt from the implementation experience. This contributes to make their verification as an essentially administrative procedure. The EC has intervened to recommend the reduction and simplifications of some M&T or to extend timetable, but it was on an ad hoc basis.

**Burdensome verification procedures.** A related operational challenge includes the need to set appropriate costs and verification mechanisms (and audit trails). One of the differences between indicators used only for monitoring purposes (such as in cohesion policy's performance framework) and indicators used also to promote a stronger performance orientation (such as with a link to payment schemes) lies in the need to establish verification mechanisms (with related responsibilities) that provide clarity in the way the achievement of each indicator is justified and assessed, and how it differentiates from others (e.g. to avoid cases whereby the same supporting document is used to justify different M&Ts<sup>95</sup>). Hence, in practice, the verifications also require focusing on cost details (MS still have to include estimated costs for reforms and investments for verification purpose). This involves bureaucratic assessment procedures generating high administrative burdens and lack of flexibility. This has been amplified by the fact that the ECA has pushed for a literal and legalistic interpretation of indicators. This process absorbs time and resources and encourages to focus on verification rather than on substantive issues (e.g., achievement of M&T). It also places pressure on the EC in verifying the fulfilment of M&T while it has limited capacity and suffers from information asymmetry.

*i*

#### Info box 10: Verification mechanism and audit trail

A clarification might be useful about the difference between the terms 'verification mechanism' and 'audit trail'. Verification mechanism is the term used in NRRP Operational Arrangements to refer to the conditions for disbursement of pre-agreed amounts (what type of evidence the European Commission requires at the level of payment request / how the European Commission assesses satisfactory fulfilment of milestones and targets). In short, it refers to the set of procedures and documents through which the Member State proves to the Commission the achievement of milestones and targets, and the checks through which the Commission verifies this and on whose basis it disburses a payment. Summary document duly justifying how the milestone (including all its relevant elements, as

<sup>95</sup> In the absence of a rigorous set of verification mechanisms, it may happen that milestones and targets with different names or descriptions are eventually justified by means of the same supporting document, thereby undermining the very logic of the system.

listed in the description of the milestone and of the corresponding measure in the CID Annex) has been satisfactorily fulfilled.

Audit trail is a term that refers to the procedures and documents that need to be in place to allow an audit authority (at EU or national level) to verify ex post the regularity of expenditure, tracking the different steps in a precise way (e.g., who received reimbursements? how much? on what basis?). Audit is a particularly problematic point under the RRF because, at least in the initial years of implementation, there have been no clear rules and responsibilities: it is very difficult to establish such rules, because the RRF resources are deliberately not linked to the costs actually incurred, and there is usually no clear link between a milestone (or target) and an amount. Payment claims are in fact aggregations of milestones and targets, but do not contain a clear amount corresponding to the single milestone or target.

An example of documentation to prove the achievement of an indicator is offered by the Austrian RRP measure “1.A.3 Combating energy poverty”, whose first milestone is about the determination of funding priorities (funding guidelines to ensure at least a 30% average reduction in primary energy). In this case, the document to prove achievement is identified as follows: Copy of the publication of the adopted funding guidelines and a link to the website where they can be accessed. This shall be accompanied by a summary document duly justifying how those funding guidelines satisfactorily fulfil the milestone requirements (including all its constitutive elements, as set out in the description of the milestone and of the corresponding measure in the CID Annex). This summary document shall: (a) confirm that the support scheme for thermal renovation in dwellings of low-income households has been launched; (b) briefly explain the methodology for defining eligible projects with buildings mainly used for vulnerable/low-income households; (c) justify how the guidelines ensure at least 30% average reduction in primary energy consumption of the buildings, including the means to verify the technical specifications of supported projects. The summary document shall also point to the relevant provisions in the funding guidelines.

### Implications for S3 reforms

The RRF experience reveals different specific lessons useful to promote a performance-based scenario connecting reforms and investments within S3.

**First, it confirms that a conditionality mechanism is very demanding to implement.** In the case of the RRF, the incentive effect of the conditionality mechanism has been consolidated through important complementary factors. For example, a “momentum effect” resulting from the sheer amount of budget involved (coupled with the novelty of the scheme) has been used by national policymakers to argue about an imperious “external constraint” and push reforms through. Other relevant factors concern the role of the EC which has relentlessly argued in favour of taking up CSR.

The RRF experience also shows that a very important condition for a conditionality mechanism to work properly is the relative simplicity of the institutional setting. It is centralised with few actors involved in a streamlined principal-agent type of interactions. This makes it possible to identify the stakeholders responsible for the implementation of reforms and investments as precisely as possible and hold them accountable for the success or failure in fulfilling the M&T.

The RRF also shows that (contrary to expectations) such a system may be burdensome and that it risks diverting the attention on procedural questions (how to comply with verification requirements for example) away from substantial issues (how to achieve results), which could bring about a compliance approach. Another drawback is also to induce stakeholders to set lower milestones/targets than necessary in order to minimise the risk of losing budget in case M&T are not achieved.

**Second, in the face of these difficulties, it might be an option to “just” rely on milestones to track the adoption and implementation of relevant reforms and instils a sense of progress towards the achievement of pre-defined objectives.** In the absence of pecuniary rewards, the incentive is lower to achieve them, but paradoxically, because the risk of losing the award is also lower, the objectives can be set higher. Even in this case, however, the RRF experience shows caveats. It is necessary to identify proper objectives (which also requires agreeing on a shared definition of “reform”). Interestingly, the participatory dimension inherent to the CP framework in general, and to S3 in particular might represent an asset when fixing these objectives. It might contribute to selecting relevant variables and to setting realistic levels. Also drawing on “negative” lessons from the RRF, it might be advisable to allow for flexibility in revising M&T to adapt to external circumstances and feedback from implementation.

**Third, these general conclusions from the RRF experience highlight different conditions for implementing successfully milestones in the S3 context and perhaps attaching a conditionality to them.** To effectively transpose these lessons to the S3 context, however, it is necessary to acknowledge that they do not apply to S3 in general but rather they need to take into consideration the many different patterns highlighted in the previous empirical analyses of how reforms have been mobilised in S3. In this respect, two important variables to consider have to do with the type of reforms concerned (enabling vs catalysed reforms) and the broader underlying rationale for mobilising reforms within S3 (ensuring basic framework conditions vs developing an experimental and adaptive process of change). These criteria define different cases calling for different types of M&T and conditions of implementation.

To illustrate the potential contours of an M&T system in these cases and identify the related conditions of success, three ideal-type scenarios were developed for analytical purposes:

*Scenario 1: Reforms to ensure basic framework conditions are in place*

In this scenario, reforms contribute to the establishment of basic conditions frameworks. These preconditions are deemed to be instrumental in facilitating the effective implementation of investments that are congruent with the S3 priorities. The potential for these reforms to be both catalysed and enabling is contingent upon the strategic positioning of the S3 within the broader policy landscape of the region or nation. In the case of catalysed reforms, i.e. reforms whose adoption and implementation responsibility falls within the S3, a structured and ambitious system of M&T referring to outcomes rather than process is in principle possible. This is applicable to reforms that are straightforward to identify at the commencement of the policy cycle and which implementation phases are also unambiguous. The technical conditions for the implementation of a conditionality mechanism would be verified, provided that it is deemed appropriate for certain reforms to be subject to such a mechanism, provided that these reforms are combined with other reforms. Conversely, in scenarios where enabling reforms are initiated outside the S3 framework, the conditions for adopting an M&T system become more stringent. These reforms are characterised by their development within governance levels that are distinct from those of the S3 framework, encompassing different policy domains or alternative governance levels. The implementation of an integrated M&T system would necessitate its coverage of diverse policy domains and its deployment across various levels of governance. It is evident that a direct correlation between implementation and outcomes is challenging

to ascertain. Consequently, the implementation of a conditionality mechanism is unfeasible, and the M&T would most likely have to be constrained to process indicators (if at all).

#### *Scenario 2: Experimental approach*

In this scenario, reforms contribute to a flexible prioritisation of reforms, emphasising dynamic adjustments and enhancing a process of adaptive evolution. It is evident that these reforms are predominantly catalysed, yet it should be noted that they may also encompass enabling reforms when the S3 strategy functions as an overarching framework, coordinating diverse policies and reforms. In this particular context, it is not feasible to establish M&T at the commencement of the policy cycle and to identify objectives in such detail. It is imperative to consider the incorporation of process indicators within the in-store environment. These indicators should serve as a guide, delineating the sequence of actions to be undertaken. It is crucial to emphasise the flexibility of these indicators, ensuring that they can be adapted as necessary to align with the evolving needs and circumstances of the users. The implementation of an M&T system would facilitate the monitoring of an evolutionary process, thereby enabling the continual refinement of strategic formulation and implementation methodologies.

#### *Scenario 3: Mission-orientation*

In this scenario, reforms are closely linked with investments in the pursuit of societal or other missions of local relevance that are aligned with broader EU objectives. It is proposed that investments and reforms would occur in parallel, in a "co-evolution" process. In previous empirical analyses, no strong evidence was found to support this scenario; only limited evidence was found. However, given that this issue is being discussed in policy debates as a desirable direction to take, it is worthwhile to extend this hypothetical exercise to this case as well. In this particular instance, M&T would regain its significance by aligning itself with the overarching objectives of the mission and striving to disaggregate these objectives into distinct, measurable milestones. Accordingly, the system would be a combination of the initial system, in which M&T are defined *ex ante*, and the subsequent system, in which M&T are subject to continuous adjustment.

It is evident that these scenarios are exemplary representations of reform, developed around homogeneous categories. However, it is important to acknowledge that in reality, there is a low probability that a single type of reform and mode of mobilisation will prevail within a single S3. Conversely, the various scenarios are likely to be combined within a single S3, in differing proportions, thereby introducing a substantial degree of complexity to the situation. Furthermore, it is imperative to incorporate additional factors into the analysis, including the ecosystem's comprehensive innovation performance and its developmental stage, the capabilities of stakeholders, such as administrative capacity, the institutional framework with its distribution of competence over reforms across various governance levels, and other pertinent considerations. Finally, it would be worthwhile to infer the implications of the different scenarios in terms of simplification (for example, in principle under scenario 1 if a conditionality mechanism can be implemented) or experimentation (which is the *raison d'être* of scenario 2).

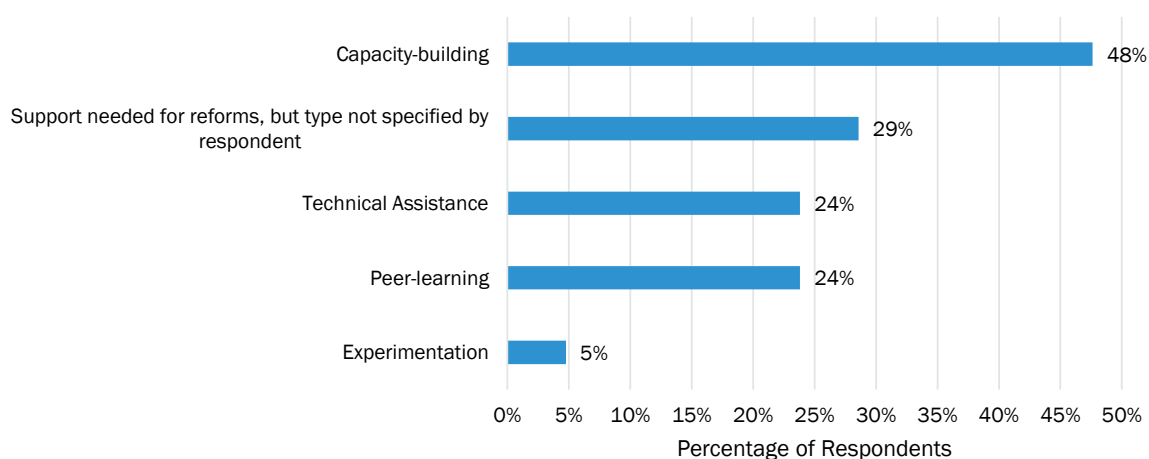
### 3.5.5 Institutional capacity support measures

At this stage, stakeholders involved in the S3 do not report a high interest in support measures that would help them with reforms. Different lines of evidence confirmed this situation. Interviewees from the case studies did not emphasise specific needs for support regarding reforms. Similarly, the respondents to the survey often did not respond to the question on the type of support needed for reforms to favour the implementation of S3 investments. Indeed, only 56 respondents did so (out of a total of 159 relevant respondents).

Among these 56 respondents, a majority (35) provided answers that were not consistent with the need for support regarding reforms. Only 21 reported insights on the need of support for reforms and the types of support that would be most appropriate.

When stakeholders expressed some need for support regarding reforms, they emphasised capacity-building, technical assistance and peer-learning (see Figure 66). A significant share of respondents (29%) noted that they would need support but without being able to determine its exact modality.

**Figure 66: Question D5. What kind of support would you need to adopt reforms that could facilitate the implementation of S3 investments? Are there any good examples of schemes that could be used in this context?**



*Source: Prognos AG/CSIL (2025), based on EU-wide online survey among S3 authorities, Managing Authorities and stakeholders. Type of respondents: Actors tasked with S3 coordination, ERDF programming and/or JTF implementation. Number of valid answers: 21, referring to 20 distinct Member States / regions. Answers were recategorized by type of support. Percentages may sum up to more than 100% since multiple types of support could be reported by a single respondent.*

Different hypotheses may explain this limited interest in support actions linking reforms and S3. As reforms are not explicitly prioritised in the current S3 framework, stakeholders may not focus their attention on this dimension. Moreover, stakeholders may have difficulties in adequately identifying their needs related to reforms. This is corroborated by the high share of respondents in our sample that were not able to pinpoint which type of support would be relevant to help them vis a vis reform for the S3. Accordingly, few stakeholders reported schemes that they would consider relevant to support reforms in the context of the S3. This included the Technical Support Instrument (TSI) of DG REFORM and the S3 Community of Practice actions.

In spite of this situation, it is still relevant to learn from the experience of existing support schemes that promote the design, implementation and evaluation of reforms, especially those focusing on RDI reforms or contexts relevant to Cohesion Policy / S3 in particular. Based on these insights, we can indeed highlight points of attention or desirable characteristics that support schemes may have in the context of linking reforms and the S3 more explicitly.

We reviewed a series of existing schemes to that end, including DG REFORM's Structural Reform Programme / Technical Support Instrument, Horizon's Policy Support Facility, INTERREG IMPROVE Programme and the S3 Community of Practice's Targeted Support Assessments.

Based on these schemes, the following points of attention for support schemes that may benefit S3 that would like to focus on reforms include (see European Commission and S3 COP, 2024; European Commission, 2019; European Commission, 2023a; European Commission, 2023b):

- **Political support for reforms:** Support from policymakers is essential to trigger the momentum for reforms
- **Alignment between the focus of the support scheme and the reform needs:** The scheme must be well aligned with the needs of the beneficiary willing to implement a reform in order to produce meaningful results. Establishing a basis for prioritisation of reforms is essential to that end, as well as being demand-driven. Ensuring the adapted form of support is provided (e.g., selecting the right expert for the context, the right peer learning partner...) is essential.
- **Alignment between the calendar of the support scheme and the reform process:** The process of the support scheme (including selection procedure and calendar) must be well aligned with the reform agendas of the beneficiary (including e.g., political cycles, etc.)
- **Emphasis on the full lifecycle of the reform:** Transition from the design to implementation (and then monitoring) phase of the reform must be emphasised to ensure long lasting impacts.
- **Strong cooperation between the provider of support and the beneficiary:** It is essential that the support scheme foster a sense of shared ownership between the provider of support and the beneficiary, in order to ensure a smooth transition from design to implementation.
- **Stakeholder engagement at the different relevant levels:** Inclusion of all relevant stakeholders (at the national, regional, local levels) is critical to ensure smooth implementation of reforms and lowered resistance to change. This is critical since existing schemes reported enhanced difficulties in decentralised contexts due to potential conflicting demands. Some support schemes require a coordination authority, but it may not be fully adapted in the S3 context (depending on the distribution of competences across levels of government).
- **Consolidation of capacity:** Limited capacity and staff turnover are attention points to facilitate the reforms.

These points could be considered when orienting stakeholders willing to benefit from support to carry out reforms in the context of their S3.

## 3.6 Monitoring and evaluation mechanisms in S3 2021-2027 – towards performance-based approaches?

### KEY FINDINGS ON MONITORING AND EVALUATION OF S3

- **The empirical analysis reveals that M&E models have become more important and matured across different Member States and regions**, but they also exhibit significant diversity. This diversity may present a challenge when the fundamental requirements for effective M&E are not met:
  - **Incomplete S3 indicator systems:** Within S3 indicator systems, output (70%) and result (77%) indicators are the most commonly used categories. However, only 55% include input indicators. This suggests a lack of connection between the measured outputs and results and their corresponding inputs, as well as a lack of information on inputs (e.g. financial investments) linked to the S3 measures.
  - **Insufficient differentiation of M&E processes:** Only 49% of the analysed S3 monitoring and evaluation models clearly distinguish between monitoring and evaluation processes. Consequently, M&E is frequently perceived as a single mechanism rather than two complementary parts of the same overall process.
  - **Low utilisation of performance-based measurements:** Of the analysed monitoring models, only 38% measure specific targets, while 14% utilise milestones. Of the evaluated models, 32% measure targets and 14% measure milestones. When M&E indicators are not corroborated by specific targets and milestones, the focus tends to shift towards measuring general metrics rather than specific S3-related developments (Section 3.6.1).
- **Open-data platforms are starting to emerge, with 26% of S3 strategies now adopting them.** However, 63% still rely primarily on conventional monitoring reports. Wider deployment of these platforms is vital. This will involve integrating diverse datasets, intensifying stakeholder communication and engagement, and creating real-time feedback loops for continuous improvement (see Section 3.6.1).
- **Monitoring and evaluation are firmly embedded in the S3 management framework.** Despite the aforementioned limitations, it is worth noting that 70% of regions use monitoring findings and 65% use evaluation results to adjust their strategies. However, it is concerning that almost 30% of regions ignore monitoring feedback and that 35% do not plan to incorporate evaluation results when revising or drafting new strategies (see Sections 3.6.1–3.6.2).

This chapter focusses on S3 monitoring and evaluation (M&E) models. **Effective M&E models are key to steer, control and, if necessary, to adapt the implementation of S3 strategies.** Monitoring models encompass all sorts of activities relating to collecting and processing information about the achievement of expected results and the degree of implementation of policy measures (**strategy controlling**). In contrast, the evaluation of the S3 needs to follow the overall aim of evaluating the implementation and achievement of the strategy's objectives (**strategy review**) as well its impact on the respective territory. Following its theory of change, the evaluation should investigate the changes and effects associated with the S3 (assessment of the effectiveness of the policy intervention logic). In

addition, and based on these assessments, improvement opportunities should be formulated for the further development of the respective S3, thereby establishing a solid foundation for its continuation or updating.

The fulfilment criteria for the enabling condition to the ERDF, ESF+ and the Cohesion Fund 2021-2027 state that Smart Specialisation Strategies need to be supported by “*Monitoring and evaluation tools to measure performance towards the objectives of the strategy*”.<sup>96</sup> Although there is some academic literature<sup>97</sup> and general guidance so far, there is no formal/textbook specification about how to monitor and how to evaluate the effectiveness of S3. **Thus, the first objective of this chapter was to analyse the applied S3 M&E models in the programming period 21-27.**

**The second objective focused on identifying examples of M&E models in the context of S3, with the aim of deriving lessons for future applications.** These illustrative M&E models particularly emphasize the significance of open platforms and performance-based approaches. To achieve this, in-depth case studies were conducted that examine the implementation and effectiveness of open platforms and performance-based measurements. Through these case studies, we aim to illustrate key issues and challenges, showcasing how these innovative approaches can drive more effective and responsive S3 evaluation processes.

**Eventually, drawing upon the findings from the previous analytical steps, we sought to propose an enhanced framework for current M&E models, steering them towards more performance-based paradigms (see chapter 4).** Performance-based M&E models are centred on measuring the effectiveness and efficiency of innovation-related activities and interventions by aligning them with predetermined milestones and targets. To operationalise this understanding, we aimed to explore flexible performance-based dimensions for M&E models that can adapt to varying contexts and needs. The insights gained from these case studies further inform our conclusions, enabling us to craft a more robust, responsive framework for S3 evaluation.

**Overall, this chapter addresses several key questions critical to understanding the landscape of S3 M&E models in the 2021-2027 programming period:**

- What are the defining characteristics of S3 M&E models in the programming period 2021-2027? What prioritization approaches are being adopted (particularly concerning open platforms and performance-based measurements)?
- How do illustrative M&E models effectively integrate open platforms into their frameworks? In what ways are performance-based measurements operationalised in applied M&E models? What specific examples of S3 M&E models highlight the opportunities and challenges associated with the integration of open platforms and performance-based measurements?
- In what ways can the existing S3 M&E mechanisms be refined and improved towards a more performance-based approach?

As a main focus of our examination was to uncover existing performance-based characteristics of applied M&E models, it is essential to establish a common definition and

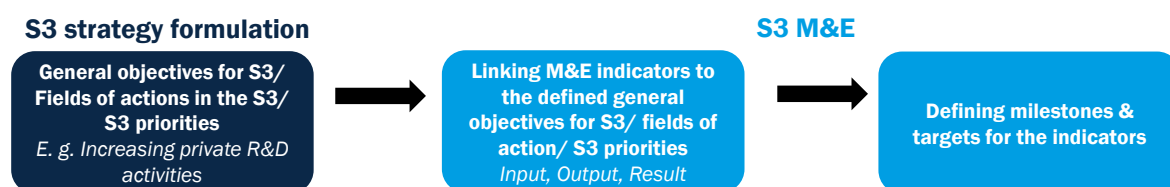
<sup>96</sup> See REGULATION (EU) 2021/1060 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021 Annex IV. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1060> (last access 18.04.2024).

<sup>97</sup> For example, Fonseca and Maguire (2024): The good, the smart, and the innovative: Governance and implementation of Smart Specialisation Strategies in 2021-27; Di Cataldo et al. (2023): The Impact of Smart Specialization Strategies in Pomorskie; Matusiak et al. (2022): Smart Specialisation implementation framework for the EU Enlargement and Neighbourhood Region or Hegyi and Prota (2021): Assessing Smart Specialisation: Monitoring and Evaluation System.

understanding of performance-based M&E frameworks. As articulated in Chapter 3.5, performance-based approaches are connected to clearly defined milestones and targets (M&T). Consequently, performance-based M&E models are designed to quantify the achievement of these predetermined milestones and targets. In order to analyse whether M&E model contains performance-based measurements, the analysis in this chapter necessitates the formulation of concrete and measurable milestones and targets for specific objectives/ fields of actions within the S3 framework, with explicit measurement of these targets by the respective M&E models.

Figure 67 illustrates the (textbook) link between the essential components of the S3 strategies (prioritisation approaches, strategic objectives/fields of action, S3 priorities) and the establishment of an efficient M&E model. Initially, the S3 strategies define strategic objectives/fields of action. The M&E model should then monitor/evaluate the progress of these strategic objectives/fields of action by substantiating them with appropriate indicators.<sup>98</sup> In the third step, specific milestones and targets can be formulated for the individual S3 strategic objectives/ fields of action (indicators, respectively).<sup>99</sup>

**Figure 67: Template for linking general objectives for S3/ fields of action to M&E models**



Source: Prognos AG/CSIL (2025).

To achieve the objectives outlined in this chapter, extensive data was collected regarding the M&E practices of Member States/regions during the 21-27 programming period. The primary sources of information included responses from the stakeholder survey as well as a detailed assessment of existing S3 documents (analysed via desk research and AI-enabled text analysis). By synthesizing insights from both sources into a **single S3 M&E database**, we aimed to capture the diverse approaches undertaken by Member States and regions in the realm of M&E. **This effort culminated in the collection and analysis of detailed information on 168 S3 M&E models.**<sup>100</sup> The presented data and figures in this section are based on this M&E database.

In addition, to highlight illustrative M&E models that successfully integrate open platforms and performance-based measurements, we conducted a series of case studies aimed at uncovering lessons learned regarding the underlying rationale for these features within M&E frameworks. Given the varying levels of economic and innovation capacity across regions,

<sup>98</sup> Clear objectives are the prerequisite of any M&E model. In the survey of Hegyi and Protá (2021) 75% of the respondents claimed that their S3 strategy has set objectives for the S3 priorities. This implies that, vice versa, 25% S3 strategies do not set strategic objectives for S3 priorities. See Hegyi and Protá (2021): Assessing Smart Specialisation: Monitoring and Evaluation System. In addition, the stakeholder survey of this study reveals that only a minority of Member States/regions report that alignment with the S3 priorities is explicitly integrated into monitoring and evaluation mechanisms to provide a structured way to ensure that investments remain coherent with regional innovation priorities.

<sup>99</sup> Matusiak et al. (2022) propose that S3 monitoring indicators should – among others – be associated with baseline and target values. See Matusiak et al. (2022): Smart Specialisation implementation framework for the EU Enlargement and Neighbourhood Region.

<sup>100</sup> The stakeholder survey as well as the assessment of existing S3 documents were focused on the same questions and the collection of the same indicators, which is why the collected information were combined. Please note that the M&E models of Guyane (France) and Lubuskie could not be analysed due to missing data.

we deliberately selected a diverse set of illustrative M&E models based on classifications from the Regional Innovation Scoreboard:

- Northern Netherlands (Strong Innovator)
- Emilia-Romagna (Strong Innovator)
- Extremadura (Emerging Innovator)
- Slovakia (Emerging Innovator)
- Hungary and (Moderate Innovator)
- Croatia (Emerging Innovator)

These case studies are largely informed by 2-3 in-depth, semi-structured interviews with key stakeholders in each Member State/region. The insights gathered from these interviews were further enriched through comprehensive desk research and literature reviews, ensuring a robust and nuanced analysis. Based on the comprehensive sample of analysed S3 strategies, we can summarize the following key observations concerning S3 Monitoring and Evaluation Models.

### 3.6.1 Navigating the landscape of monitoring practices in S3 2021-2027: A comprehensive overview

A high-level summary of the empirical findings for the 168 S3 monitoring models in the period 2021-2027 is provided in Table 21, with more detailed information available in the subsequent sections of the report. Here we assessed the applied indicator systems, reference to the Regional Competitiveness Index (RCI), an index measuring the major factors of competitiveness, and the Regional Innovation Scoreboard (RIS),<sup>101</sup> as well as the reporting mechanisms. Moreover, it was assessed whether monitoring was supposed to be actively included in throughout the policy cycle and if it included performance-based elements.

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<sup>101</sup> The EU Regional Competitiveness Index (RCI) is measuring the major factors of competitiveness for all the NUTS-2 level regions across the European Union. The RCI contains 3 Innovation pillars: Technological readiness, Business Sophistication and Innovation (see [https://ec.europa.eu/regional\\_policy/sources/work/rci\\_2022/eu-rci2\\_0-2022\\_en.pdf](https://ec.europa.eu/regional_policy/sources/work/rci_2022/eu-rci2_0-2022_en.pdf)). The EU Regional Innovation Scoreboard is measuring the innovation performance of regions across the European Union. (see [https://research-and-innovation.ec.europa.eu/document/download/5357c81b-9222-464b-8468-38ccd83b5624\\_en?filename=ec\\_rtd\\_ris-2023-methodology-report.pdf](https://research-and-innovation.ec.europa.eu/document/download/5357c81b-9222-464b-8468-38ccd83b5624_en?filename=ec_rtd_ris-2023-methodology-report.pdf)).

**Table 21: Descriptive analysis of S3 Monitoring Models in the 2021-2027 period**

| Characteristics monitoring models                               | Indicators   | Overall | Empirical application of these characteristics in S3 monitoring models |                  |                    |                    |
|---|--|---------|--|------------------|--------------------|--------------------|
|   |  |         | Types of Member State/ regions   |                  |                    |                    |
|   |  |         | Innovation Leader  | Strong Innovator | Moderate Innovator | Emerging Innovator |
| <b>S3 indicator system/Types of applied indicators</b>          | Input Indicators   | 55 %    | 50 %   | 57 %             | 55 %               | 55 %               |
|   | Output Indicators  | 70 %    | 45 %   | 55 %             | 84 %               | 79 %               |
|   | Result Indicators  | 77 %    | 50 %   | 63%              | 91 %               | 86 %               |
|   | Indicators that track reforms linked to the S3                                     | 13 %    | 5 %  | 10 %             | 16 %               | 14 %               |
|   | Further types of Indicators  | 46 %    | 45 %   | 45 %             | 50 %               | 40 %               |
| <b>Explicit use of RCI &amp; Regional Innovation Scoreboard</b> | RCI  | 15 %    | 10 %   | 14 %             | 16 %               | 17 %               |
|   | Regional Innovation Scoreboard   | 39 %    | 25 %   | 31 %             | 45 %               | 48 %               |
| <b>Reporting mechanisms/ Open Data Platforms</b>                | Providing monitoring data/ results on open platforms                               | 26 %    | 10 %   | 24 %             | 32 %               | 29 %               |
|   | Providing monitoring data/ results otherwise                                       | 63 %    | 75 %   | 53 %             | 64 %               | 67 %               |
|   | Do not provide data and results openly/ no information                             | 9 %     | 5 %  | 10 %             | 11 %               | 7 %                |
| <b>Part of the policy cycle</b>                                 | Proposing to use monitoring results to adapt the S3 during the programming         | 51 %    | 30 %   | 39 %             | 64 %               | 57 %               |
|   | Proposing to use monitoring results in the development of the new S3               | 53 %    | 55 %   | 47 %             | 41 %               | 74 %               |
|   | Do not propose to use monitoring results in the policy cycle/ no information       | 27 %    | 30 %   | 41 %             | 25 %               | 12 %               |
| <b>Performance-based measurements</b>                           | Proposing to measure milestones linked to the S3 in the monitoring model           | 14 %    | 15 %   | 4 %              | 21 %               | 14 %               |
|   | Proposing to measure targets linked to the S3 in the monitoring model              | 38 %    | 20 %   | 29 %             | 43 %               | 50 %               |
|   | Do not propose to measure milestones and targets linked to the S3 monitoring model | 58 %    | 70 %   | 69 %             | 50 %               | 50 %               |

Source: Prognos AG/CSIL (2025), based on the analysed S3 strategies (including Desk Research, AI analysis, stakeholder survey), n = 168.

### S3 monitoring indicator systems

**The analysis of the types of indicators shows that all three basic categories – Input, Output and Result – are frequently used in the monitoring systems of S3 strategies,** with output (70%) and result indicators (77%) being the most prevalent category in the S3 indicator systems.

**Input indicators** are emphasized in the documents as the basis for resource allocation. Examples include the financial resources allocated for research and innovation projects or the number of participating institutions. Thus, information on inputs can be generally considered as a fundamental element in the strategy controlling process and understanding the dose-response relationship. However, as shown in the table above, this type of indicator is used less frequently (55%) in S3 strategies. **Output indicators** typically capture the immediate effects of the measures for the beneficiaries, such as the number of incentivised R&I projects, number of cooperations with research institutions or newly employed R&I personnel. They are crucial for assessing the immediate effects of the strategy on the beneficiaries. With 70% of S3 strategies, output indicators are frequently mentioned in the S3 documents. The same applies to **result indicators**. They are commonly used to assess the medium- to long-term impacts of the strategy on national/regional level. Frequent examples are changes in patenting activities, R&I expenditures or scientific publications. In turn, indicators that track reforms linked to the S3 can hardly be found in the analysed strategies (12%). Eventually, the analysed monitoring models also apply further types of indicators. These include, for example, contextual or benchmarking indicators that express a comparison of the regional economy to other regions or nations. With regards to content, this often reveals a large overlap with the type “result indicators”.

**Overall, the S3 strategies demonstrate a balanced use of all three types of basic indicators, with output and result indicators more strongly emphasized and input indicators lagging behind.** This suggests a strong emphasis on the immediate results of implemented measures, while also considering the long-term effects while less consideration is given to inputs for the strategy implementation – potentially due to the frequent use of ERDF as main source of financing S3 implementation and operationalisation of financial plans. Moreover, in alignment with a recent paper by Fonseca and Maguire (2024)<sup>102</sup>, the results also indicate that the design and application of S3 indicators systems vary significantly across Member States and regions – i.e., S3 indicator systems are shaped by the national/regional preferences and priorities. However, the findings also indicate a lack of clarity regarding the connection between measured outputs and results and the corresponding inputs.<sup>103</sup> This issue is further underscored by responses from the stakeholder survey, which clearly highlight the need for the development of meaningful and specific indicators. Stakeholders stress the importance of moving beyond generic metrics, advocating for the creation of tailored indicators that accurately assess the impact of S3 priorities.

### Use of scoreboards/indices in S3 monitoring

**In addition, the Regional Innovation Scoreboard (RIS) is frequently mentioned in S3 strategies with its collection of indicators that enables the identification of regional strengths and weaknesses in the territory in a benchmark.** It is often even presented as a central indicator (result/contextual indicator) for measuring and assessing the progress

<sup>102</sup> Fonseca and Maguire (2024): The good, the smart, and the innovative: Governance and implementation of Smart Specialisation Strategies in 2021-27.

<sup>103</sup> The European Commission indicates that an effective monitoring system provides a clear overview of policy implementation by applying indicators that measure inputs, outputs and immediate effects (results). See European Commission (n. d): Monitoring is crucial to evidence-based policy making. It is a critical learning tool for S3.

in innovation performance (39%) linked to the S3 objectives. A detailed analysis of the sub-indicators reveals that the most mentioned sub-indicators are:

- **R&I Expenditures in the Public Sector as a Percentage of GDP:** Frequently mentioned as a key measure for public investment in research.
- **R&I Expenditures in the Business Sector as a Percentage of GDP:** Highlighted as an essential indicator of private sector investment in innovation.
- **Percentage of Population Aged 25-34 Having Completed Tertiary Education:** Commonly noted as a measure of educational attainment contributing to innovation capabilities.
- **SMEs Introducing Product Innovations as a Percentage of SMEs:** Frequently mentioned, indicating the innovation activity among small and medium enterprises.
- **Employment in Innovative SMEs:** Commonly referenced to measure the contribution of innovative firms to regional employment.

Potential advantages of using the RIS include its comprehensive set of indicators specifically focused on innovation and its benchmarking capabilities. However, it is crucial that the RIS and its sub-indicators are applied only when they align with the strategic objectives/ fields of action defined in the respective S3 as monitoring indicators should generally be tailored to effectively measure the specific developments related to S3 within Member States or regions. Another disadvantage may be the mismatch in the regional scale of the provided data. For instance, in Germany, the data at the regional level does not always align with the regional boundaries defined in the respective S3.

**The Regional Competitiveness Index (RCI)<sup>104</sup>, in the context of this study the innovation pillar, is mentioned less frequently in the monitoring models of the S3 strategies (15%).** When the RCI is explicitly mentioned as indicator for the S3 monitoring model, it serves to analyse the innovation aspect of competitiveness. However, while often not explicitly mentioned, the sub-indicators from the RCI (pillar innovation) are frequently part of the applied S3 indicator systems. Examples include particularly the sub-indicators that are similar to the sub-indicators of the RIS:

- **Total Patent Applications:** Mentioned frequently as a measure of innovation output.
- **Innovative SMEs Collaborating with Others:** Highlighted as an indicator of engagement and collaboration in innovation activities.
- **Total Intramural Research and Development Expenditure:** Frequently mentioned, representing investment in R&I within the region.
- **Scientific Publications:** Noted often as a measure of research output and knowledge generation.
- **Human Resources in Science and Technology:** Commonly referenced for assessing the availability of skilled personnel in innovation sectors.

The RCI offers a comprehensive view of regional competitiveness. In doing so and similar to the RIS, the RCI provides a comprehensive indicator set that is focused on innovation as

<sup>104</sup> The RCI helps to analyse various factors that influence competitiveness and supports the evaluation of economic, social and innovation conditions in the regions.

well as a good benchmark capability. Moreover, the RCI provides a broader perspective on regional competitiveness, incorporating multiple dimensions beyond innovation, such as economic performance and quality of life. Similar to the RIS, it is essential that the RCI indicators are tailored to effectively measure specific developments related to S3 in Member States or regions. However, a disadvantage is that some sub-indicators of the RCI may overlap with those in the RIS, leading to redundancy and potentially obscuring which index offers more relevant insights for innovation-focused strategies.

Overall, the analysed S3 strategies indicate that the RIS plays a more explicit role in the monitoring models of the S3 strategies, while the RCI, particularly the innovation pillar, is mentioned less frequently.

### Open Platforms in S3 monitoring

**The analysis of the S3 strategies reveals that proposed Open Platforms (26%) are depicted as digital platforms that furnish data and monitoring results in a manner that is user-friendly and accessible.** These proposed S3 open platforms play an increasingly important role for several reasons:<sup>105</sup>

- **Integration of Diverse Data Sources:** Proposed open platforms suggest the integration of various data sources by aggregating information from government departments, national databases, and local reporting systems. This comprehensive database captures inputs, outcomes, and results related to S3.
- **Enhanced Communication and Engagement:** Open platforms should improve communication by disseminating data and results, increasing visibility and public awareness. By presenting statistical data, results and reports in user-friendly formats, these platforms foster greater participation from stakeholders, enhancing cooperation, transparency and accessibility.
- **Continuous Improvement through Feedback Loops:** Open platforms should promote ongoing S3 enhancements by establishing transparent feedback loops, allowing monitoring and evaluation data to inform strategic direction and operational adjustments. Additionally, the monitoring systems provided by these platforms assist a range of actors – including for example non-S3 government bodies, enterprises or research institutions – in making informed decisions based on the provided data.

**Overall, Open Platforms are a new tool in the S3 strategies to promote access to monitoring data and increase transparency.** However, the frequency of proposing open platforms and the type of publication varies between Member States and regions – regular monitoring reports are still more often common means of publishing monitoring results (63% of the analysed S3 monitoring models) – especially Innovation Leader (9%) and More Developed Regions are applying Open Platforms less often (17%). These monitoring reports provide comprehensive analyses and summaries of progress in implementing S3 strategies.<sup>106</sup>

**Illustrative examples for applied Open Platforms are the cases of Northern Netherlands, Emilia-Romagna (Italy), Extremadura (Spain), Veneto (Italy)<sup>107</sup> or Austria.<sup>108</sup>** The Open Platforms of Northern Netherlands, Emilia-Romagna and

<sup>105</sup> Information based on the analysed S3 strategies/ Stakeholder survey.

<sup>106</sup> See for example S3 Monitoring & Evaluation Report of North Rhine-Westphalia ([NRW RIS3 Monitoringbericht 2023](#)).

<sup>107</sup> See <https://monitoraggios3.innoveneto.org/>.

<sup>108</sup> See <https://fti-monitor.forwit.at/O/system>.

Extremadura were further analysed in a Case study (see info box below). Each of the three regions offers unique approaches, success factors, challenges and lessons applicable to the development of M&E models using open platforms.

**The implementation of open platforms showcases key success factors such as open data transparency, strong stakeholder collaboration and adaptability to evolving needs, all of which enhance trust, accountability and user engagement** (see case study summary on S3 'M&E with Open Platforms' below). In contrast, challenges include the technical and financial demands of building and maintaining these open platforms, issues with data comprehensiveness and accessibility and the need for sustained stakeholder engagement to ensure relevance and coherence across decentralised systems. The Case Studies show that for successful implementation and scalability, developing robust governance structures, sustained stakeholder engagement, ensuring sustainable funding and maintaining flexibility and transparency in response to local needs are essential components. These insights collectively highlight the potential for cross-regional learning in enhancing the effectiveness of S3 initiatives through open platforms.



### The case of Northern Netherlands, Emilia-Romagna and Extremadura S3 M&E with Open Platforms

#### Emilia-Romagna, Northern Netherlands and Extremadura



#### Introduction

This analysis focuses on the use of effective M&E models to enhance the implementation of Smart Specialisation Strategies (S3). Highlighted are several open platforms, including "Monitoraggio S3" in Emilia-Romagna, the Northern Netherlands "Innovation Monitor", and Extremadura's "RIS3 Observatory". These platforms, which differs notably from each other, aim to facilitate transparent data collection, simplify coordination and enable informed decision-making, thereby strengthening regional innovation ecosystems through cross-regional collaboration and supporting advanced Technology Readiness Levels.

#### Link to the platforms

Emilia-Romagna: <https://monitoraggios3.art-er.it/>

Northern Netherlands: <https://www.snn.nl/noord-nederlandse-innovatiemonitor>

Extremadura: <http://observatorio.ris3extremadura.es/#/>

#### Key success factors, challenges and transferability of the learnings

Open platforms like "Monitoraggio S3" enhance trust and accountability via data transparency, involving active stakeholder collaboration to adapt evolving local needs. The Northern Netherlands employs an innovative survey mechanism, highlighting regional coordination and adaptability, while Extremadura consolidates diverse data sources into an accessible format, democratizing data access. All of them showcase key success factors such as open data transparency, strong stakeholder collaboration and adaptability to evolving needs, all of which enhance trust, accountability and user engagement.

In contrast, challenges include technical and financial demands, which are significant hurdles in maintaining these platforms, alongside issues relating to comprehensive data collection and accessibility. For the Northern Netherlands, decentralised data collection risks fragmenting the system, while Extremadura struggles with initial configuration challenges and delayed data acquisition.

Emilia-Romagna's platform model shows potential for scalability by integrating additional indicators and expanding data sources. The collaborative development approach offers a framework adaptable to varying regional contexts. Meanwhile, the Northern Netherlands' adaptive systems demonstrate scalability potential, although lack of cohesive governance remains a barrier. Extremadura exemplifies potential in ongoing platform restructuring, emphasizing improved data management and accessibility.

### Conclusion

The Case Studies show that each region faces unique challenges that offer valuable lessons, emphasizing the importance of robust governance, sustained stakeholder engagement, sustainable funding, and flexible, transparent strategies. These insights underscore the potential for cross-regional learning through open platforms, enhancing S3 initiatives' effectiveness by adapting to local needs and facilitating interregional cooperation.

*Source: Prognos AG/CSIL (2025), Interviews with Emilia-Romagna's, Northern Netherlands and Extremadura's S3 coordination authority (2025)*

## Use of S3 monitoring in the policy cycle

**The analysed S3 strategies often highlight that monitoring results are crucial for the refinement of existing strategies and/or the planning of future initiatives (73%).** It becomes clear that in many Member States and regions, monitoring serves as a tool for policy learning in the current program period. However, the findings also reveal that nearly 27% of Member States and regions do not plan to utilise the results from their monitoring processes. This suggests that the significance of monitoring processes/ results for the development and improvement of innovation systems may still be underestimated within the S3 management framework.

**The regions that use monitoring for the further development of existing strategies as well as in the planning of future strategies emphasize the importance of feedback loops/strategy reviews, whereby the results of the monitoring are regularly analysed.** These feedback loops/strategy reviews are used to gain insights and, if necessary, to adjust and improve current S3 strategies. The S3 strategies also mention the involvement of various stakeholders in the process of strategy adjustment. The results of the monitoring are used to inform stakeholders and incorporate their feedback into the further development of the S3 strategy. In summary, many S3 strategies describe mechanisms and processes for integrating monitoring results into the further development of existing S3 strategies. These mechanisms promote data-driven decision-making and ensure that the strategies remain dynamic and adaptable to changing conditions and needs. As also outlined by Fonseca and Maguire<sup>109</sup>, the specific implementation and frequency of feedback integration differ across Member States and regions.

## Performance-based models in S3 monitoring

**In the context of the S3 strategies, performance-based monitoring models can be used to track the progress/achievement of measurable and agreed S3 related targets and milestones.**<sup>110</sup> The S3 strategies aim to promote innovation and economic growth by setting specific strategic objectives/fields of action such as stimulating research and development (R&D) activities among small and medium-sized enterprises (SMEs) or enhancing knowledge transfer between research institutions and the private sector. This

<sup>109</sup> Fonseca and Maguire (2024): The good, the smart, and the innovative: Governance and implementation of Smart Specialisation Strategies in 2021-27.

<sup>110</sup> Hegyi and Prota (2021) emphasize the importance of establishing clear ex-ante expectations of anticipated results for monitoring models: "Subsequently, it is necessary to have a monitoring system that allows to collect, organise, and conveys information about the developments of policy interventions and to measure the distance between the actual and expected results of S3 related investment." See Hegyi and Prota (2021): Assessing Smart Specialisation: Monitoring and Evaluation System, p. 17.

strategic objectives/fields of action should be measured in the M&E models by appropriate indicators.<sup>111</sup> However, an analysis of the current monitoring models reveals a gap in performance measurement: Only 38% of the examined models measure specific targets for indicators that are related to strategic objectives/ fields of action. Examples can be observed in the monitoring frameworks mentioned by countries like Slovakia, Hungary, and Croatia, which notably include defined target values for the chosen indicators – which are related to strategic objectives – and timelines in their S3 framework, providing a clear roadmap for achievement. The observed target values are heterogenous and do not follow a clear pattern.<sup>112</sup> In contrast, the majority of S3 monitoring models lack this level of specificity, undermining the overall effectiveness of the monitoring process. This applies especially to Member States and regions that have a high innovation score (Leading Innovators) or development status.

**Furthermore, milestones – which are understood as key administrative or procedural steps leading toward the realisation of measures – are even less frequently articulated and measured within the analysed S3 monitoring models, with only 14% making such provisions.** Noteworthy examples include the monitoring model from Navarra, which sets milestones reflecting sectoral evolution, implementation progress, and the effectiveness of the policy mix. These milestones play a crucial role, serving as checkpoints that guide stakeholders in assessing both the short-term and long-term impacts of strategic initiatives. As with S3 targets, milestones are less often applied in Member States/regions with a high innovation score (Strong Innovator) or high development status, respectively.

**Ultimately, while S3 monitoring models track developments within the S3 framework, they fall short of rigorously measuring progress against defined targets and milestones.** The results from the stakeholder survey hint at difficulties in defining clear targets/ KPIs (see case study box at the end of the following chapter for additional information). This lack of targeted measurement not only hampers accountability but may also limit the potential for **informed decision- and policy-making** and adjustments to strategies as needed.

### 3.6.2 Evaluating S3: Insights into evaluation models employed by Member States and regions in the 2021-2027 period

While the preceding section delved into S3 monitoring models – focused on systematically collecting and processing data pertaining to the achievement of expected results and the implementation of policy measures – the current section shifts the lens toward the S3 evaluation approaches. We present empirical findings derived from our extensive S3 evaluation analysis. Table 22 provides a comprehensive summary of our findings for the analysed S3 evaluation models. We analysed the form of implementing the evaluation, potential features of the evaluation plan, the embeddedness in theoretical frameworks, the link to the monitoring process as well as the reporting mechanisms and the performance-based elements.

<sup>111</sup> Hegyi and Prota (2021) analysed the existence of S3 related objectives, the measurement of the socio-economic-environmental impact of S3 related interventions by monitoring models and the link between S3 strategy objectives and result indicators. See Hegyi and Prota (2021): Assessing Smart Specialisation: Monitoring and Evaluation System.

<sup>112</sup> This is in line with Molica et al. (2024), who found challenges faced by ERDF programmes in defining accurate and realistic target values for monitoring and evaluation. See Molica et al. (2024): Measuring achievements: Can cohesion policy programmes effectively monitor their performance?

Table 22: Descriptive analysis of S3 Evaluation Models in the 2021-2027 period

| Characteristics monitoring models   | Indicators  | Empirical application of these characteristics in S3 monitoring models |                                |                  |                    |                    |
|-------------------------------------|---|--|--------------------------------|------------------|--------------------|--------------------|
|                                     |   | Overall  | Types of Member State/ regions |                  |                    |                    |
|                                     |   |  | Innovation Leader              | Strong Innovator | Moderate Innovator | Emerging Innovator |
| Implementation of the evaluation    | Evaluation and S3 monitoring are defined separately and carried out in two individual tasks | 49 %   | 15 %                           | 33 %             | 61 %               | 67 %               |
|                                     | Evaluations are carried out within ERDF/ ESF programme evaluations                          | 21 %   | 15 %                           | 18 %             | 27 %               | 21 %               |
|                                     | S3 evaluation and monitoring are implemented jointly  | 38 %   | 65 %                           | 45 %             | 30 %               | 24 %               |
| Features of the evaluation plan     | Background and relevance of the evaluation  | 39 %   | 20 %                           | 27 %             | 48 %               | 52 %               |
|                                     | Evaluation approach   | 33 %   | 25 %                           | 24 %             | 41 %               | 40 %               |
|                                     | Definition of priorities (e. g. focus on a specific issue)                                  | 30 %   | 30 %                           | 27 %             | 32 %               | 36 %               |
|                                     | Evaluation objectives and research questions  | 35 %   | 10 %                           | 29 %             | 39 %               | 57 %               |
|                                     | Methods and data requirements   | 25 %   | 25 %                           | 16 %             | 30 %               | 40 %               |
|                                     | Evaluation timetable  | 28 %   | 20 %                           | 18 %             | 30 %               | 55 %               |
|                                     | Indicative budget   | 13 %   | 10 %                           | 4 %              | 11 %               | 33 %               |
|                                     | Other items   | 9 %  | 0 %                            | 6 %              | 13 %               | 26 %               |
| No distinct evaluation plan         | 38 %  | 55 %   | 51 %                           | 29 %             | 24 %               |                    |
| Embedded in a theoretical framework | Yes   | 14 %   | 10 %                           | 6 %              | 20 %               | 19 %               |
| Link to the monitoring process      | Utilizing monitoring data   | 55 %   | 25 %                           | 49 %             | 61 %               | 69 %               |
|                                     | Assessing indicators  | 46 %   | 25 %                           | 43 %             | 50 %               | 55 %               |
|                                     | Analysing trends  | 35 %   | 25 %                           | 37 %             | 27 %               | 48 %               |
|                                     | Informing decision-making   | 39 %   | 25 %                           | 35 %             | 45 %               | 43 %               |

|                                       |   |      |      |      |      |      |
|---------------------------------------|---|------|------|------|------|------|
|                                       | <b>Adaptive management</b>  | 23 % | 10 % | 20 % | 29 % | 26 % |
|                                       | <b>No link/ no information</b>  | 30 % | 65 % | 35 % | 21 % | 17 % |
| <b>Part of the policy cycle</b>       | <b>Proposing to use evaluation results to adapt the S3 during the programming</b>         | 47 % | 35 % | 33 % | 55 % | 57 % |
|                                       | <b>Proposing to use evaluation results in the development of the new S3</b>               | 51 % | 45 % | 47 % | 45 % | 67 % |
|                                       | <b>Do not use monitoring results in the policy cycle/ no information</b>                  | 35 % | 40 % | 45 % | 36 % | 17 % |
| <b>Performance-based measurements</b> | <b>Proposing to measure milestones linked to the S3 in the evaluation model</b>           | 14 % | 15 % | 8 %  | 21 % | 12 % |
|                                       | <b>Proposing to measure targets linked to the S3 in the evaluation model</b>              | 32 % | 20 % | 22 % | 43 % | 33 % |
|                                       | <b>Do not propose to measure milestones and targets linked to the S3 evaluation model</b> | 62 % | 70 % | 71 % | 48 % | 64 % |

Source: Prognos AG/CSIL (2025), based on the analysed S3 strategies (including Desk Research, AI analysis, stakeholder survey), n = 168.

The application of an evaluation approach was added in the current programming period as part of the enabling conditions.<sup>113</sup> Monitoring and evaluation are two different parts of the same overall process. Thus, there needs to be a close interaction between the S3 M&E models.

### Distinguishing between monitoring and evaluation in S3 M&E models

**So far, a clear distinction between monitoring and evaluation is not always explicitly made in the analysed S3 strategies** (in 38% of the analysed S3 strategies, the M&E processes are planned to be implemented jointly). It is important to note that the boundaries between monitoring and evaluation appear to be fluid, with both processes often regarded as one process. However, monitoring and evaluation are supposed to be two interlinked parts of the same process. Illustrative S3 strategies with a clear description of the distinction between their (planned) monitoring and evaluation processes are for example Greece, Toscana (Italy), North-West Romania or Bulgaria.

The following aspects can be derived from the analysis of the 168 S3 strategies:

- **Monitoring in the analysis S3 strategies is often defined as a continuous process aimed at tracking progress and results on an ongoing basis.** It focuses on collecting data on activities and indicators to oversee the implementation of the strategy and adjust as needed (continuous observation of implementation). However, the results of the analysis indicate that S3 monitoring is not always closely linked to the S3 strategic objectives/ fields of action (see results regarding performance-based elements).
- **S3 evaluation is usually defined as a systematic process aimed at assessing the long-term effectiveness and efficiency of measures after they have been implemented.** This includes more in-depth analyses of effectiveness, goal achievement analysing and lessons learned to inform decisions for future strategies. S3 evaluation is carried out less frequently than S3 monitoring processes. The S3 evaluation should be – similar to the S3 monitoring processes – closely linked to S3 strategic objectives/ fields of action in order to evaluate the achievement of the desired S3 outcomes and, thus, to provide accurate insights for further improvement and adjustment.

Overall, it can be concluded that 49% of S3 strategies express a clear distinction between monitoring and evaluation, mainly through separate definitions, chapters and models. Thus, the analysed S3 M&E models suggest that S3 authorities still often understand monitoring and evaluation as one single (identical) mechanism.

**While monitoring and evaluation should be defined and executed as distinct tasks, it is crucial to maintain a close interconnection between these two processes in S3 strategies.**<sup>114</sup> Our analysis reveals that 31% of the examined M&E models do not explicitly describe the link between evaluation and monitoring. This gap can be partially attributed to some S3 strategies not clearly distinguishing between monitoring and evaluation activities. For those S3 strategies that do explicitly address this interconnectedness, several approaches are employed to link monitoring and evaluation elements:

<sup>113</sup> See REGULATION (EU) 2021/1060 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021 Annex IV. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1060> (last access 18.04.2024).

<sup>114</sup> Monitoring and evaluation are supposed to be two different parts of the same process.

- **Data utilisation (55%):** Both monitoring and evaluation rely on similar data sources, such as output and result indicators or surveys. Thus, evaluation uses the data collected during monitoring as a primary source of information. This commonality ensures consistency in the information used for both processes.
- **Assessing indicators (46%):** Monitoring tracks changes in indicators over time. Evaluation then uses these indicators to measure the relevance, efficiency, effectiveness, impact, and sustainability.
- **Informing decision-making (39%):** Evaluation uses monitoring data to provide deeper insights for strategic decisions. The results obtained from the monitoring process provide valuable insights that inform the evaluation. Evaluators use the data collected through monitoring to assess the effectiveness and impact of the S3 initiatives.

**Overall, the evaluation of S3 strategies is intricately linked to the monitoring process and the data collected in the analysed S3 strategies.** An improved integration of these elements would facilitate continuous improvement, effective data utilization, stakeholder engagement and clear communication of results. An increased interconnectedness would ensure that S3 initiatives are assessed rigorously and can be adapted based on evidence and feedback, ultimately contributing to more effective innovation and economic development strategies.

### Use of evaluation plans in S3 strategies

**Describing an evaluation plan, as for example required for Cohesion Policy programmes, is essential for ensuring clarity, structure, accountability, and stakeholder engagement throughout the evaluation process.** It ultimately enhances the quality and utility of the evaluation, supporting continuous improvement and informed decision-making. The analysed evaluation models in the S3 strategies frequently propose the following features of such an evaluation plan:

- Background and Relevance of the Evaluation (39%)
- Evaluation objectives and research questions (35%)
- Evaluation Approach (33%)
- Evaluation timetable (28%)

### Use of theoretical frameworks in S3 evaluation models

**Embedding an evaluation model in a theoretical framework also enhances clarity, guides evaluation design, establishes assumptions, facilitates communication, and promotes learning and adaptation.** It also supports accountability and evidence-based decision-making, ultimately leading to more effective and informed strategies and interventions. So far, the analysis reveals that only a few S3 evaluation models are explicitly proposed to be embedded in theoretical frameworks, commonly utilizing “Theory of Change” and “Intervention Logic” (14% of the analysed S3 M&E models). Examples are the proposed evaluation models of Balears, Normandie, Brussels Capital Region, Slovakia or Skåne. They rely on a Theory of Change or logical framework (Effect logic/ learning system model, respectively) to illustrate the potential connections between the strategic objectives and the expected results.

## Performance-based S3 evaluation models

**The analysis of S3 performance-based evaluation models highlights a disconnect between intended objectives and actual measurement. While the S3 evaluation models aim for progress, only 14% measure milestones and 32% specific targets.** Take Andalucía, Spain, as a beacon of effective practice. It is an evaluation framework not only seeks to assess contributions to results but also to chart progress toward defined goals and adjust strategies based on insights gathered through to 2027 – the evaluation model of Andalucía assesses the progress in achieving the challenges and objectives of the S3 in order to propose changes in the design and to improve the results of the defined fields of action. This structured approach emphasises the importance of milestones as essential steps in navigating the complexities of implementation. Additional examples are Croatia, Hungary and Slovakia that were analysed more deeply in a case study (see below). However, in general, the analysis reveals that especially Member States/regions that have a high innovation score or development status do not regularly utilise milestones and targets.

**On a broader scale, however, the measurement of milestones within S3 evaluation frameworks remains sporadic.** While agreements on targets appear more prevalent, specific action areas outlined in S3 strategies often lack alignment with M&E systems. This misalignment may result in the tracking of vague metrics rather than focused achievements directly linked to the core objectives of S3 strategies. Consequently, the potential for informed decision-making and adaptive policymaking is jeopardized, ultimately challenging the effectiveness of S3 initiatives in driving innovative growth and economic development.

**The conducted case study regarding performance-based M&E models underscores the critical role of coordinated governance, stakeholder engagement and the use of theoretical frameworks in elaborating performance-based S3 M&E systems** (see info box below):

- Coordination of governance frameworks, indicator systems and IT databases need to go hand-in-hand. Setting up a common data platform can be a good project to establish collaborative processes and align (innovation) visions.
- Stakeholder involvement is key to get a realistic picture of both which targets are ambitious but reachable<sup>115</sup> and which steps are necessary to get there and should consequently be part of the milestone and target framework.
- Theoretical frameworks like a Theory of Change can guide this process and provide a template for developing well-adapted, interlinked milestones and targets systems.

**Milestones and targets are part of the management frameworks in the three Member States to different degrees to ensure that implemented activities are on track and to assess whether results align with the expected results.** Many of the challenges experienced in Croatia, Hungary and Slovakia when developing their S3 M&E systems further towards performance-based M&E approaches are relevant for the numerous countries and regions struggling to define and utilise milestones and targets productively. Designing a good system of milestones and targets requires good interministerial coordination, close coordination with stakeholders and theoretical frameworks, indicator systems and data platforms. Going through this process takes effort but it provides spillovers of added value in all these areas. In the end, defining milestones and targets is

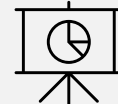
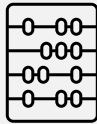
<sup>115</sup> Molica et al. (2024), for example, emphasis that target values could be defined in form of ranges, instead of a fixed value. See Molica et al. (2024): Measuring achievements: Can cohesion policy programmes effectively monitor their performance?

based on the (management and governance) ability to design a well-grounded and concrete vision of development.

i

### Case study example M&E-Models: Performance-based measurements

#### Croatia, Hungary and Slovakia



This case study examines the establishment of performance-based M&E models of Smart Specialisation Strategies (S3) in Croatia, Hungary and Slovakia. Comparative analysis shows common challenges and offers insights on enhancing coordination, data management and alignment of objectives across various policy domains. Croatia, Hungary and Slovakia expose some of the challenges in this process and point to some ways to tackle them.

#### Key success factors, challenges and transferability of the learnings summary

Utilising **theoretical frameworks** like the Theory of Change, active **stakeholder involvement** and close **coordination across units of government** can facilitate the formulation and monitoring of concrete, relevant and interlinked indicators, milestones and targets, thereby enabling continuous reflection and adaptive management in S3 implementation. The three countries work with different forms of **theoretical frameworks** to define relevant indicators and to set milestones and targets. The use of Theory of Change (Croatia) or intervention logic (Croatia, Hungary and Slovakia) approaches provides a framework for linking strategic S3 objectives with measurable milestones and targets, thereby aiding in tracking progress. The analysis reveals the importance of **stakeholder engagement**, which enhances buy-in and relevance of the strategies. Overarching challenges across these countries include the need for cohesive data management systems, aligning various funding streams with S3 objectives and enhancing inter-ministerial collaboration. Addressing these challenges while leveraging the established milestones and targets is critical for fostering performance-based M&E frameworks. All three countries emphasize the need for coordinated **management structures** to oversee the implementation of their S3 strategies. Croatia's management involves multiple ministries, similar to Hungary's integration of R&I, digitalisation and SMEs under one umbrella and Slovakia's efforts to link different ministries' indicator systems. While the institutional set-ups and strategies differ in detail, all three countries face challenges in the coordination of different ministries and policy areas to form a coherent S3 governance and M&E framework to implement a performance-based approach.

#### Conclusion

The study underscores the critical role of coordinated governance and stakeholder engagement in elaborating performance-based S3 M&E systems. Designing a good system of milestones and targets requires good interministerial coordination, close coordination with stakeholders and theoretical frameworks, indicator systems and data platforms. In the end, defining milestones and targets is based on the ability to design a well-grounded and concrete (innovation) vision of development.

*Source: Prognos AG/CSIL (2025), based on interviews with Croatia's, Hungary's, Slovakia's S3 coordination authority.*

### S3 evaluation and policy learning

**109 out of the 168 S3 strategies (i.e., 65 %) outline how evaluation results should be leveraged to enhance existing strategies.** Illustrative examples are the S3 strategies of Azores (Portugal), Veneto (Italy), Hungary or Hesse (Germany). These strategies describe feedback loops that incorporate reviews of evaluation results, serving three primary purposes:

- Analysing insights gained from the evaluation.
- Making corresponding adjustments to the strategy.
- Creating accountability.

Such evaluation processes can promote a learning-oriented approach to strategy development. Moreover, S3 strategies emphasise the importance of stakeholder engagement in both the evaluation and feedback processes. Evaluation results are used to inform stakeholders of strategy performance and to incorporate stakeholder feedback into strategy refinement.

The mechanisms for incorporating these results are diverse and include reviews that are based on evaluation reports and stakeholder involvement. However, in line with the findings for S3 monitoring models, our results also suggest that evaluation results appear to be underestimated for the development of innovation ecosystems in 35% of Member States and regions.

## 4 Conclusions and policy options for future smart specialisation strategies

The final chapter of the study summarises the empirical findings, presenting an integrated set of conclusions and policy options. Utilising a range of research methods, including comparative case studies, survey evidence and quantitative analysis, the study examined smart specialisation as a strategic framework for enhancing research and innovation capacities and for driving innovative and smart economic transformation in EU regions. The study identified ongoing capacity-building requirements and evaluated the ramifications of these discrepancies for S3 within the framework of Cohesion Policy and related contexts. The conclusions and recommendations that follow are intended to inform EU, national and regional authorities as they refine S3 governance and implementation within the current programming period, as well as in preparation for the policy framework after 2027.

### 4.1 Main conclusions on S3 as a strategic framework

As Smart Specialisation Strategies for the 2021–2027 period continue to unfold and discussions on the post-2027 policy framework advance, this study provides a timely and comprehensive assessment of the current state of S3 implementation across the European Union. It has reviewed progress in the **design, implementation, and governance** of S3, offering evidence on how the approach is evolving in practice.

At the core of the analysis was the **guiding question** defined in the Terms of Reference:

**“Does smart specialisation fulfil its purpose and provide the adequate strategic framework to channel and facilitate ERDF investments in innovation towards the most important areas for regional economic growth and structural transformation?”**

In responding to this question, the study has addressed six key areas of investigation, providing both a stocktaking of the present and policy-relevant insights for the future of S3.

#### 4.1.1 Is the prioritisation approach effectively targeting ERDF investments for supporting the development of Regional and industrial ecosystems?

The S3 framework encourages regions to concentrate R&I investments in areas that build on local strengths and opportunities. As discussed in Chapter 3.1, **for the 2021–2027 period, regions have adopted diverse prioritisation approaches**, reflecting both sector-specific specialisation and broader transformative goals. Nearly half of all S3 priorities (45%) – included in 74% of strategies – focus on specific sectors or technologies, supporting value chain development in areas such as agri-food, tourism, cultural and creative industries, energy, advanced materials, engineering, and ICT. These choices reflect a combination of “innovation push” strategies, targeting advanced or high-tech sectors, and “innovation pull” approaches, where the inclusion of traditionally low-tech sectors aims to stimulate innovation through technology adoption, business model renewal, or skills upgrading.

**Around 26% of priorities – found in 79% of strategies – address societal challenges such as health, mobility, inclusion, and sustainability, integrating efforts across**

**multiple sectors.** Another 26% of priorities – present in 81% of strategies – target cross-sectoral transformation themes, particularly digitalisation, greening, and Industry 4.0, with implications across entire regional economies. Lastly, a smaller but strategic category of ecosystem-oriented priorities accounts for 4% of all priorities and appears in 8% of strategies. These aim to strengthen the overall innovation environment through actions related to skills development, infrastructure, internationalisation, and systemic collaboration, providing enabling conditions for innovation to flourish across sectors.

**Hybrid prioritisation approaches dominate the landscape.** Only 12% of strategies rely on a single predominant approach, whereas 88% combine two or more priority approaches. The most common pattern (42% of strategies) combines transformational and societal-challenge themes with sectoral niches, while a fifth add innovation-ecosystem objectives to this mix. This flexibility enables regions to address location-specific opportunities while contributing to shared European missions.

**Regional S3 prioritisation approaches are influenced, to some extent, by territorial characteristics such as economic diversification and development status.** The statistical analysis found that more diversified regions and those in transition tend to prioritise multi-sectoral, transformational priorities, while less diversified regions focus on sector-specific themes; however, ecosystem-oriented priorities are consistently present across all development categories, highlighting a shared interest in supporting innovation ecosystems.

Importantly, **66% of survey responses indicate that S3 is widely recognised as the main strategic framework for R&I policy across most Member States and regions,** with a scope that often extends beyond ERDF funding to include other types of investment.

**To align R&I ERDF investments with S3 priorities, national and regional authorities implement various mechanisms.** The study identified several cases where the translation of S3 strategies into more operational work programmes or action plans, where priorities are further specified, selected, or fine-tuned, is proving effective. This approach not only facilitates implementation but also helps capture stakeholder interest and evolving demand, which in turn informs the continuous adjustment and refinement of the strategy itself. At the implementation phase, alignment is supported through tools such as preferential selection criteria that reward alignment through higher scores or increased aid intensity, mandatory eligibility criteria requiring project alignment with S3 priorities, or dedicated calls for proposals targeting specific areas.

**The analysis reveals no definitive evidence as to the effectiveness of prioritisation approaches in directing ERDF investments during the current period.** This is partly because ERDF implementation rates were rather low at the time the analysis was performed. The success of S3 prioritisation appears to hinge on achieving a coherent balance between sector- or technology-specific priorities and horizontal objectives. This balance must align both with EU-level goals and regional development needs, while also building on existing regional strengths and supporting longer-term transformation trajectories.

**However, translating these priorities into effective investments faces several persistent barriers.** More than half of survey participants identify administrative burdens, regulatory constraints, and limited access to funding as the main obstacles, followed by low stakeholder capabilities, weak interregional linkages, inefficient governance, and limited entrepreneurial dynamism. **These challenges underline the ongoing need for capacity-building and tailored support across regions.** Importantly, these barriers are perceived across the spectrum, from the most developed to less innovative regions, highlighting that capacity-building requirements are widespread and not confined to specific regional contexts. In some cases, these obstacles may also point to the need for broader structural

reforms, such as improvements in governance, education, or inter-institutional coordination, to create the enabling conditions for effective S3 implementation (see more on this below).

#### 4.1.2 How does smart specialisation and ERDF support the industrial transformation of EU regions?

**Section 3.2 shows that all stakeholders interviewed indicate that S3 is a key policy tool for supporting industrial transformation in their region or country.** This is particularly evident in regions that have identified ecosystem-related or transformational priorities. Even regions that have selected sectoral or technology-specific priorities for their R&I investments tend to align them with strategic areas relevant to European competitiveness. Specifically, there is a high degree of thematic overlap between S3 priorities and the Strategic Technologies for Europe Platform (STEP) technology areas: approximately 84% of the S3 priorities analysed potentially align with at least one STEP domain. Similarly, there is significant alignment between S3 and the Territorial Just Transition Plans (TJTPs), with around 80% of TJTPs either explicitly referencing S3 or targeting sectors closely related to S3 priorities.

**The analysis of ERDF programme shows that S3 is referenced in 51% of the 183 ERDF programmes across various Specific Objectives (SOs) beyond R&I-focused SOs 1.1 and 1.4,** with the highest mentions related to SME competitiveness, STEP technologies, digitalisation, and quality employment (cut-off date of programme analysis: January 2025). In 72% of these references, S3 is cited as a framework to ensure strategic coherence and guide interventions across a broad range of investments beyond R&I. Meanwhile, 28% of cases explicitly indicate that S3 plays a role in project selection, through preferential criteria or mandatory alignment conditions.

**ERDF programmed actions aligned with S3 support a range of industrial transformation objectives.** The 2021-2027 ERDF programmes include over 1,500 planned actions aimed at fostering industrial transformation. Regional differentiation is identified through a keyword analysis of policy action descriptions. Key areas supported include:

- **Industrial diversification:** Less developed regions allocate a larger share of actions (50%) to diversification, compared to less than 20% in more advanced regions. This likely reflects an emphasis on building capabilities in new and emerging areas of specialisation.
- **High-risk investments:** Strong/Leader innovative regions place greater emphasis on disruptive or experimental innovation. Such high-risk investments are most often mentioned in actions supporting SME competitiveness.
- **Workforce and skills development:** Skill enhancement is a key priority in less developed and moderate innovator regions, where up to 80% of actions (in non-R&I SOs) support workforce development and 84% focus on education. These efforts are supported under many ERDF specific objectives and complemented by other EU funding instruments such as ESF+.
- **Business growth:** Support for scaling up companies is a widespread objective across all regions.

**The study also identified some barriers in the integration and implementation of S3 within broader EU industrial transformation frameworks.** Governance issues and fragmentation hinder effective coordination across multiple levels and actors, undermining

the overall coherence of policy design and implementation (see also conclusion 3 below on governance). Moreover, some stakeholders pointed to regulatory ambiguities, particularly regarding State aid rules, as a barrier. These, combined with the difficulty of engaging large enterprises, pose additional challenges in planning and aligning investments with the objectives of the STEP initiative.

#### 4.1.3 What coordination mechanisms and stakeholder engagement practices are deployed in S3 processes, and do distinct patterns emerge across different regions?

**Overall, the analysis of S3 governance and stakeholder engagement across EU Member States and regions reveals that S3 governance arrangements are highly heterogeneous throughout the EU**, reflecting differences in institutional capacity and governance models. While the principles of networked and multi-level governance, along with inclusive stakeholder engagement, are widely acknowledged on a strategic level, their concrete implementation varies significantly by Member State, region, and governance model.

#### Conclusions on S3 governance structures

**Member States and regions have formally adopted and implemented S3 strategies at varying governance levels, reflecting national and regional specificities.** In practice, this has resulted in **three main operational governance models**, each representing a different approach to the organisation and coordination of S3 processes:

- **10 Member States** chiefly rely on **national strategies** (e.g., Hungary, Lithuania, Luxembourg, Slovenia and Slovakia),
- **11 Member States combine national and regional strategy** processes in varying ways (e.g., Denmark, Austria, Greece, Poland),
- **six Member States**, including large countries such as Germany and France as well Sweden or the Netherlands, keep **regional-only strategies**.

The first two groups represent predominantly moderate and emerging innovators (with the exception being Denmark, Austria and Ireland), while six strong innovators and Innovation Leaders (e.g., Belgium, Finland, the Netherlands and Sweden, Germany, France) place primary responsibility at the regional level. It is worth noting that 17 of the 27 EU Member States adopt either a regional or a mixed national-regional governance model, meaning that a majority of countries embed a strong regional dimension in their S3 strategies. Since countries with regional or mixed models typically develop multiple strategies this results in a total of 150 out of 171 S3 strategies being implemented at the regional level (i.e., 88 %).

**Connected to the above, the study confirms that the governance level at which S3 are adopted and implemented is a decisive factor that shapes other important governance arrangements**, particularly the vertical and horizontal coordination mechanisms deployed across different regions. Mixed governance models with national–regional components tend to balance all three vertical coordination mechanisms—top-down, bottom-up, and joint decision-making. For example, in Greece, the National S3 Coordination Network, which includes representatives from all 13 regions, facilitates collaboration through regular meetings, joint planning, and structured consultations. This setup enables both top-down and bottom-up inputs and joint decision-making and is supported by the Council for Monitoring Development Interventions. In the case of Austria

S3 governance relies on vertical coordination mechanisms, with a broad national innovation strategy complemented by regionally developed strategies that are linked through dense formal and informal consultation processes.

**The systematic alignment of EU, national and regional actions throughout the S3 cycle, i.e., vertical coordination, is recognised as essential in almost all S3 strategies.**

Nearly half of all strategies reference “multi-level governance”, but explicit provisions for EU-national (14 %) or regional-national (7 %) cooperation specifically focussed on S3 are rare. Moreover, the actual deployment of vertical coordination mechanisms is strongly influenced by the underlying governance model as presented above: Survey data confirm that national-only models lean on top-down consultations to align and coordinated decisions at the various levels, with over 60% of respondents indicating its use to a large or very large extent) regional-only models on bottom-up dialogue with nearly 60% of respondents indicating its strong use, and mixed models employ a more balanced, though generally moderate, use of all mechanisms, with less than 50% of respondents reporting any of the mechanisms being used to a large or very large extent.. The implication is clear: Achieving coherent EDP demands mechanisms that combine strategic direction with local knowledge, rather than privileging one directional flow. By emphasizing top-down coordination, national-only governance models may risk neglecting regional priorities and specific structural conditions. In contrast, by fostering bottom-up engagement and local ownership regional-led governance models may lack the strategic coherence or national support needed to achieve critical mass and scale up impact. Mixed governance models attempt to balance these dynamics but often do so only to a moderate extent. The implication is that neither purely top-down nor exclusively bottom-up approaches are sufficient; effective S3 governance requires mechanisms that integrate both perspectives, ensuring alignment between overarching goals and local needs.

**Horizontal coordination** – the cross-sector alignment of strategies and funding within a single governance tier – **is also deemed important, but only about half of S3 strategies explicitly reference concrete cross-sector cooperation.** Formal coordination mechanisms, such as inter-ministerial and inter-departmental working groups, feature in only one-third of strategies, and more concrete tools like joint budgeting or aligned funding instruments are rarer still: about 60 % of surveyed S3 authorities report little or no use of joint budgeting, highlighting a systemic gap in coordinated financial planning. Nonetheless, there are exceptions: Baden-Württemberg’s “breathing” S3 illustrates how continuous stakeholder dialogue, and a diversified funding mix (EU, federal, regional and private) can overcome these gaps, aligning resources without duplicating programmes. Again, it is important to note that the governance level at which S3 is adopted and implemented heavily influences the type and extent of horizontal coordination. National-level S3 strategies make greater use of network coordination and inter-ministerial working groups, whereas regional and mixed models use these mechanisms less extensively and tend to rely more on hierarchical horizontal mechanisms.

**Strengthening both vertical and horizontal linkages is therefore pivotal to unlock S3’s transformative potential.**

As the survey results show, more than 30 % of survey respondents from S3 authorities and other stakeholders see inadequate/insufficient governance as a key bottleneck negatively affecting the implementation of S3 investments. When only looking at the other stakeholders, this figure rises to 50 %. Hence, formalising multi-level consultation fora, embedding inter-departmental taskforces, and coordinating funding calendars can bridge current disconnects, while adaptive strategies that evolve with technological and geopolitical change ensure relevance over time. By institutionalising these practices, Member States and regions can move from fragmented governance towards an integrated, performance-oriented ecosystem that maximises place-based innovation impact.

## Conclusions on S3 stakeholder engagement

Regarding the **diversity and continuity of stakeholder engagement** across the S3 policy cycle, the analysis confirms a clear and consistent hierarchy in the involvement of different groups throughout all phases of the S3 policy cycle, regardless of the region's development level.

**Public authorities (75 to 84 %) and academia (48 to 74 %) dominate S3 stakeholder landscapes, while business, especially SMEs, and civil society remain peripheral.** A clear perception gap exists: S3/ERDF Managing Authorities view almost every stakeholder category more positively than non-government respondents, suggesting that formal consultation does not always translate into felt co-ownership. Intermediary bodies (cluster organisations, industry associations, chambers of commerce) partially bridge this divide, but direct business participation is still modest, particularly in transition and more-developed regions. The role of cluster organisations in S3 implementation varies markedly across regions. In Less Developed Regions, their involvement often fades after priority setting, reflecting limited managerial capacity – two-thirds operate with  $\leq 5$  FTE. In contrast, Transition and More Developed Regions show sustained engagement, supported by larger teams. The share of medium-to-large organisations ( $\geq 10$  FTE) rises from 15 % in LDRs to 46 % in MDRs. This suggests that weaker organisational capacity hampers the effective contribution of cluster organisations to key S3 functions such as the EDP, interregional collaboration, and industrial transformation.

**Engagement intensity peaks during priority-setting and weakens through implementation and, most markedly, monitoring & evaluation.** Across all development tiers the same hierarchy persists – government first, academia second, cluster organisations third, with large firms and SMEs in the middle and civil society last. Although cluster organisations gain prominence as regional ecosystems mature, as described above, the overall ranking is remarkably stable, indicating systemic rather than context-specific patterns. This drop-off across the policy cycle signals that many strategies still rely on episodic consultation rather than sustained, iterative EDP.

**The instruments most widely deployed are not those stakeholders deem most effective.** Thematic working groups and workshops are the go-to tools (used by  $\approx 85$  % of Managing Authorities), yet pilot initiatives are rated the single most effective format for continuous engagement by both authorities (85 %) and other stakeholders (70 %). Conversely, surveys/consultations and online platforms are easy to scale but perceived as less impactful. Living labs remain experimental (employed by only 17 % of regions) but score highly where they are tried, especially in transition areas. This mismatch points to untapped potential in resource-intensive, co-creative formats that foster deeper collaboration and learning.

## Conclusions on S3 governance, stakeholder engagement and its implications on the effectiveness of S3

**Overall, several persistent governance challenges remain across all types of regions, requiring further capacity-building efforts.** Despite some progress, horizontal and vertical coordination mechanisms are still not fully exploited, and genuine, continuous engagement of all quadruple helix actors – especially large enterprises, SMEs and civil society – remains an ongoing challenge in most EU regions. Coordination instruments that could bridge important gaps, such as joint budgeting, integrated funding streams and cross-ministerial working groups, remain exceptional. All in all, these findings have **significant implications for the effectiveness of S3 across almost all core features of the concept:**

- **Inefficient governance is identified as one of the key barriers to mobilising R&I investments aligned with S3**, as has been discussed in Section 3.1.4.
- According to interviews/case studies and survey evidence, **a well-functioning governance structure is a key success factor in facilitating the alignment of S3 with industrial transformation objectives**, including coordination between S3 and other plans such as the TJTPs (see survey evidence and case study examples in Section 3.2).
- **Public authorities and stakeholders alike note persistent obstacles to building systematic collaboration with complementary regions**, so ad-hoc partnerships still predominate and many interregional-innovation opportunities remain unrealised. An analogous shortfall appears in joint budgeting: the provision in Article 63(4) of Regulation (EU) 1060/2021 that allows ERDF resources to fund activities outside the home Member State or region is seldom exploited, underscoring further untapped potential and governance implications (see Section 3.4).
- **Robust governance structures, in particular well-functioning vertical and horizontal coordination mechanisms, are also essential to ensure that enabling reforms**, which are often designed outside the S3 framework and in different policy domains and can effectively support S3 objectives and the implementation of related investments (as discussed in Section 3.5).
- Existing governance arrangements – characterised by differing degrees of horizontal coordination, vertical integration and digital-platform use – mean that **many regions’ M&E schemes still lack complete indicator sets, clear integrated monitoring and evaluation procedures, and milestone-based targets**, signalling room to reinforce feedback loops and enhance evidence-informed S3 management (see Section 3.6).

**Targeted capacity-building can close these participation gaps and raise engagement quality.** Case studies from the Basque Country and Catalonia illustrate two viable pathways: a structured, cross-sector governance model anchored in specialised innovation departments and pilot groups (Basque Country), and a lean, place-based “Innovation Camp” approach that mobilises local actors around territorial challenges (Catalonia). Both emphasise continuous training, dedicated facilitation teams and partnerships with research intermediaries. Scaling such context-sensitive measures, alongside broader adoption of high-impact engagement tools, would help regions embed more inclusive, durable stakeholder participation throughout the S3 cycle and mitigate some of the limitations outlined above.

**To summarise, there is a clear distinction in the coordination and stakeholder engagement patterns observed across different EU regions.** Different governance models – national, regional and mixed – show different balances between top-down and bottom-up coordination. This leads to different profiles of stakeholder engagement. It is evident that regional-led governance models tend to yield more inclusive and networked governance arrangements.

#### 4.1.4 How do S3 policy and ERDF programme design support interregional collaboration?

The evidence collected in this study confirms that **interregional collaboration is widely recognised as crucial for achieving S3 objectives**. This finding is supported by responses from public authorities (86%) and stakeholders (89%) surveyed in the

stakeholder consultation. Furthermore, all S3 strategies for the period 2021–2027 – along with their associated ERDF programmes – explicitly reference interregional collaboration, thereby fully complying with the enabling-condition requirements.

**Yet, the strategic design of these provisions for interregional collaboration differs markedly in both coherence and level of detail.** For instance, three quarters of S3 documents explicitly refer to funding sources for interregional innovation projects, mainly national or regional ERDF programmes. Detailed specifications on measures and initiatives (e.g., macroregional strategies, Important Projects of Common European Interest (IPCEIs), Interreg projects and S3 Thematic Platforms) vary across strategies. While 35% of the strategies include seven or more measures to support interregional collaboration, for 29% no concrete measures were identified. Similarly, the analysed ERDF programmes provide no information on planned budgets for interregional collaboration and only to a limited extent information on planned conditionalities or incentives to stimulate interregional collaboration. **This demonstrates that the opportunities under Article 63.4 of the CPR 1060/2021 to fund operations outside the Member State/region or in joint funding schemes with partner regions are hardly used.** A rare exception is the case of Norte (Portugal), where interregional collaboration is explicitly incentivised through follow-up grants for joint R&I projects and enabling joint investments with partner regions such as Galicia (Spain) using ERDF funds, coordinated via a dedicated Joint Financial Committee. Moreover, there are a few examples of successful implementation of interregional incentives such as in North-East (Romania), where ERDF-supported projects aiming at external collaboration receive additional points. Another example is the AKKE programme in Pääijät-Häme (Finland), that includes an interregional collaboration incentives in the funding sources for projects and the possibility to apply for funding for preparing interregional collaboration projects.

**Hence, structured interregional engagement still falls short of its potential and ad-hoc collaboration is the most common approach within interregional collaboration.** Only one third of the survey respondents, covering both stakeholders and S3 authorities, report about frequent and structured interregional collaboration, while 46% collaborate occasionally/informally or not at all (18%).

**A key challenge to establishing long-lasting interregional innovation corridors are constrained capacities, identified by 63% of the public authorities and 60% of the stakeholders as the biggest challenge.** A further challenge includes inadequate coordination mechanisms to identify mutually beneficial areas (identified by 55% of public authorities). Stakeholders primarily grapple with unaligned funding opportunities with over 60% reporting perceived inadequate funding opportunities and access to available funds. Factors impacting the implementation of interregional collaboration vary by regional development level. More Developed Regions face strategic coordination issues, while Less Developed Regions struggle more with foundational challenges such as deficits in capacities and access to funding.

**The existing S3 measures foreseen within the S3 strategies are seen as moderately effective in facilitating interregional collaboration by the surveyed S3 authorities** – with differences according to what level of interregional collaboration is referred to. On the one hand, the current S3 measures have proven to be effective<sup>116</sup> in establishing interregional partnerships (54%) and fostering existing value chains (46%). On the other hand, challenges in the commercialisation of R&D results and the creation of new value chains remain as the S3 measures are assessed as less effective in these categories. Furthermore, survey evidence reveals a maturity gap in the perceived effectiveness of interregional collaboration measures, with S3 officials in Innovation Leader

<sup>116</sup> Summary of very effective and effective responses.

regions rating most instruments as very effective or effective, whereas their counterparts in Emerging Innovator areas deem them only slightly or not effective.

**Against this background, dedicated instruments, in particular the Interregional Innovation Investments (I3) Instrument with its direct embedment into the S3 architecture, are seen as particularly relevant in Less Developed Regions** with 28% of the respondents assessing the instrument as very important, compared to 19% in transition and More Developed Regions. Similarly, the **S3 Thematic Platforms are emerging as valuable enablers of interregional exchange** with nearly 68 % of respondents from S3 authorities affirming the support provided by the different Thematic Platforms (in particular, the Thematic Platform on Industrial Modernisation). However, their integration into the core strategic logic of most national/regional S3s remains modest (only 43 % of S3 strategies mention the S3 Thematic Platforms), indicating the potential to translate platform-based networking into fully resourced, high-impact projects remains largely untapped.

**The literature consistently highlights that weak interregional linkages fragment investment flows and leave substantial innovation potential untapped across EU regions.** Our survey corroborates this finding: **more than 30% of respondents view insufficient cross-regional connections as a major barrier to mobilising R&I funding** ('to a very large extent' for over 10% of respondents, and 'to a large or very large extent' for over 30%). When only looking at Less Developed Regions this rating is even higher, reaching 40 % of survey respondents. Overall, the figure rises above 60% when those reporting 'to some extent' are included.

**Overall the findings highlight an ongoing need for capacity building and support** to convert cross-regional partnerships into joint investments, new value chains and tangible market outcomes. In this context, ERDF can play a pivotal role in supporting projects with higher TRL levels and further commercialisation activities.

#### 4.1.5 What would be the potential of smart specialisation in a performance-based policy scenario connecting reforms and investments?

The evidence collected for this study shows that **S3 already encompass reforms even if there was little incentive or obligation to do so in the 2021-2027 programming period.** However, S3 appear to mobilise reforms of different types and in very different ways, reflecting the variety of S3 architecture and positioning in the wider regional/national policy mix (e.g., if the S3 is an umbrella strategy), but also other factors like the characteristic of the institutional set up (degree of centralisation, multi-level governance), the capacity of stakeholders, the strength and weaknesses of the regional/national industrial and innovation ecosystem, etc. Thus, reforms can differ depending on their underlying intervention logic. For instance, they can target specific bottlenecks in the ecosystems ensuring that basic framework conditions are in place and create enabling environments that facilitate investment mobilisation, and/or they may focus on improving governance mechanisms and promoting flexible adjustment processes. Reforms can also differ depending on whether they are initiated in the context of the very S3 or whether they are designed in other policy domains, and at a different level of governance.

**This requires adopting maximum flexibility when aiming at promoting closer ties between reforms and investments within S3.** If milestones and targets can rightly be seen as an incentive mechanism and powerful tools to foster stronger attention dedicated results and performance, recent policy experience shows that different conditions must be fulfilled for this to happen, which are specifically difficult to meet in the context of S3. A closer examination suggests that a system of milestones could be appropriate only in specific cases, i.e., for reforms mostly designed within the context of S3 and for which the

implementation path is relatively straightforward. On the contrary, if deployed in an indiscriminate and uniform manner, milestones risk undermining their intended benefits of results orientation and simplification, instead promoting a compliance-driven approach and burdensome procedures.

**Eventually, encouraging reforms within S3 relies on the activation of appropriate governance processes, in particular vertical and horizontal coordination.** Both commitment and ownership, on the one hand, *and* capacity building (support measures), on the other hand, are needed for benefits of reforms to take over unwanted negative effects such as added complexity.

**Ultimately, encouraging reforms within S3 requires the implementation of effective governance processes, particularly vertical and horizontal coordination.** For the benefits of reforms to outweigh the negative effects, such as added complexity, both commitment and ownership, as well as capacity building through dedicated support measures are needed.

#### 4.1.6 What are the defining characteristics of S3 M&E models in the programming period 2021-2027?

Based on the detailed analysis of S3 M&E models in the 2021-2027 period, important insights were gained that provide a comprehensive view of the current landscape.

**Monitoring arrangements across the 2021–2027 S3 portfolio are expanding in scope, yet a better performance alignment remains a future task.** The M&E models across Member States and regions exhibit significant diversity. While this variety can be beneficial to align with governance context and prioritisation approaches, to name a few, it leads to challenges in cases where fundamental requirements for effective M&E are not met. For instance, the S3 M&E models in certain regions are missing essential components, such as

- a full **indicator system** with an input-output-impact framework<sup>117</sup>,
- a **clear distinction** between monitoring and evaluation processes or
- clearly **defined milestones and targets** to measure defined S3 strategic objectives/ fields of action.

While a clear majority of S3 strategies employ output (70%) and result indicators (77%), only 55% track inputs and a mere 14% monitor milestones, leaving considerable room to tighten the connection between resources, activities and outcomes. Referring to the issue of milestones and targets, many M&E models draw up and formulate vague metrics rather than precise targets or milestones, which can potentially undermine the effectiveness of the S3 strategies.<sup>118</sup> This lack of clarity may limit the effectiveness of S3 in enhancing regional innovation capacities. As indicated above, governance is a key issue here: the case study on performance-based S3 M&E showed that effective milestone and target-setting hinges on robust horizontal coordination (e.g., inter-ministerial), strong vertical stakeholder

<sup>117</sup> S3 indicator systems are often shaped by the preferences and priorities of Member States and regions, see also Fonseca and Maguire (2024): The good, the smart, and the innovative: Governance and implementation of Smart Specialisation Strategies in 2021-27.

<sup>118</sup> This finding is further corroborated by an earlier study by Hegyi and Prota (2021) on the 2014-2020 period, which revealed that in several analysed cases the applied indicators were not specifically tailored to the respective S3; Hegyi, F.B. and Prota, F., Assessing Smart Specialisation: Monitoring and Evaluation Systems, EUR 30654 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-32592-5, doi:10.2760/443642, JRC123734.

engagement (e.g., innovation agencies, intermediaries), and is underpinned by clear theoretical frameworks, comprehensive indicator systems, and reliable data platforms.

**Secondly, it appears that the function of M&E models in the S3 management framework has not been fully internalised in every Member State/region.**

Approximately half of the respondents intend to utilise the findings from monitoring to inform priority-setting, yet explicit targets (38%) and milestones (14%) remain uncommon, particularly in innovation-leading regions. This suggests that clearer benchmarks could further facilitate strategic learning. The assessment of S3 strategies furthermore revealed that fewer than half of these documents clearly differentiate between evaluation and monitoring. Furthermore, only one third of the strategies under review outlined a structured evaluation plan, and just 14% embedded assessments in a Theory of Change. Evidence from regions such as Andalucía, Croatia, Hungary and Slovakia demonstrates that inter-ministerial coordination, open data and stakeholder-validated targets can greatly enhance evaluative value. The extension of these practices, coupled with the systematic linkage of evaluation findings to monitoring indicators, would furnish regions with the requisite evidence base to refine S3 strategies and optimise their transformative potential.

**Finally, there is considerable scope for the enhancement of transparency and near-real-time feedback mechanisms.**

At present, only 25% of regions anticipate the dissemination of monitoring data through open platforms, while a substantial 63% continue to rely on conventional reports. Case studies from Emilia-Romagna, the Northern Netherlands and Extremadura illustrate that dedicated portals, when coupled with robust governance and sustained resources, can build stakeholder trust and facilitate adaptive S3 management. Moreover, interviews with S3 authorities in France and Belgium indicate that digital tools delivering granular data on beneficiaries and funded operations would allow holistic tracking of S3 contributions beyond the R&I investments captured under SO 1.1 and 1.4, thereby strengthening assessments of the strategy's overall impact on industrial transformation goals. This cross-cutting approach could support more informed strategic decision-making and reinforce the coherence between S3 priorities and broader regional development objectives.

## 4.2 Policy options for future smart specialisation strategies

The study builds on the evolution of Smart Specialisation from an **ex-ante conditionality** in the 2014–2020 period to an **enabling condition** in the 2021–2027 programming cycle. Policy options are formulated on the basis of a comprehensive assessment of the current state of play, recognising both the progress made since the first generation of S3 and the interim findings emerging from the second cycle.

**The findings from the 2021-27 period from this study underscore** that impactful S3 requires a balanced combination of vertical depth and horizontal breadth of priorities, underpinned by capable institutions and structured stakeholder engagement. Interregional initiatives require empowered orchestrators and coherent financing. Reforms must be context-sensitive and integrated into strategic frameworks. M&E must evolve into a forward-looking, performance-oriented management tool. Adopting these principles will enable Member States and regions to translate place-based innovation strategies into resilient, inclusive, green economic transformation.

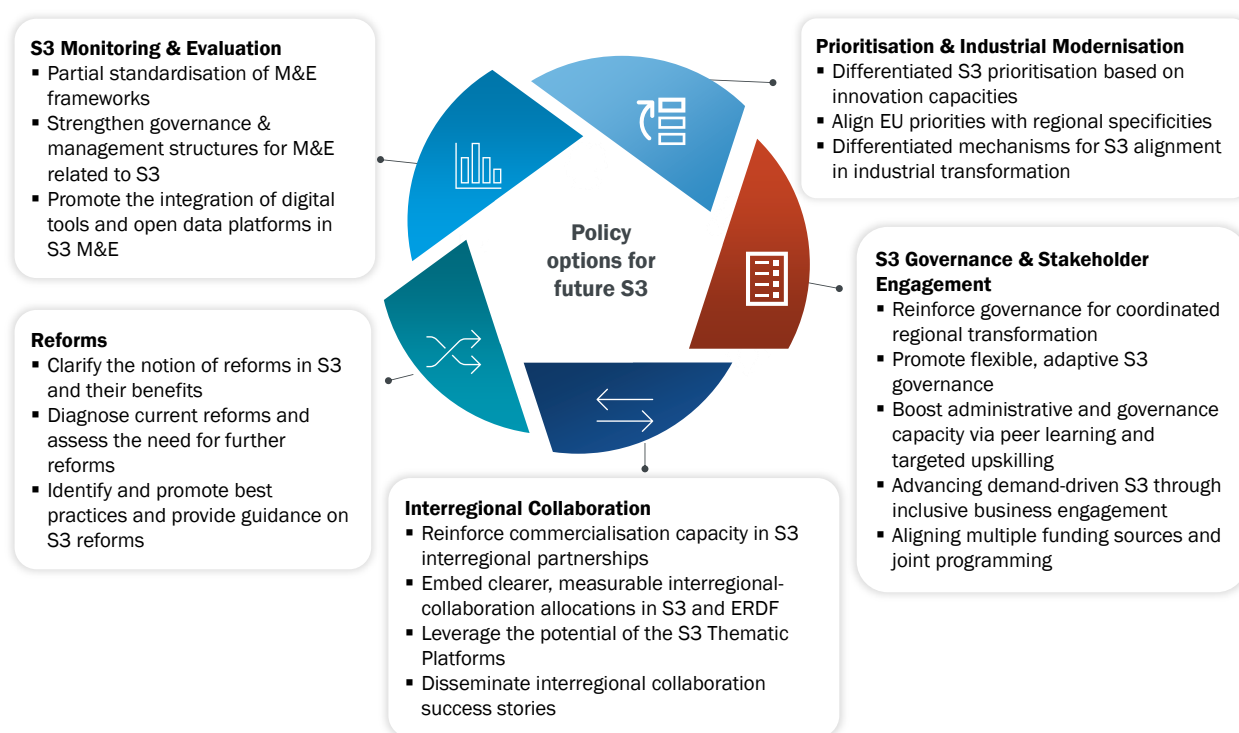
Against this background, the **policy options are structured along the key analytical dimensions of the assessment:**

1. Strengthening **prioritisation approaches** and the role of S3 in supporting **industrial transformation**;

2. Improving **governance and stakeholder engagement** mechanisms;
3. Reinforcing **interregional collaboration** within the S3 framework;
4. Enhancing the alignment between **S3 and broader reform agendas**; and
5. Advancing **monitoring and evaluation systems** towards more performance-oriented models.

These dimensions are closely interlinked and should be conceived as part of a coherent and integrated approach to strengthen the effectiveness of S3 implementation and to position it more firmly as a strategic framework for regional transformation and long-term economic competitiveness.

**Figure 68: Overview of Policy Options for future S3**



Source: Prognos AG/CSIL (2025), own elaboration based on the findings and conclusions of the study.

**Capacity building needs are treated horizontally along all of these policy options, with particular needs in the fields of governance, stakeholder engagement, interregional collaboration and monitoring and evaluation.** They apply to all types of EU regions, with varying degrees and specific needs, which calls for a demand-driven design and differentiation of capacity building activities with the aim of increasing operational excellence of S3 implementation.

#### 4.2.1 Policy options on prioritisation approaches and the role of S3 in industrial transformation and competitiveness

This section outlines policy options aimed at strengthening the role of S3 in fostering R&I investments, supporting industrial transformation, and enhancing regional competitiveness. Drawing on lessons from this study, the options reflect the need for more strategic, tailored,

and coordinated approaches to prioritisation. In particular, they highlight how S3 priorities could better align with regional capabilities and contribute to broader transformation goals. These suggestions should not be interpreted as rigid prescriptions but rather as flexible orientations to guide future strategy design.

### Policy option 1: Differentiated S3 prioritisation based on innovation capacities

The study has highlighted the diversity of priorities selected across regions, reflecting varying strategic orientations (see Section 3.1). Stakeholder consultations and survey responses indicate that **each prioritisation approach offers distinct advantages and presents specific trade-offs:**

- **Sectoral or technology-specific priorities** typically focus on strengthening expertise and capacity within particular fields. This approach enables regions to leverage existing economic strengths, align with traditional industrial structures, and stimulate targeted innovation and investment, following a “strengthening strengths” strategy. However, this can also lead to over-specialisation (see Section 3.1.3). By focusing narrowly on established sectors, regions may limit their ability to diversify and transition into higher-value areas.
- **Horizontal priorities** address broader systemic conditions for innovation, such as fostering R&I capacity, developing skills, enhancing public-private collaboration, and supporting wide-reaching industrial transformations (e.g., digital and green transitions). These priorities are generally sector-agnostic and aim to strengthen the innovation ecosystem as a whole, while also aligning with EU-wide transformation goals. However, their broad nature can reduce focus on high-value sectors or technologies. Some interviewees also noted that calls centred on horizontal priorities may be driven by a “leave no one behind” logic, aiming to ensure inclusivity across sectors. While this logic has merit, it can dilute the strategic focus required for smart specialisation if not linked to clear transformation pathways. Such broad or unfocused interventions risk failing to build critical mass with limited investment density, especially in regions with limited institutional capacity (see Section 3.1.3).
- **Societal challenge-oriented priorities** occupy an intermediate position. These focus on broader transformation goals, such as healthcare or smart mobility, while involving multiple, interconnected sectors or value chains. According to interviewees, this approach allows regions to better align their S3 agendas with EU-level frameworks such as Horizon Europe, while maintaining strategic flexibility.

As shown in this report, **many regions now adopt hybrid strategies**, combining vertical, horizontal, and challenge-oriented priorities. This blended model enables regions to build on existing strengths through sector-specific initiatives while also addressing broader ecosystem needs and long-term transformation objectives. Statistical analysis reveals only weak regional patterns in S3 prioritisation choices (Section 3.1.3).. However, some trends are evident: more diversified regions are generally more inclined to adopt cross-sectoral or transformation-oriented priorities, while less diversified regions tend to favour sector-specific or technology-based specialisations. Notably, ecosystem-oriented priorities, though still relatively limited in number, are present across all types of regions and governance levels.

**Against this background, this first policy option proposes a more deliberate and coherent diversification of prioritisation approaches, tailored to the specific characteristics of each region, particularly in terms of their innovation capacities.** This would allow regions to adapt the nature and scope of their S3 priorities to their unique starting points and development trajectories, promoting both relevance and adequate ambition.

- **Regions with stronger innovation capacities may benefit from prioritising cross-sectoral areas linked to societal challenges.** These priorities can maximise synergies across sectors while fully leveraging existing innovation strengths. Although societal challenges involve ecosystems of related sectors, the focus remains on specific (though cross-sectoral) value chains. This approach suits regions with established capabilities in several interconnected domains, enabling them to pursue more complex objectives and move into higher-value activities. Nonetheless, there can be justified exceptions, such as certain Finnish regions prioritising strategic industries like mining and rare earth metals, where vertical/sector-specific focus remains vital due to unique regional assets and EU strategic interests.
- **Regions with more limited innovation capacities could consider adopting a balanced mix of vertical and horizontal priorities, targeting specific sectors or technologies while simultaneously investing in ecosystem development and broader industrial transformation.** This approach supports wider regional development goals, while also strengthening innovation capacity in high-value areas closely related to existing strengths. It enhances absorptive capacity and mitigates risks. In this process, both traditional sectors (such as tourism or agri-food) and more innovation-driven sectors can be selected, depending on the regional context. Importantly, even traditional sectors that reflect a region's unique potential can become platforms for innovation through modernisation and technology adoption. To avoid stagnation and limited ambition, a dynamic, stepwise strategy is essential to enable regions to gradually evolve their prioritisation over time. For example, as seen in the case of S3 in Czechia (see Section 3.1.1), horizontal priorities may serve as an initial step to build foundational capacities and engage a broad range of stakeholders. In parallel, a limited number of sector-specific priorities can provide strategic focus. As the regional innovation ecosystem matures, the emphasis can progressively shift toward industrial diversification and the adoption of more cross-sectoral or challenge-oriented priorities.

While tailoring S3 priorities to regional innovation capacity is crucial, **institutional quality remains a key enabling factor**. It shapes how effectively innovation potential is mobilised and sustained. Even regions with robust innovation assets may underperform in the absence of strong governance frameworks. Conversely, enhancing institutional capacity in less advanced regions can significantly improve their ability to pursue related diversification and develop innovation capabilities over time. For this reason, policy options to strengthen S3 governance mechanisms are discussed in Section 4.2.2 below.

More broadly, **capacity should be viewed as something that can be built over time, rather than a fixed condition**. It should be assessed not only through existing structures, but also in terms of a region's willingness to experiment, collaborate, and adapt. In some cases, regions with weaker formal institutions may nonetheless exhibit strong bottom-up, community-driven innovation, conditions that may justify a more ambitious policy agenda.

### **Policy option 2: Ensure strategic alignment with EU priorities while preserving regional specificities and flexibility**

Ensuring strategic alignment with EU priorities while preserving flexibility to reflect regional specificities is essential for maximising the impact of S3 as a tool for place-based industrial transformation. Many regions already integrate EU-level directions into the definition of their priorities, particularly in relation to broad transformational objectives, the strengthening of industrial ecosystems, and the identification of strategic technological areas and sectors contributing to EU competitiveness and strategic autonomy. However, while EU-wide goals provide a valuable overarching framework, a one-size-fits-all approach risks overlooking the diverse innovation capacities and economic structures across regions. This creates a

potential tension between the top-down orientation of EU strategic priorities and the decentralised, context-sensitive nature of S3.

To reconcile this, **S3 must carefully balance this top-down orientation with mechanisms that reduce the risk of misalignment with regional contexts**, ensuring that priorities remain relevant, feasible, and impactful at the local level. To effectively manage this balance, the experience gained during the current programming period suggests the following approaches:

- **Enhance diagnostic tools and industry consultation to align regional strengths with EU strategic goals.** Many S3 priorities thematically overlap with EU objectives, such as green and digital transitions, strategic technologies, or industrial ecosystems. However, not all regions possess the necessary knowledge base, industrial infrastructure, or innovation capabilities to contribute meaningfully to every EU priority. For example, in sectors like defence, which is now a key focus of the EU's competitiveness strategy, capabilities are concentrated in a few regions. This makes the identification of a genuine specialisation niche more challenging in certain territories. The recent STEP initiative has shown that some regions are able to more easily align with these initiatives by leveraging their existing capabilities and S3 priorities that already focus on them (Section 3.2.4). However, other regions must conduct a more in-depth assessment of their current and potential capacities, accompanied by thorough stakeholder consultations, to determine whether and how they can align their strengths with overarching EU goals, as several cases discussed in Section 3.2.4 show. Investing in improved diagnostic tools and foresight exercises is critical to support this process.
- **Develop clear and adaptive action plans or work programmes that allow priority fine-tuning over time.** As discussed in Section 3.1.4, several regions have benefitted from translating broader S3 priorities into concrete sub-priorities and measures via biennial or triennial action plans. These plans enable regular updates to reflect evolving beneficiary needs and external conditions, while maintaining flexibility in fund allocation and responsiveness to local and EU-level changes. This iterative process supports the continuous alignment of regional priorities with overarching EU goals without compromising the place-based character of S3.

By enabling regions to adopt diversified portfolios of priorities aligned with distinct EU goals, supported by improved diagnostics and adaptive planning and implementation frameworks, S3 can better reconcile top-down imperatives with bottom-up realities. This balance is critical for fostering impactful, context-sensitive industrial transformation across Europe's varied regional landscapes.

### **Policy option 3: Differentiated mechanisms for S3 alignment in industrial transformation**

As discussed in Section 3.2, all stakeholders consulted agree that S3 can serve as a framework to guide innovation-driven industrial transformation across all EU regions. The mechanisms to enforce this alignment may be adapted to reflect the specific characteristics of each region. Factors such as innovation capacity, economic development level, and funding availability vary widely, necessitating differentiated approaches that foster effective, context-sensitive alignment of investments for industrial transformation with S3 priorities. Based on evidence collected in this study, particularly insights from the interview programmes, the following considerations are proposed:

- **Member States or regions with higher ERDF funding (typically less developed ones)** often face structural challenges and would benefit from targeted incentives to support alignment between industrial transformation investments – in areas such as

SME competitiveness, digitalisation, and others – and S3 priorities. Given the broader development needs of these areas, it is important to balance a focus on selected sectors with broader support for ecosystem reinforcement and horizontal transformation needs, as outlined in Policy Option 1 (see above). To promote alignment and sectoral focus while maintaining flexibility to address wider development goals, targeted incentives, such as preferential funding terms or tailored calls, can be used instead of rigid alignment conditions. Moreover, capacity building remains essential to strengthen local innovation ecosystems and skills, enabling regions to progressively enhance their innovation performance and better align with S3 over time.

- **Member States or regions with relatively lower ERDF funding but higher innovation capacities and stronger economic performance** are better positioned to lead strategic industrial transformation. In these contexts, clearly defined alignment mechanisms can help concentrate more limited resources on transformative outcomes. Eligibility criteria for funding aligned with regional S3 priorities may be appropriate to focus investments – beyond those for R&I under Specific Objectives 1.1. and 1.4 – on next-generation industries and innovation-driven growth, ensuring that predominately projects aligned with S3 priorities receive support. These regions could also be encouraged to undertake higher-risk, experimental projects in emerging sectors, using S3 as a guiding framework for prioritisation. Examples such as Baden-Württemberg (Germany) demonstrate how targeted funding mechanisms and clear strategic priorities can catalyse impactful industrial transformation.

This differentiated approach acknowledges the uneven starting points of regions and avoids excessive conditionality on less advanced territories, while allowing for stronger alignment mechanisms in regions with greater capacities. However, it also raises challenges related to fairly and effectively assessing regional capacities to ensure that these stronger alignment conditions are applied where appropriate, without imposing undue burdens or hindering fund absorption. Regular monitoring of investment uptake and related progress may be necessary to verify that more demanding obligations are implemented only when conditions are suitable (see Section 4.2.5).

#### 4.2.2 Policy options for improving S3 governance

**Robust, multi-level governance is essential for achieving transformative outcomes through S3.** Evidence shows that, while broad stakeholder inclusion is important, it has not yet matured into deep, continuous engagement. Coordination instruments that could bridge these gaps, such as joint budgeting, integrated funding streams and cross-ministerial working groups, remain exceptional. Regions therefore require adaptive governance formats, such as living labs, thematic working groups and regularly updated action plans, to refresh priorities through direct dialogue with firms and civil society.

**It is crucial to emphasise that the approaches to enhance S3 governance must not be viewed as standalone interventions.** Instead, they must be embedded within comprehensive and coherent policy frameworks. These frameworks must create the conditions for strengthening regional and national innovation ecosystems and driving long-term economic transformation. Measures to foster effective S3 governance are an essential component of a broader systemic policy approach. This approach builds and reinforces innovation capabilities across the economy, stimulates sustained investment in R&I, supports the expansion of science and technology infrastructure, and enhances institutional, administrative, and governance capabilities at multiple levels. This requires a dynamic and evolving policy mix. This must be continuously adapted to the specific

development trajectories, institutional and innovation capabilities, structural conditions, and emerging needs of various EU Member States and regions.

Some specific policy directions to strengthen horizontal and vertical coordination and stakeholder engagement along the complete policy cycle, while dealing with governance complexities include:

#### **Policy option 4: Strengthen coordination and governance mechanisms for an integrated vision and implementation of regional transformation.**

**To fully realise the potential of S3 as a strategic framework for research and innovation, industrial transformation, and broader economic competitiveness, significantly stronger coordination and governance mechanisms are needed.** This involves both horizontal coordination across ministries, departments, and policy areas, and vertical alignment across European, national, and regional levels. The analysis highlights that coordination across different funding sources (e.g. ERDF, Horizon Europe, Interreg, Just Transition Fund) and strategic agendas remains suboptimal. Fragmented governance structures are one of the most frequently cited challenges in aligning S3 with other instruments, such as the Territorial Just Transition Plans (TJTP). Communication and coordination issues between the multiple entities responsible for implementing S3, TJTP, and ERDF programmes are primary barriers to a more coherent and integrated vision and approach for effective regional transformation strategies.

The study identifies that many regions still lack widespread use of specific governance mechanisms, such as inter-ministerial coordination units or dedicated S3 implementation structures, which are essential for ensuring that investments are consistently aligned with S3 priorities. At the regional and Member State level, a more robust governance framework should streamline the call design and project selection process, ensuring that investments are more strategically targeted and aligned with regional transformation goals. In some regions, voluntary efforts to enhance S3 coherence beyond the minimum requirements, such as aligning SME support under ERDF with S3 goals, show the potential for a more systemic upgrading of production structures, though governance challenges remain. Strengthening these mechanisms would help streamline the process, ensuring more strategic targeting of investments and reforms and better alignment with regional transformation goals. This study provides valuable good practices to draw inspiration from.

#### **Policy option 5: Address governance complexities by promoting flexibility and adaptability in governance processes**

**Foster practices that allow S3 governance structures to evolve in response** to region-specific development trajectories, maturity of innovation ecosystems, structural conditions, resources, as well as new technological, economic, and geopolitical developments. This can be achieved by encouraging – **through the supporting role of the European Commission** – the development of governance models and strategies that are regularly reviewed and updated to reflect new priorities and changing regional contexts. Following the logics of the EDP, it is beneficial for **both Member States and regions** to treat the S3 strategy as a “living” document – one that is continuously revised in response to technological, economic, and geopolitical changes. To ensure adaptability, agile approaches and mechanisms for regular review and adjustment can be embedded in S3 strategies enabling the system to respond proactively to new opportunities and challenges:<sup>119</sup>

<sup>119</sup> Winickoff, D. & King, R. (2025). Why innovation needs smarter governance, not just faster tech, OECD, <https://www.oecd.org/en/blogs/2025/06/why-innovation-needs-smarter-governance-not-just-faster-tech.html>

- **Biennial or triennial reviews of S3 governance structures and processes** can also be made compulsory, engaging key regional stakeholders to evaluate alignment with current priorities and emerging issues and review the functioning of governance processes.
- Incorporate **foresight tools** such as scenario planning and horizon scanning to anticipate future developments, ensuring that governance models remain proactive and future-oriented.
- Establish **feedback loops** to implement insights and lessons learned from these reviews directly allowing the refinement of governance mechanisms and strategic priorities.

Besides regular reviews, **actions to reduce complexity in S3 governance** could include:

- **Adoption of agile, adaptive and modular governance principles:** Adopt agile, adaptive, and modular governance principles that allow the flexible addition, improvements, or exclusions of coordination mechanisms, such as working groups, advisory panels, committees, platforms, as regional and national demands evolve. This approach enables governance systems to respond to changing contexts without requiring a major overhaul of the entire governance architecture. This can take place through policy experimentation deploying pilot projects, testbeds and ‘sandbox’ environments, allowing Member States and regions to test innovative governance approaches with limited risk before scaling implementation.<sup>120</sup>
- **Advance the digital transformation of governance:** Encourage Member States and regions to adopt or improve digital platforms that serve as comprehensive one-stop-shops for S3 governance. These digital platforms should centralise all interactions, documentation, and workflows related to S3 governance, supporting collaborative decision-making, stakeholder engagement, and monitoring of S3 initiatives, and thereby significantly reducing fragmentation and streamlining administrative processes.<sup>121</sup>
- **Support administrative simplification and process optimisation:** Simplify administrative procedures in S3 governance by conducting process audits to identify and exclude redundancies, bottlenecks, and unduly complexities. Develop and implement standardized templates and guidelines to make governance processes more straightforward and accessible for all stakeholders.<sup>122</sup>

<sup>120</sup> Könnölä, T., Eloranta, V., Turunen, T., & Salo, A. (2021). Transformative governance of innovation ecosystems. *Technological Forecasting and Social Change*, 173, 121106; Winickoff, D. & King, R. (2025). Why innovation needs smarter governance, not just faster tech, OECD, <https://www.oecd.org/en/blogs/2025/06/why-innovation-needs-smarter-governance-not-just-faster-tech.html>; Mergel, I., Gong, Y., & Bertot, J. (2018). Agile government: Systematic literature review and future research. *Government Information Quarterly*, 35(2), 291-298.

<sup>121</sup> OECD (2020) One-Stop Shops for Citizens and Business, [https://www.oecd.org/en/publications/one-stop-shops-for-citizens-and-business\\_b0b0924e-en.html](https://www.oecd.org/en/publications/one-stop-shops-for-citizens-and-business_b0b0924e-en.html); Rissola, G., & Sörvik, J. (2018). Digital innovation hubs in smart specialisation strategies. *Publications Office of the European Union, Luxembourg*; Kim, S., Andersen, K. N., & Lee, J. (2022). Platform government in the era of smart technology. *Public Administration Review*, 82(2), 362-368; Tsampoulatidis, I., Kompatsiaris, I., & Komninou, N. (2018, June). From E-Government to We-Government: an analysis towards participatory public services in the context of the H2020 WeGovNow project. In *International Conference on Information Society and Smart Cities (ISC 2018)*, Cambridge, UK (pp. 27-28).

<sup>122</sup> OECD (2025) Administrative simplification, <https://www.oecd.org/en/topics/administrative-simplification.html>

### Policy option 6: Strengthening administrative and governance capacities for S3 implementation through continued peer learning and capacity building activities

**Continue to promote European and interregional cooperation to enhance administrative and governance capabilities** not only within public authorities, but also among a broader range of stakeholders – such as research institutions, businesses, and civil society organisations. These capacities should extend beyond those required for participation in consultations and actively enable stakeholders to engage meaningfully in co-creation, priority-setting, and policy design. Several initiatives from **Member States and regions, with the support from the European Commission** can play a key role in building these capacities needed for inclusive and effective governance:

- **Facilitate peer learning and the exchange of good practices:** Create or enhance structured platforms and thematic workshops at both European and interregional levels to support peer learning, the sharing of experiences, challenges, and effective solutions in S3 governance, e.g. as part of the S3 Community of Practice.<sup>123</sup>
- **Encourage cross-regional and cross-country policy learning and dialogue:** Foster ongoing policy dialogue among regions and countries to facilitate the exchange of policy- and governance-related knowledge and tools, e.g. in the context of the Interreg Europe Learning Platform.<sup>124</sup>
- **Capacity-building roadmaps to enhance capacity building for a diverse range of stakeholders:** Develop capacity-building roadmaps that address people management, organisational management, strategic planning, the implementation of operational programmes, and the improvement of framework conditions.<sup>125</sup> Implement target capacity-building initiatives for public authorities, research institutions, business associations, and civil society organisations, focusing on strengthening skills in co-creation, priority-setting, and policy design.

### Policy option 7: Advancing demand-driven S3 through inclusive business engagement

**Both regions and Members States** should **foster business sector engagement throughout the entire policy cycle by combining organised interest representation through intermediary organisations** (such as cluster organisations, chambers of commerce, and industry associations) with direct participation of individual companies via open and inclusive mechanisms. This can be achieved through open calls for participation and inclusive formats – such as innovation dialogues, idea competitions, and co-creation processes – to ensure that S3 processes are more demand-driven and closely aligned with the needs of the business community.

Embedding cluster organisations within S3 governance creates a durable bridge to the private sector. However, its effectiveness hinges on management capacity: cluster organisations in Less Developed Regions are often run by small teams, whereas those in advanced regions generally have larger, specialised staff. Especially in areas where capacity is limited, public co-funding and technical assistance should be used to ensure clusters can fully shape priority-setting, implementation and continuous strategy renewal.

<sup>123</sup> [https://ec.europa.eu/regional\\_policy/policy/communities-and-networks/s3-community-of-practice\\_en](https://ec.europa.eu/regional_policy/policy/communities-and-networks/s3-community-of-practice_en).

<sup>124</sup> <https://www.interregeurope.eu/policy-learning-platform>.

<sup>125</sup> OECD (2020) Strengthening Governance of EU Funds under Cohesion Policy: Administrative Capacity Building Roadmaps, OECD, [https://www.oecd.org/en/publications/strengthening-governance-of-eu-funds-under-cohesion-policy\\_9b71c8d8-en.html](https://www.oecd.org/en/publications/strengthening-governance-of-eu-funds-under-cohesion-policy_9b71c8d8-en.html).

### Policy option 8: Strategic alignment of multiple funding sources and joint programming

**The concept of joint budgeting**, recognised as the primary mechanism for the aggregation of resources across administrative layers and policy domains, **has been underutilised within the framework of Smart Specialisation governance**. The survey results indicate that approximately 60% of S3 authorities characterise its utilisation as "minor" or "non-existent," and more than one-fifth report an absence of uptake, irrespective of a region's development status. This finding indicates a systemic gap in integrated financial planning and weakens the capacity of S3 to mobilise critical-mass investments.

Addressing this shortfall necessitates the **establishment of a comprehensive financial framework within each S3** by the relevant **Member States and regions**, encompassing European, national, regional, and private funding streams. This framework must be meticulously designed to align with a unified set of innovation priorities. The allocation of envelopes with clearly defined objectives, in conjunction with eligibility criteria explicitly aligned with the strategy's priorities, would optimise complementarity, minimise redundancy, and enhance investment density in designated domains.

**Complementary measures are also required:** The synchronisation of programming cycles across funding sources has the potential to mitigate timing discrepancies and facilitate collaborative initiatives, such as joint calls or the co-funding of instruments. Simultaneously, the simplification of administrative procedures and the empowerment of inter-ministerial or cross-departmental coordination bodies would enhance the day-to-day management of multi-source funding. When considered collectively, these measures have the potential to transform joint budgeting from a seldom-used option into a robust mechanism for delivering coherent, high-impact investment in regional innovation ecosystems.

#### 4.2.3 Policy options for strengthening interregional collaboration within S3

This section outlines policy options aimed at strengthening the role of S3 in fostering interregional collaboration. Drawing on the findings from this study, the options reflect the need for capacity building and support to convert cross-regional partnerships into joint investments, new value chains and tangible market outcomes. Furthermore, improved strategic alignment is necessary to maximise the benefits from existing measures and initiatives. These suggestions should not be interpreted as rigid prescriptions but rather as flexible orientations to guide future strategy design.

### Policy option 9: Reinforce the commercialisation dimension within S3 measures to strengthen interregional value chains

**Deep interregional innovation collaboration rests on the ability to develop interlocking innovation projects across the value chain and across borders**. The analysis in Section 3.4 has shown that existing S3 measures for interregional collaboration may require enhancement, particularly in supporting the commercialisation of innovation outcomes and substantially fostering new value chains, especially in Less Developed and Transition Regions to foster real innovation diffusion and value chain integration. To further maximise the long-term impact and market relevance of research and innovation activities, the commercialisation dimension within S3 measures should therefore continue to be reinforced. This is closely linked to fully exploiting downstream synergies, i.e., using ERDF funding to scaling-up and commercialising results, of, for example, Horizon projects.

### **Policy option 10: Promote more consistent and detailed strategic planning for interregional collaboration within S3 strategies and ERDF programmes to improve alignment, clarity of objectives and measurable outcomes.**

As no region can sustain its specialisations on its own, **strategic planning on how to integrate into which European value chains is an indispensable part of S3**. This involves leveraging existing features of ERDF programmes such as further promoting the possibilities under the largely unused article 63.4. The results derived from the empirical analysis suggest focussing on foundational capacity-building in Less Developed Regions, while supporting strategic coordination in more advanced regions. Interregional support therefore requires a differentiated approach based on regional needs and innovation capacity. The I3 Instrument fills this gap in the EU funding landscape but is limited in its scope and take-up. Strengthening the links between I3 projects and S3 Partnerships could be an effective short-term measure to utilise existing programmes and structures to the full potential.

This step also involves the systematic examination of the underlying barriers to interregional collaboration that may arise due to differing legal frameworks and co-financing rules on national levels. Here, capacity building also means the capacity of administrations and the private sector to collaborate closely on how to reform these legal, regulatory, and financial barriers in order to reap the full potential of cross-border innovation collaboration – something that is closely linked to the topic of integrating S3 strategies with reform plans, covered in the following chapter.

### **Policy option 11: Continue to leverage the potential of the S3 Thematic Platforms**

**The S3 Thematic Platforms are emerging as valuable enablers of interregional exchange**, however, their integration into the core strategic logic of most national/regional S3s remains modest. Expanding participation and strategically integrating the platforms into regional innovation ecosystems could drive effective interregional cooperation. As already indicated in policy option 10, the link between implementation of I3 projects and Thematic Smart Specialisation Partnerships could be strengthened by actively integrating the projects to S3 Platforms and Partnerships. This can contribute to enhancing the dissemination of project results and strategic alignment. Moreover, the S3 Thematic Platforms could be more directly supported in the identification of complementary partner regions, based on shared S3 priorities/sub-priorities and matching ambitions.

### **Policy option 12: Share best practices and success stories to continue promoting the benefits of interregional collaboration**

**By sharing best practices and success stories, reinforcing joint innovation goals and leveraging collective strengths for regional development cross-border cooperation can be promoted further.** The case studies, for example on Galicia-Norte, as well as the S3 CoP Working Group on interregional collaboration have identified examples for incentives regions are using to leverage funding on national and EU levels for interregional collaboration. These include follow-up grants, conditionalities or higher funding rates for interregional collaboration. A more direct measure are coordinated calls by different regions. Enhanced monitoring and follow-ups of successful interregional projects under direct management could ensure that regions capitalise on results of existing interregional projects and translate these into ERDF and S3 objectives.

**Seeking complementarities between regions, based on the specific regional needs, from the outset can further enhance the benefits from interregional collaboration.** This could be supported by integrating the assessment of complementary regions and joint roadmaps with key partner regions in the selection/validation process of S3 areas. This

would ensure that areas present a distinctive EU added value and encourage managing bodies and local stakeholders to integrate interregional collaboration as a full component of the development of specialisation areas.

**Likewise, enhanced intermediary support, for example, to cluster organisations and networks** (e.g. Enterprise Europe Network), could facilitate building and expanding cross-border collaboration as well as knowledge sharing. Continued efforts to strengthen awareness about interregional collaboration on regional and national levels could further mainstream cross-border cooperation in thinking and practice.

As the analysis has shown, important provisions for effective interregional collaboration are the opportunities to building long-term trust and sufficient flexibility and openness, but also equipping responsible authorities with the necessary means to support these efforts. The strengthening of interregional innovation chains should also acknowledge the role of multinational enterprises, directly or indirectly through the participation in clusters.

#### 4.2.4 Policy options for including reforms systematically in future S3

Specific effort could be dedicated to reforms when devising and implementing S3 strategies. This would comprise different steps/activities.

##### **Policy option 13: Clarify the notion of reforms in S3 and increase awareness about the different realities and benefits**

First, it would be necessary to **clarify the notion of reforms and increase awareness** about the different realities it covers as well as the potential benefits. It would be an opportunity to build a common understanding of the role of reforms within S3. This can take place in general at the initiative of the EC through awareness-raising activities and guidance and be furthered at the level of single S3 through hands-on support.

##### **Policy option 14: Implement a diagnostic exercise to identify existing relevant reforms and assess need for further reforms**

Second, a **diagnostic exercise could identify existing relevant reforms and assess the need for further reforms**, specifying their type and mode of mobilisation. This process would be fully embedded within the S3 activities to ensure a close connection between reforms and S3 investments. It would take place at the design phase but continue all along the implementation phases for a continuous update, especially in the case of reforms promoting dynamic adjustment processes. It would involve relevant stakeholders, if needed in different policy fields and at different levels of governance responsible for initiating and implementing the reforms contemplated. As such, this diagnostic process would mirror the process of involvement of stakeholders aimed at defining S3 priorities (EDP). When possible, reforms identified in this process could be included into integrated policy roadmaps aligning regulatory frameworks, policy mixes, infrastructure planning, funding sources, and capacity-building measures, subject to revisions when needed (“living documents”).

##### **Policy option 15: Identify and promote best-practices and provide guidance on S3 reforms**

In parallel, the **best-suited approach for monitoring the implementation of reforms** should be identified and implemented. It can be via the definition of milestones and/or via a process of “diagnostic monitoring” depending on the type and logic of intervention of

reforms. Monitoring progress would involve the same stakeholders and the same (continuous) modality as the diagnostic activities.

Adequate guidance and customised support specific to S3 reforms would facilitate the process of identification, implementation, and monitoring of reforms where/when needed, including via peer review. Guidance and support should account for different administrative and institutional capabilities of regions in undertaking a complex reforms programme.

#### 4.2.5 Policy options of performance-based S3 M&E models

In this section, we propose policy options for M&E models. These policy options are primarily derived from the analysis and results of Section 3.6.

Overall, **for S3 strategies to be truly effective, they must adopt a holistic approach that emphasises the interconnection and coordination of all strategic elements**, including S3 governance, strategic objectives/ fields of action, feedback loops and M&E models. Potential reforms of the M&E frameworks should be tailored to regional conditions, considering local needs, governance structures and the feasibility of action plans. In this context, performance-based measurements (milestones and targets) represent only one part of a broader framework. While they may play a crucial role in evaluating efficiency and effectiveness, they should be viewed as one option (besides, for example, diagnostic monitoring) of a future assessment strategy rather than prerequisites for conditional payments. The guiding question for the rationale behind defining S3 milestones and targets could be: Are funded S3 projects making satisfactory progress toward their intended targets (expected results), including any necessary revisions to the original plan when they are not?

These overarching considerations have informed the outline of three specific policy options.

##### Policy option 16: Partial standardisation of M&E frameworks

**Developing a comprehensive indicator framework for Member States and regions that includes various types of indicators** (input, output, result) could facilitate more complete assessments of performance and impact, enabling timely identification of areas needing improvement.<sup>126</sup> This may not only enhance consistency but also enable Member States and regions to establish clear connections between their M&E models and defined strategic objectives/ fields of action in their S3s. A mandate that all M&E indicators need to be directly linked to the S3 strategic objectives and fields of action would ensure that M&E frameworks provide insights that are relevant to specific S3 initiatives. By underpinning these connections/indicators with measurable milestones and targets, S3 authorities can ensure that progress is tracked more effectively (see Section 3.6).<sup>127</sup> As suggested by Molica et al. (2024), target values could be defined in the form of ranges, instead of a fixed value.<sup>128</sup> An illustrative textbook example how to link strategic objectives/ fields of action, indicators and targets is shown in the S3 of Slovakia (see figure below).

<sup>126</sup> The responses in the Stakeholder survey hint at the need for the development of meaningful and specific indicators.

<sup>127</sup> This is in line with recent literature that suggest that M&E indicators are linked so S3 strategic objectives as well as associated with baseline and target values. See Hegyi and Prota (2021): *Assessing Smart Specialisation: Monitoring and Evaluation System* and Matusiak et al. (2022): *Smart Specialisation implementation framework for the EU Enlargement and Neighbourhood Region*.

<sup>128</sup> Molica et al. (2024): *Measuring achievements: Can cohesion policy programmes effectively monitor their performance?*

**Figure 69: Strategic goals linked to indicators and targets**

| Strategic goal  | Indicator name  | Monitored unit        | Current value   | Target value  |
|---|---|-----------------------|-----------------|---------------|
| Increase the quality and availability of human resources in RDI <sup>74</sup>                                   | Number of persons employed in R&D in FTE                                  | Number of researchers | 21,195.9 (2019) | 24,000 (2027) |
| Improve the innovation performance and position of Slovakia in international comparison <sup>75</sup>           | Position of Slovakia in the Global Innovation Index                       | GII value             | 42.05 (2019)    | 45 (2027)     |
| Increase the contribution of the research to the economic growth by developing the quality of RDI <sup>76</sup> | Percentage share of expenditure on R&D from the private sector in the GDP | % of the GDP          | 0.40 % (2019)   | 0.86 % (2027) |

Source: *Research and Innovation Strategy for Smart Specialisation of the Slovak Republic 2021-2027*, p. 32.

### Policy option 17: Strengthen governance and management structures for M&E related to S3

Linked to the policy options around governance (Section 4.2.2.), **a further strengthening of governance and managements structures for M&E related to S3 will be important.** This involves investing in robust frameworks that prioritise M&E as a fundamental component of the S3 management process. Establishing dedicated teams or specialised M&E units can ensure oversight of M&E activities, facilitate regular stakeholder engagement and cultivate a culture of data-driven decision-making and policy learning. Operational synergies with Cohesion Policy programmes and their Managing Authorities should be strengthened in this process, if not yet done. Additionally, sustaining and enhancing capacity-building programmes, e.g. in the context of the S3 Community of Practice, can be crucial to better equip Member States and regions with the skills and knowledge needed to effectively design and execute their M&E frameworks.<sup>129</sup> Moreover, M&E should be forced to be integrated into the S3 management cycle, ensuring that past performance informs future strategic decisions.

### Policy option 18: Promote the integration of digital tools and open data platforms in S3 M&E

This may include the **adoption of digital tools and open platforms for data collection, analysis and dissemination** that facilitate integration of diverse data sources. It is advisable to develop guidelines and best practice frameworks to support the establishment of open platforms, ensuring that they are backed by strong governance, stakeholder engagement, secure funding and operational flexibility. This approach could also enhance communication and engagement with stakeholders, promote transparency and enable continuous feedback loops, thereby improving the quality and accessibility of data used in M&E processes.

<sup>129</sup> Matusiak et al. (2022): Smart Specialisation implementation framework for the EU Enlargement and Neighbourhood Region.

## 4.3 Outlook

**As the EU prepares for the post-2027 programming period, the debate on the future governance of Cohesion Policy should recognise the unique value of Smart Specialisation.**

**S3 has evolved into the Union's primary place-based innovation framework.** Over the course of two programming cycles, it has translated the diversity of Europe's regional assets into a portfolio of competitive strengths, which now underpin industrial modernisation, the twin green-digital transition, and the adoption of strategic technologies, such as those promoted under STEP. The 2021-27 strategies demonstrate a more sophisticated prioritisation logic and stronger alignment with EU objectives. Through the Entrepreneurial Discovery Process, they also demonstrate broader stakeholder ownership than in the pioneer period. In effect, S3 has become a key reference architecture that links territorial specifics with EU-wide objectives while safeguarding local ownership.

**The design and implementation of strategies has advanced markedly since the first generation of Smart Specialisation Strategies,** thanks in part to the growing role of cluster organisations within S3 governance. Many regions now have clear visions and priority portfolios, as well as more structured governance models that strengthen the link between strategy and day-to-day execution. However, achieving full maturity will require sustained effort and a stronger focus on operational excellence, including clear decision-making processes, dedicated coordination units, joint planning calendars, and increasingly data-driven monitoring and evaluation systems. Administrative complexity, fragmented funding streams and uneven human resource capacity continue to impede progress in all cohesion categories, and monitoring and evaluation frameworks have yet to be uniformly embedded in management cycles. **Therefore, continuous, multi-level capacity building for S3 authorities, coordinating bodies and evaluation units is indispensable for converting carefully strategies into transformative regional outcomes.**

**Beyond its role in Cohesion Policy, Smart Specialisation should form the core of the Union's wider competitiveness strategy.** Both the Draghi High-Level Report on EU Competitiveness<sup>130</sup> and the Letta Report on the Future of the Single Market<sup>131</sup> advocate aligning place-based capabilities more deliberately with Europe-wide strategic goals, ranging from scaling up deep tech and building resilient value chains to facilitating the green and digital transitions. S3 already provides the bottom-up intelligence, governance mechanisms and entrepreneurial networks required to translate these ambitions into concrete regional projects. By embedding S3 more firmly in the policy mix that follows the recommendations of the Draghi and Letta reports, the EU can better utilise territorial strengths, close productivity gaps, and secure technological sovereignty, all the while reinforcing the integrity of the Single Market.

**Strengthening European value chains and scaling innovation will require deeper interregional cooperation in complementary S3 prioritisation areas,** especially in light of the global reconfiguration of the economy and value chains. To unlock the full potential of S3, pan-European platforms that aggregate demand, share pilot lines and pool talent are needed, as they enable regions to reach critical mass and commercialise innovation more quickly than any single territory could alone. Providing expanded analytical and capacity-building support, matchmaking services and dedicated financing for such alliances will maximise the potential of S3 to strengthen European value chains.

<sup>130</sup> Draghi, M. (2024). The future of European competitiveness: A competitiveness strategy for Europe (Report prepared for the European Commission). [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_24\\_4932](https://ec.europa.eu/commission/presscorner/detail/en/ip_24_4932)

<sup>131</sup> Letta, E. (2024). Much more than a market: A new approach to the single market (Report prepared for the European Council). <https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>

**Sustaining the current momentum of S3 and capitalising on the developments made over the last 15 years in the next programming period therefore calls for renewed political commitment, coherent policy alignment and adequate resources at all governance levels.** The successful realisation of these conditions will enable Smart Specialisation to continue to drive Europe's innovation-led transformation and strengthen technological sovereignty, while ensuring that no territory is left behind in the transition to a greener, more competitive economy.

## 5 Annexes

### 5.1 Annex 1: Overview of case study selection rationale by Member State/region

| Suggest-ed cases        | T1 | T2 | T3 | T4 | T5 | T6 | Description  |
|-------------------------|----|----|----|----|----|----|--|
| Lombardy (Italy)        | X  |    |    | x  |    |    | <p>Lombardy's approach to S3 prioritisation provides a compelling example of how regional strategies can be aligned with evolving goals and long-term strategic priorities. Unlike the 2014-2020 period, where the focus was primarily on traditional economic sectors, Lombardy now defines "innovation ecosystems" based on cross-domain thematic objectives. This approach offers a flexible framework that enables the region to better respond to overarching EU objectives and adapt to shifts, such as industrial competition or disruptions in the value chain.</p> <p>The Lombardy ERDF programme plays a key role in driving investments for SME competitiveness (SO1.3) and in supporting the STEP objectives, making it a particularly interesting case for analysis under Task 4.</p>   |
| Austria and its regions | X  | X  |    |    |    |    | <p>Austria's approach offers an exemplary case of prioritisation approach structured around horizontal priorities, closely tied to EU objectives (green deal, participation in IPCEIs, excellent fundamental research, etc.) rather than focusing on specific technologies or sectors. The Austrian S3 strategy adopts an open-content and technologically neutral approach, which does not favour any specific sector or technology but remains open to all research areas with the potential to contribute to its overarching goals, such as sustainability, digitalisation, gender equality, and economic resilience. It is complemented by regional plans that define more sector-oriented priorities in line with the regional specialisation profiles.</p> <p>Austria exemplifies effective multi-level governance in S3, offering valuable insights into fostering a strong regional dimension within a national framework. Its combination of strong institutional quality and well-developed regions enables a collaborative approach between national and regional levels in S3 implementation. The interplay between national direction and regional flexibility is a defining feature of Austria's S3 governance. At the national level, Austria provides a strategic framework, EU funding coordination, and policy guidance, while the regions retain significant autonomy to define and implement their own specialisation areas. This balance ensures alignment with EU and national objectives while empowering regions to tailor strategies to their specific strengths and needs.</p> |
| Lower Silesia (Poland)  | X  |    |    | X  |    |    | <p>Lower Silesia offers an alternative approach to balance EU and regional objectives. Unlike Lombardy, which defines cross-domain priorities, the S3 of Lower Silesia encompasses a mix of vertical priorities based on regional strengths, including "Aerospace and automotive" and "Medicine", and transformational horizontal priorities, such as "Industry 4.0" and "Green Deal". These latter priorities, introduced as a novelty compared to the previous period, encourage the integration of digital and sustainable solutions across various sectors, thus ensuring the regional alignment with the objectives of industry transformation, twin transition and other EU strategic objectives.</p>  |

| Suggested cases        | T1 | T2 | T3 | T4 | T5 | T6 | Description  |
|------------------------|----|----|----|----|----|----|--|
|                        |    |    |    |    |    |    | The region also has a TJTP, which apparently does not explicitly mention S3. It would be interesting to verify through interviews whether there is any intended alignment with S3 and, if not, what the reasons for this are.  |
| Czechia                | X  |    |    |    |    |    | <p>Czechia S3 is one of the few strategies that explicitly include horizontal priorities, with a focus on reinforcing the innovation ecosystems. Alongside a set of vertical and cross-domain priorities, such as advanced medicine and environmentally friendly transport, the national strategy defines horizontal priorities aimed at addressing systemic challenges within the R&amp;D&amp;I ecosystem and overcoming barriers to innovation diffusion. The identified key areas of change include increasing R&amp;I investments for businesses, improving public research quality, workforce skills, and digital adoption.</p> <p>The Czech S3 document also details how these different types of priorities are operationalised. The alignment of a programme or call with the priorities of the S3 starts from the broadest option of alignment with a horizontal priority through cross-cutting or systemic measures (e.g., supporting the internationalisation of research organisations) and it gradually progresses to options of alignment with RIS3 priorities that are thematically increasingly narrowed down through vertical calls (e.g., supporting research activities in the field of “nanomaterials and their use in mechanical engineering, industrial chemistry and other sectors”).</p> <p>Regional S3 strategies (NUTS3 level) were prepared using the same prioritisation approach as the National RIS3 Strategy. Each of them defines key areas of change for the horizontal priorities, in addition to R&amp;I specialisation domains (economic sectors and/or technologies).</p> |
| Croatia                |    |    | X  |    |    | X  | <p>Croatia is a Southern and Eastern European country with a lower-than-average innovation performance. Its national S3 makes explicit references to reforms in order to boost its performance, while structuring the interventions in priority thematic areas. It includes reforms that addresses the entire innovation and industrial ecosystem, but also some that are more specific to individual S3 priorities (e.g., regulatory barriers reduction in the field of healthcare, as instrumental to promote the personalised healthcare priority). The Croat S3 also contains a rare example of milestones and targets already connected to the implementation of reforms (e.g., implementation of legislative acts).</p> <p>As a consequence, it is a strong candidate for some of the case studies, notably those connected to Tasks 3 and 6.</p>  |
| Greece and its regions |    | X  |    |    |    |    | The case of Greece and its regions is particularly relevant for exploring the challenges of ensuring a strong regional dimension in national Smart Specialisation Strategies (S3) within a <b>multi-level governance framework</b> . With 13 regions involved, the country employs a three-tier system: national and regional calls for proposals, decision-making led by Regional Councils for Research and Innovation (RCRI), and executive-level management of S3 action plans. While regions have gained importance in recent years, the national level remains dominant, reflecting structural imbalances and governance inefficiencies. Weak research and innovation ecosystems, coupled with overlapping responsibilities and coordination gaps, hinder effective RIS3 implementation. This case provides valuable insights into addressing governance and innovation challenges in S3 frameworks, particularly in Less Developed Regions.  |

| Suggested cases             | T1 | T2 | T3 | T4 | T5 | T6 | Description   |
|-----------------------------|----|----|----|----|----|----|---|
| Baden-Württemberg (Germany) |    | X  |    |    |    |    | <p>Baden-Württemberg offers an exemplary case of how S3 can coordinate multiple funding sources, including European, national, and regional initiatives, beyond the European Regional Development Fund (ERDF). The region's robust institutional capacities and its status as a leading innovation hub make it an ideal example for examining advanced funding coordination mechanisms in Smart Specialisation.</p> <p>In addition to ERDF, Baden-Württemberg actively participates in programs like Interreg and Horizon Europe, leveraging these to support cross-border cooperation and innovation. These initiatives focus on key areas such as Industry 4.0, digitalisation, and sustainable energy, illustrating how diverse funding streams can be aligned to strengthen regional innovation strategies.</p>   |
| Basque Country (Spain)      |    | X  |    |    |    |    | <p>The Basque Country, a developed region with strong institutional capacities, exemplifies effective capacity-building measures for Smart Specialisation Strategies (S3). Its innovation-driven strategies focus on industrial transformation, stakeholder collaboration, and enhancing the capabilities of regional actors, including SMEs and public organisations.</p> <p>Key initiatives include Innobasque, the Basque Innovation Agency, which coordinates regional innovation policy, providing capacity-building services, and fostering networking, and the B Accelerator Tower (BAT), which supports startups, including with capacity-building and promotes economic growth. The region's comprehensive, locally funded programs, alongside ERDF and Interreg contributions, provide valuable insights into fostering robust innovation ecosystems.</p>   |
| Portugal                    |    | X  | X  |    |    |    | <p>Portugal offers an interesting example of capacity-building measures to enhance the capabilities of key actors in initiating and implementing S3-aligned investment projects, despite its medium institutional capacities and moderate regional development. Indeed, an analysis of the ERDF budget programmed reveals a relatively high share of budget allocation for SO1.4 in the six regional inland programmes of Portugal. It adopts a multi-level approach to capacity building to drive S3 implementation and enhance regional innovation ecosystems.</p> <p>Portugal's national programmes Innovation and Digital Transition Thematic Programme extends the prioritisation approach of the Smart Specialisation Strategy beyond Specific Objectives (SO) 1.1 and 1.4, which explicitly require it as an enabling condition. The national programme states that the priorities of national and regional S3 will be a merit condition for the support provided under SO 1.3 (support for SME productive innovation). It is therefore an interesting case to analyse under Task 4.</p> |
| Campania (Italy)            |    |    | X  | X  |    |    | <p>Campania exemplifies an S3 strategy where priority areas are defined in transformational terms, with explicit references to the industrial ecosystems' transition pathways. The region leverages its S3 to activate industrial transition processes based on transformative innovation, positioning it as a paradigm to address pressing societal challenges such as climate change and sustainability. A case study on a region like Campania can provide valuable insights into the specific measures implemented within ERDF programmes to foster industrial transformation aligned with the goals of the transition pathways.</p> <p>Furthermore, Campania has already incorporated STEP objectives into its programme, and the analysis of the programmes reveals that S3 is positioned as a strategic framework to guide investments under STEP as well. This makes it an interesting case to analyse from this perspective too.</p>   |

| Suggested cases                                     | T1 | T2 | T3 | T4 | T5 | T6 | Description   |
|---|----|----|----|----|----|----|---|
| Wallonia (Belgium)                                  |    |    | X  | X  |    |    | <p>In Wallonia, S3 serves as the overarching framework for all industrial and innovation policy, extending beyond ERDF. While not a mandatory criterion outside ERDF-funded R&amp;I projects, efforts have been made to integrate S3 into other policy areas. For instance, investment support for companies now prioritises alignment with S3, despite initial resistance from Managing Authorities. Additionally, S3 influences digital and training policies, with the ESF agency aligning training programmes and the digital agency using S3 to guide investment decisions. Export agencies also incorporate S3 into their priorities. As a strategic tool for regional transformation policy, S3 is also closely linked with the Territorial Just Transition Plan of Wallonia through coherent priorities and mechanisms to ensure alignment in investments.</p> <p>Wallonia dedicated an explicit attention to reforms in its S3. The S3 is seen as an opportunity to engage or consolidate the reforms of the policy mix in three policy areas: research policy, support to SME and innovation and training policy. It is also a case where the regional government has access to several levers, given the federal nature of Belgium, which makes it particularly relevant to examine specific dynamics in a multi-governance context.</p> |
| Catalonia (Spain)                                   |    | X  |    |    |    |    | <p>Catalonia is a more developed Spanish region with better-than-average innovation performance. It is often identified as a best practice for its approach to Smart Specialisation in general. It is an interesting case given its strong focus on a mission-oriented approach for its S3 (e.g., green transition). It has a strong governance system.</p>   |
| Galicia (Spain), Norte (Portugal)                   |    |    |    |    | X  |    | <p>Updated cross-border S3 2021-2027, joint EDP and <a href="#">Joint Investment Plan 2021- 2027</a> for the Euroregion Galicia – Norte aim to promote cooperation and joint initiatives in 6 strategic collaboration areas (marine and biomass energy, agri-food and biotechnology, industry 4.0, mobility industries, health and active ageing, creative industries and tourism). This example of a coordinated approach in the context of smart specialisation showcases various shared benefits, primarily better use of the European funding framework through increased fundraising, implementation of coordinated actions to improve fundraising in programs of excellence and positioning in innovation (e.g. H2020, Interreg, VInnovate) and increase critical mass based on synergies and complementarities in value chain innovation, given the growing need to combine knowledge and productive capacities in innovative processes.</p>   |
| Innovation Express Scheme and Brandenburg (Germany) |    |    |    |    | X  |    | <p><a href="#">The Innovation Express Scheme</a> implemented within the Interreg Alpine Space project <a href="#">ARDIA-Net</a> and <a href="#">Innovation Express Call 2024 (IEC24)</a> are two interesting cases for further examination. The Innovation Express Call 2024 represents a joint approach for supporting participants, especially SMEs, at international matchmaking and joint RDI projects in the fields of transregional circular bioeconomy value chains, key resources and sectors in agriculture, food and beverages, chemistry, polymers and energy. The funding instrument aims at facilitating cross-sector collaboration, the development of innovative solutions in two given thematic fields for projects by developing transregional linkages among SMEs, research institutions and other business organisations. The IEC24 is a joint call for proposals, implemented within the frame of the INNOBIOVC project, which synchronises existing regional funding schemes in the Alpine Space and beyond. The call encourages applications aiming at advanced TRLs.</p> <p>Ex. Brandenburg (Germany) – using ERDF for Innovation Express calls</p>  |
| Emilia-Romagna (Italy)                              |    |    | X  |    |    | X  | <p>The region makes an interesting case on the one side due to its online <a href="#">S3 Dashboard</a> which includes S3-related data in different dimensions such as 'Output', 'Result' and 'Transition'. Moreover, it makes an interesting case since Italy is characterised by a multi-level S3 governance that includes a</p>   |

| Suggested cases      | T1 | T2 | T3 | T4 | T5 | T6 | Description   |
|----------------------|----|----|----|----|----|----|---|
|                      |    |    |    |    |    |    | <p>"national" (sum of all regional priorities) S3 Italian S3 in addition to the regional S3 of Emilia-Romagna. In that context, the connection to the Italian multilevel open platform <a href="#">OpenCoesione</a> can also be examined. This region is an example for strong and open S3 monitoring and evaluation system.</p> <p>Emilia-Romagna also dedicates a strong attention to reforms, with a flexible approach based on the needs emerging from its ecosystem.</p>   |
| Extremadura (Spain)  |    |    |    |    |    | X  | <p>The region has a rather longstanding experience with the monitoring and evaluation of S3. The S3 of Extremadura 2014-2020 included a detailed monitoring and evaluation system that was built on six elements that included sets of indicators (output, outcome, context), monitoring and evaluation plans as well as a dedicated governance structure for the S3 monitoring and evaluation. The S3 of Extremadura 2021-2027 includes similar elements and especially the online <a href="#">S3 Extremadura monitoring tool</a> as a new element of the monitoring and evaluation system. Like Emilia-Romagna, this is an example for strong and S3 monitoring and evaluation system.</p>  |
| Norte (Portugal)     |    | X  |    | X  | X  |    | <p>The region makes an interesting case since its monitoring system operates under the assumption that both bottom-up and top-down logical approaches complement each other. The objectives are to track if the resources are allocated as originally planned, to ensure that the actual achievements are reached as foreseen and align with the relevant priority domains, and to foster structural changes within the economy at the intended pace. Norte's monitoring model begins by incorporating input and output indicators linked to monitoring the policy mix. It then progresses to result indicators, encompassing measurements of bets in various priority domains, facilitating the monitoring of strategic objectives. Finally, the context indicators enable the verification of the overarching level of achievements of S3 and its vision. The indicators tied to the priority domains are the nodal point of the entire monitoring model.</p>   |
| Northern Netherlands |    |    |    |    |    | X  | <p>The Northern Netherlands make an interesting case for many reasons. The region is characterised by different societal and transition challenges which are tackled by the regions S3. The Northern Netherlands Alliance (SNN), as the authority responsible for the region's S3, together with the University of Groningen, has developed the <a href="#">Innovation Monitor</a>, which is published annually. With a survey at the core of this Innovation Monitor it involves a large number of stakeholders (especially SMEs).</p>   |
| Slovakia             |    |    | X  |    |    | X  | <p>Slovakia is a Central European country with a lower-than-average innovation performance. Its S3 strongly integrates specific reforms in the field of R&amp;I, which can be explained by the importance of European funds for these activities in the country. Reforms mentioned in the S3 are expected to have direct effect on the implementation of the investments, and the country explicitly recognises the importance of successfully carrying out the planned reforms to make sure S3 investments reach their goals. It is thus a prime candidate for the case study of Task 3.</p> <p>The proposed M&amp;E model of the Slovak S3 strategy (SK RIS3 2021+) incorporates several criteria for best practice M&amp;E models. It is designed with distinct yet interconnected monitoring and evaluation processes that form part of an integrated system. In addition, the Slovak M&amp;E model proposes the implementation of an Open Platform. This approach streamlines access to monitoring information and data sources through the aggregation of decentralised statistical data collection systems into a unified communication platform, specifically a web portal. Moreover, the monitoring model is designed to measure the achievement/ results of agreed targets. In this process, the monitoring aims to identify discrepancies between defined goals, synergies in strategy implementation and effectiveness of strategy implementation at each level of monitored information.</p> |

## 5.2 Annex 2: Targeted stakeholder consultation – online survey

### Stakeholder consultation on the future of Smart Specialisation Strategies (S3)

Fields marked with \* are mandatory.

Welcome to the stakeholder consultation on Smart Specialisation Strategies (S3)

The European Commission, Directorate-General for Regional and Urban Policy (DG REGIO) has commissioned Prognos AG and CSIL with a study on smart specialisation strategies (S3) and their implementation in the 2021 – 2027 period. The results and views collected by this study will also inform the discussion on the future of S3.

The central objective of this survey is to collect information and views from S3 practitioners and stakeholders on the current generation of S3 strategies and their implementation. The main topics are:

- Formulation and strategic approach of S3 priorities
- Governance and stakeholder management mechanisms
- Linking reforms and investments
- Interregional cooperation
- Monitoring and evaluation

Seize this opportunity to have your voice heard and contribute to the future of smart specialisation in the EU!

If you have any questions about the survey and the project, please contact us via the contact form at any time.

We thank you in advance for your valuable support!

Your team at Prognos & CSIL

#### Please note:

- You can **save** the survey at any time (via the button on the right-hand side of the screen) and resume it at a later time.
- Depending on the type of organisation you represent, you will receive an **adapted set of questions**. Therefore, if some questions are not displayed, they are not missing but rather targeting a different group of organisations.

## Privacy Notice

Your participation in this survey is entirely voluntary, and no personal data will be collected. It will not be possible to trace individual responses back to specific participants. The raw data will remain exclusively with Prognos AG and will not be shared with third parties. For more information on data protection at Prognos AG, please refer to our [Data Protection Policy](#). If you have specific questions about data protection, you may also contact our Data Protection Officer, Angelina Thevessen, at [datenschutz@prognos.com](mailto:datenschutz@prognos.com).

### **A: Background information**

**\*A1. The present survey is designed to gather information and feedback on S3 from a large variety of different actors. In order to receive the questions that are relevant for you, please select the category you belong to:**

- Actors tasked with S3 coordination, ERDF programming and/or JTF implementation
- Stakeholders (clusters and other umbrella organisations, companies, research institutions, civil society organisations)

**\*A1.1 Now, please identify more precisely, which function(s) your organisation fulfils.** Please select all options that apply.

- ERDF managing authority, or intermediate body acting under the responsibility of the managing authority, in charge of the ERDF programme
- Regional or national institution or body, responsible for the management of the smart specialisation strategy
- (e.g., dedicated department in national/regional ministry)
- Regional and National Coordination of the Territorial Just Transition Funds

**\*A1.1 Which type of stakeholder are you?** Please select all options that apply.

- Umbrella organisations (e.g. clusters, chambers of commerce, industry association, etc.)
- Small and Mid-sized Enterprises (SME)
- Large enterprises
- Public research centre or university
- NGOs and civil society organisations
- Other (please specify)

**A1a. Please specify your type of organisation.**

**\*A2. Please select the EU Member State in which you are located.**

*[drop-down menu with all EU27 Member States]*

**A3.** *[If there are regional S3s in the country where the stakeholder is located, this question asks the participant to select the territorial unit(s) where the organisation is represented or located]*

**A4. Have you been actively involved in the design of your regional/national Smart Specialisation Strategy?**

- Yes
- No

**A4a. Do you want to add any comments on your general involvement in your regional/national S3?**

### **B: Formulation and strategic approach of S3 priorities**

S3 priority definition and alignment with Member State/region's strengths and competitive advantages

The S3 is a policy framework aimed at helping Member States/regions identify their unique strengths and leverage them to drive research and innovation in areas with potential competitive advantages. S3 priorities can be formulated in various ways. This section aims to understand the approach to the S3 prioritisation adopted for the 2021-2027 period in your Member State / region. It also examines how the current S3 priorities align with the distinctive strengths and competitive advantages of your Member State/region.

**B1. Which strategic approach guided the formulation of the S3 priorities for the 2021-2027 period?**

**B1. Which strategic approach do you think mainly guided the formulation of S3 priorities for the 2021-2027 period?**

Please select all that apply.

|   | Not at all            | To some extent        | To a large extent     | I don't know          |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| Priorities were formulated with a strong emphasis on economic <b>diversification</b> (shifting to new sectors, industries, technologies)  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Priorities were formulated with a strong emphasis on economic /technological <b>strengthening</b> and modernisation (enhancing existing sectors and industries)   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Priorities were formulated to address more explicitly the challenges and opportunities of the <b>green and digital transitions</b> .  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Priorities were formulated with a focus on <b>structural improvements to innovation ecosystems</b> , such as advancements in education systems, skills development, infrastructure, and public-private collaboration. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Priorities reflect a <b>combination of national-wide priorities</b> and more specific <b>regional/local priorities</b>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|  |                       |                       |                       |                       |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| Priorities were formulated with consideration of competitive advantages in the context of <b>European value chains</b> rather than solely focusing on national or regional strengths | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (please specify)   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**\*B1a. If “Other”, please specify:**

**B2. How has the list of S3 priorities for the 2021-2027 period changed as compared from the 2014-2020 period?** Please specify the key needs or reasons that prompted these changes.

**B3. To what extent do you believe the S3 priorities formulated for the 2021-2027 period are suitably targeted towards developing the unique strengths and competitive advantages of your region / Member State?**

|                | Not at all            | Slightly              | Moderately            | Mostly                | Fully                 | I don't know          |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Please select: | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**B4. Please provide examples or areas where you feel the alignment of S3 priority areas with the regional and/or national competitive advantages is strong or where improvements are needed.**

**B5. In your opinion, how effective are the mechanisms or processes in place for adjusting S3 priorities to respond to changing regional and/or national priorities or emerging opportunities?**

### **Role of S3 and ERDF in research and innovation funding**

This section explores the role of the S3 and the ERDF in shaping and supporting public investments in research and innovation within your Member State or region.

**B6. What role does the Smart Specialisation Strategy (S3) play in your Member State/region?** Please select the option that best describes its scope.

- S3 is **limited to providing a framework for allocating** ERDF funds for Research and Innovation.
- S3 provides the **main framework for the Member State & region's research and innovation policy**, with a scope going beyond ERDF-funded activities.
- I don't know

**B6a. Could you elaborate on your response in the free-text box below?**

**B7. How does the ERDF contribute to the public R&I funding in your Member State/region compared to other funding sources?** Please select the option that best describes the role of ERDF in your Member State /region.

- ERDF is the **primary source** of public R&I funding.
- ERDF is a **key source** of R&I funding, **complemented by other EU programmes** (e.g., Horizon Europe).
- ERDF is a **key source** of R&I funding, **complemented by national and regional funding**.
- ERDF plays a **secondary role** in R&I funding, with **other EU programmes as the main contributors**.

- ERDF plays a **secondary role** in R&I funding, with **national and regional funding as the primary source**. ERDF contributes **equally** to R&I funding **alongside other sources** (EU, national, regional).
- Other (please specify)
- I don't know

**\*B7a. If "Other", please specify:**

### **The role of S3 to support broader industrial transformation**

This section explores how S3 can contribute to driving industrial transformation. While the existence of an S3 is an enabling condition for investments in research and innovation (R&I), currently it does not extend to other crucial investments for industrial transformation. These include areas such as enhancing SME competitiveness, supporting business digitalisation and green practices, as well as the development of strategic technologies that are key to European competitiveness and resilience. We aim to gather insights on whether and how S3 already contributes to these broader industrial transformation objectives.

**B8. Beyond research, innovation and skills-related investments programmed under ERDF Specific Objectives 1.1 and SO 1.4, in which other areas of industrial transformation does the Smart Specialisation Strategy (S3) in your Member State/region influence EU funding allocations?**

**B8. As far as you are aware, is the S3 currently being used as a strategic framework to guide investments for industrial transformation in your Member State / region? If yes, please indicate the specific areas of focus from the list below.**

Please select one or more of the following areas.

- Sustainable growth, SME competitiveness, and job creation through productive investments (e.g. investments currently programmed under ERDF SO 1.3?)
- Support for digitalisation across citizens, companies, research organisations and public authorities (e.g. investments currently programmed under ERDF SO 1.2?)
- Promotion of green transition and sustainability through energy efficiency, renewable energy, circular economy, climate adaptation and biodiversity protection initiatives (e.g. investments currently programmed under ERDF PO2/ funded through the JTF)
- Development of transport, energy and digital infrastructures (e.g. investments currently programmed under ERDF PO3, Connecting Europe Facility etc.)

- Support for the development of strategic technologies for Europe (e.g. investments currently programmed under the ERDF SO 1.6 and 2.9)
- Promote cross-border, transnational and interregional cooperation (e.g. Interreg)
- Education and skills development (e.g. via ESF+, Erasmus +)
- Other (please specify)
- I don't know

**\*B8a If “Other”, please specify:**

### **Actions to mobilise ERDF investments aligned with S3 priorities**

This section explores the measures and actions currently in use or planned for the current programming period to catalyse ERDF investments that align with S3 priorities.

#### **B9. How is alignment with S3 priorities ensured for ERDF investments under Specific Objectives 1.1 (Research and Innovation) and 1.4 (Skills and Innovation) in your country/region, in particular the programme, calls, selection criteria, etc.?**

Please describe how alignment is achieved, particularly through programme design, calls for proposals, selection criteria, or other mechanisms.

#### **B10. For other Specific Objectives (SO 1.2, 1.3, etc.): Which of the following measures/actions are being used (or planned to be used) in the current programming period to mobilise investments under ERDF programmes aligned with the S3 priority areas?**

- **Preferential conditions** are/will be applied during project selection to encourage and reward investments aligned with S3 priorities.
- **Strict eligibility criteria** are/will be used to ensure only S3-aligned projects qualify for ERDF support. **Dedicated funding** calls /funding competitions are/will be issued targeting investments directly contributing to S3 priorities.
- A **specific share of the ERDF budget** under relevant Specific Objectives is allocated to S3-aligned projects. Programme-level **performance indicators** are used to assess the alignment of investments to S3 priorities. Dedicated **training and support for enterprises**, especially SMEs, is provided to enhance their ability to participate in S3-aligned initiatives.

- **Reduced bureaucracy** and simplified procedures for accessing funding or permits for S3-related investments.
- **Roadmaps or action plans** are/will be developed to outline steps, timelines, and milestones for implementing S3 priorities.
- A coordinated set of interconnected projects (**project portfolios**) within S3 priority areas are/will be selected to ensure a comprehensive approach to implementation.
- Other (please specify)
- I don't know

**B11. Please, briefly explain your answer or elaborate on it.**

### **The link between S3 and the Territorial Just Transition Plans**

Territorial Just Transition Plans (TJTJs) are strategies, funded by the Just Transition Fund, designed to support regions and communities that are heavily affected by the shift to a greener economy. These plans aim to mitigate the social and economic impacts of this transition by creating new opportunities and ensuring social fairness.

We are interested in understanding how S3 and TJTJs can be aligned to foster industrial transformation in a coherent way. The goal is to see how both can work together to achieve sustainable development while meeting the regional needs and EU-wide objectives.

**B12. How are the Smart Specialisation Strategy (S3) and the Territorial Just Transition Plan (TJTP) aligned in your Member State/region to support industrial transformation?** Please select one or more options that apply to your Member State/region.

- The JTF project selection criteria prioritise S3-related projects within the Research and Innovation area.
- The JTF project selection criteria prioritise S3-related projects beyond Research and Innovation.
- Stakeholders involved in S3 governance are also active in the JTF programme monitoring committee. Performance indicators are used to track and align progress across both S3 and TJTJs.
- Other (please specify)
- There are no mechanisms of alignment between S3 and the TJTP. There is no TJTP in my region.

- I don't know.

**\*B12a. If "Other", please specify.**

**B12b. Please feel free to explain or elaborate on your answer, providing concrete examples.**

**B13. If one or more Territorial Just Transition Plans (TJTPs) exist in your Member State/region, which challenges do you see in aligning the objectives of S3 and the TJTP? Consider challenges such as governance fragmentation, differing priorities, and any other barriers.**

### **C: Governance & stakeholder mechanisms**

#### **Coordination across governance levels and policy sectors**

This section explores the coordination of S3 processes across different levels of governance—vertical coordination (e.g., national, regional, sub-regional)—and across policy sectors—horizontal coordination (e. g., innovation, industrial, and environmental policies). Coordination mechanisms play a crucial role in ensuring policy coherence across policy sectors and fostering alignment of collective actions across governance levels within S3 processes. The aim of this section is to obtain a comprehensive understanding of the types and characteristics of horizontal and vertical coordination mechanisms deployed in S3.

**\*C1. Is the S3 primarily implemented at the national level, regional level, or both in your Member**

**State/region?**

Please select the most applicable option.

- National only
- Regional only
- National with regional components

**\*C1a. If the S3 is implemented at the national level, how are regional and local authorities involved? Please select the most applicable option.**

- Not involved at all
- Have a role in decision-making and implementation of S3

**\*C1b. If the S3 is implemented at the regional level, how are national authorities involved?** Please select the most applicable option.

- Not involved at all
- Have a role in decision-making and adoption of S3

**C2. To what extent are the following vertical coordination mechanisms used to enable cooperation and alignment between governance levels (e.g., national, regional, sub-regional) in the S3 process in your country/region?**

|   | Not at all            | To a minor extent     | To a moderate extent  | To a large extent     | To a very large extent | I don't know          |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| <b>Top-down consultations initiated by national authorities</b><br>Mechanisms where national authorities guide regional authorities and set priorities for regional strategies.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Bottom-up consultations initiated by regional authorities</b><br>Processes where regional authorities propose initiatives or provide feedback to national bodies that inform national S3 plans or policies ensuring that regional needs and perspectives are taken into account. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Joint decision-making mechanisms (e.g., steering committees, policy forums) involving national and regional authorities</b><br>Formal processes where both levels jointly decide on priorities and resource allocations.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Other (please specify)  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |

**\*C2a. If “Other”, please specify:**

**C3. To what extent are the following horizontal coordination mechanisms used to enable cross sectoral alignment and collaboration in the S3 process in your country/region?**

|   | Not at all            | To a minor extent     | To a moderate extent  | To a large extent     | To a very large extent | I don't know          |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| <b>Joint decision-making processes</b> involving various relevant departments /ministries to make decisions and align S3 priorities with broader goals.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Inter-departmental/ministerial working groups or task forces</b> aimed at aligning S3 implementation across different policy areas   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Joint funding schemes or pooled budgets</b> allocating resources across different policy areas to support S3 projects.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Policy alignment through coordination of policy strategies and regulatory frameworks</b> of relevant policy areas ensuring coherence among policies affecting S3, such as innovation, industrial, and environmental. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Other (please specify)  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |

**\*C3a. If “Other”, please specify:**

**Inclusive and continuous stakeholder engagement**

The process of engaging all relevant stakeholders in S3, also known as the Entrepreneurial Discovery Process (EDP), is conceived as an inclusive approach that engages diverse stakeholders and a continuous process, from the initial identification of priorities to implementation, refinement and monitoring and evaluation. The goal of this section is to gain insights into the functioning of this continuous process to ensure that a variety of stakeholders are represented and actively engaged throughout the entire S3 policy cycle.

**C4. To what extent do you think the following groups are well represented in S3 stakeholder engagement processes?**

|   | Not at all            | Low                   | Moderate              | High                  | Very high             | I don't know          |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Academia and research institutions                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| SMEs  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Large enterprises                                       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Government and public sector                            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Civil society (NGOs, citizens, community organisations) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cluster organisations                                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Industry associations                                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Chambers of commerce                                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Others (please specify)                                 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**\*C4a. If "Other", please specify.**

**C5. What specific tools/mechanisms are used to maintain ongoing stakeholder engagement throughout the Entrepreneurial Discovery Process (EDP) in the S3 framework?** Please choose one or more of the following tools and mechanisms.

- Thematic working groups and workshops for continuous consultation
- Pilot initiatives/concrete project development on commonly agreed priorities
- Living labs to develop solutions to local challenges
- Online platforms/web-based tools
- Surveys/consultations
- Focus groups
- Other (please specify)
- I don't know

**\*C5a. If "Other", please specify.**

**C6. How effective are these instruments in maintaining continuous engagement of stakeholders across different phases of the S3 process?**

|  | Very ineffective      | Rather ineffective    | Moderately effective  | Rather effective      | Very effective        | I don't know          |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Thematic working groups and workshops for continuous consultation            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Pilot initiatives/concrete project development on commonly agreed priorities | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Living labs to develop solutions to local challenges                         | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Online platforms/web-based tools   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Surveys/consultations  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Focus groups   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (as defined above)   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**C7. To what extent are different stakeholder groups involved along the S3 policy cycle?** (i.e. from priority-setting and decision-making to implementation and finally monitoring & evaluation)

**C7.1. Priority-setting and decision-making: Level of involvement in the decision-making process to define the S3 priorities.**

|   | Not at all            | Low                   | Moderate              | High                  | Very high             | I don't know          |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Academia and research institutions                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| SMEs  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Large enterprises                                       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Government and public sector                            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Civil society (NGOs, citizens, community organisations) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cluster organisations                                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Industry associations                                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Chambers of commerce                                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (please specify)                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**\*C7.1a. If "Other", please specify.**

**C7.1b. Please describe briefly the responsibilities of stakeholders with high/very high involvement in *priority-setting* and *decision-making*.**

**C7.2. *Implementation*: Level of involvement in implementing the S3 strategy through concrete funding instruments.**

|                                    | Not at all            | Low                   | Moderate              | High                  | Very high             | I don't know          |
|------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Academia and research institutions | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| SMEs                               | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Large enterprises                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Government and public sector       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
|                                    |                       |                       |                       |                       |                       |                       |

|   |                       |                       |                       |                       |                       |                       |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Civil society (NGOs, citizens, community organisations) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cluster organisations                                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Industry associations                                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Chambers of commerce                                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (please specify)                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**\*C7.2a. If "Other", please specify.**

**C7.2b. Please describe briefly the responsibilities of these stakeholders in implementation.**

**C7.3. Monitoring and Evaluation: Level of involvement in the monitoring and evaluation process - and the conclusions drawn from it to revise S3 priorities or instruments.**

|   | Not at all            | Low                   | Moderate              | High                  | Very high             | I don't know          |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Academia and research institutions                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| SMEs  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Large enterprises                                       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Government and public sector                            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Civil society (NGOs, citizens, community organisations) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cluster organisations                                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Industry associations                                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Chambers of commerce                                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (please specify)                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**\*C7.3a. If "Other", please specify.**

**C7.3b. Please describe briefly the responsibilities of these stakeholders in *monitoring and evaluation*.**

**D: Linking reforms and investments within S3**

This section explores how S3 can become a framework underpinning both investments *and* reforms. It identifies reforms useful to address bottlenecks in innovation/industrial ecosystems and facilitate the mobilisation of investments aligned with S3 priorities.

**Bottlenecks of the ecosystem affecting S3 implementation**

**D1. What are the main bottlenecks in your innovation and industrial ecosystem, which affect the implementation of S3 investments? (If your S3 is regional, consider the regional ecosystem, if it is national, the national one).**

|   | Not at all            | To a minor extent     | To some extent        | To a large extent     | To a very large extent | I don't know          |
|---|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| <b>Restrictive regulatory constraints:</b> The regulatory framework (laws, regulations, policies) may prevent or slow down investments in research and innovation, for instance through excessive requirements, or poor flexibility to allow experimentation. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Inadequate intellectual property protection system:</b> Restrictive procedures or poor enforcement of intellectual property rights can reduce the incentives to engage in research and innovative investments.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Low demand or interest for innovation:</b> Limited appetite for innovation can limit the uptake of innovative solutions in the ecosystem, for instance due to risk aversion or cultural barriers.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Limited entrepreneurial dynamism:</b> Limits in the creation and development of businesses can restrict the supply of innovative investments (e.g., low number of companies in relevant sectors...).   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Low business competitiveness:</b> Unfriendly business conditions can reduce the implementation of research and innovative investments, for instance because of taxation levels or structure.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| <b>Limited capabilities of stakeholders/firms:</b> Poor abilities linked to management or   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |

|   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| innovation can restrict the ability of stakeholders to initiate or sustain research and innovative investments.   |   |   |   |   |   |   |
| <b>Inadequate education and training system:</b> The maladaptation of the education and training system in terms of quality, quantity or focus can cause misalignment between requirements for innovative investments and reality (e.g., skills shortage, skill mismatch...).                   | ● | ● | ● | ● | ● | ● |
| <b>Malfunctioning labour market:</b> Poor labour market operation (e.g., low wages, working conditions...) can restrict the ability of stakeholders to employ the adequate human resources for innovation (e.g., attraction /retention of talent, brain drain...).                              | ● | ● | ● | ● | ● | ● |
| <b>Inadequate research system:</b> Poor performance of the academic sector (quality, quantity, focus) can impede the transition to innovative investments.  | ● | ● | ● | ● | ● | ● |
| <b>Poor infrastructure:</b> Lack of quality infrastructure can make innovative investments impossible or more expensive to carry out (e.g., research or digital infrastructure).  | ● | ● | ● | ● | ● | ● |
| <b>Limited access to funding:</b> Lack of public or private funding for innovation can impede the implementation of such activities (e.g., public support, venture capital...).   | ● | ● | ● | ● | ● | ● |
| <b>Inadequate/inefficient governance:</b> Lack of or poor linkages between stakeholders, organisational issues, as well as lack of direction, can result in duplications or missed opportunities regarding innovative investments. It can concern specific S3 governance or broader governance. | ● | ● | ● | ● | ● | ● |
| <b>Weak interregional, international linkages:</b> Limited networking and connections to stakeholders outside the region can limit the ability to secure opportunities for innovative investments (e.g., securing relevant partners...).  | ● | ● | ● | ● | ● | ● |
| <b>Administrative burdens:</b> Excessively long or complex administrative procedures can restrict the implementation of innovation  | ● | ● | ● | ● | ● | ● |

|  |   |   |   |   |   |   |
|--|---|---|---|---|---|---|
| activities due to discouragement of targeted parties (e.g., grants or support schemes provision...). |   |   |   |   |   |   |
| <b>Other</b> (please specify)  | ● | ● | ● | ● | ● | ● |

**\*D1a. If “Other”, please specify:**

**Reforms to address S3 bottlenecks**

In the following, we use the term 'reform' to refer to any measure that improves one or more dimensions of the innovation and industrial ecosystem without mobilising funding (i.e., pure investment projects are excluded from this definition). These reforms are expected to facilitate the mobilisation of investments in line with S3 priorities. There are different types and modalities of reforms, including:

- laws and regulations (e.g. to introduce flexibility in the labour market or to protect intellectual property),
- administrative reforms (e.g. to increase result orientation, to simplify procedures), the adoption of strategies and action plans, capacity building measures, incentives measures (e.g. tax credits),
- the introduction of institutional/organisational changes (e.g. the establishment of a technology transfer office or a one-stop business portal), etc.

**D2. Are reforms explicitly mentioned in the current S3 (2021-2027)? If so, what are the types of linkages between the S3 and these reforms?**

- The S3 does not make explicit references to any reforms
- The S3 makes explicit references to reforms as part of the contextual analysis
- The S3 makes explicit references to reforms planned in other contexts (e.g., Resilience and Recovery Plans) that are expected to benefit the S3
- The S3 makes explicit references to reforms specifically planned in the context of the S3 The S3 makes other references to reforms (please specify)

**\*D2a. If "Other", please specify:**

**D3. For the most relevant bottlenecks identified in Question D1 ("to a very large extent"), are there ongoing or planned reforms to tackle them? Please include reforms at any level (i.e., national, regional/subnational...) that may address your bottlenecks.**

(response options show only for elements rated "to a very large extent" above in question D1; leave empty if you do not know)

| Bottleneck                                | Status of reforms   | Presentation of reforms<br><br>Briefly describe the reform | Level of implementation   |
|---|---|--|---|
| <b>Restrictive regulatory constraints</b> | Please select: <ul style="list-style-type: none"> <li>▪ Planned</li> <li>▪ Carried out</li> </ul> | Please describe:<br><br>[free text]                        | Please select: <ul style="list-style-type: none"> <li>▪ National</li> <li>▪ Regional</li> </ul> |

|   |  |     |   |
|---|--|-----|---|
|   | <ul style="list-style-type: none"> <li>▪ Not applicable</li> </ul> |     | <ul style="list-style-type: none"> <li>▪ Sub-national</li> <li>▪ Mixed</li> <li>▪ Not applicable</li> </ul> |
| <b>Inadequate intellectual property protection system</b> | ...  | ... | ...   |
| ...   | ...  | ... | ...   |

**D4. Please list and describe up to three high-priority reforms you believe would be especially relevant to enhance S3 implementation in your region or country.**

**Institutional capacity support for reforms**

**D5. What kind of support would you need to adopt reforms that could facilitate the implementation of S3 investments? Are there any good examples of schemes that could be used in this context?**

**E: Interregional cooperation**

This section examines how Smart Specialisation Strategies contribute to fostering interregional cooperation under Cohesion Policy, focusing on shared or complementary S3 priorities and value chains. To fulfil the "enabling condition" for good governance of national or regional smart specialisation strategies, current S3s need to support measures for enhancing cooperation with partners outside their Member State in priority areas. The purpose of this section is twofold: firstly, to gather insights into the types and effectiveness of actions included in S3 that aim to foster interregional cooperation; and secondly, to identify any remaining bottlenecks and areas for improvement within S3.

**E1. How important is interregional cooperation for achieving the S3 objectives in your region / Member State?**

|                |                       |                       |                       |                       |                       |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                | Not important         | Less important        | Important             | Very important        | I don't know          |
| Please select: | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**E1. How important, do you think, is interregional cooperation for achieving the S3 objectives in your region / Member State?**

|                | Not important         | Less important        | Important             | Very important        | I don't know          |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Please select: | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**E2. How do you engage with your peers in other regions to foster interregional cooperation and mutual learning in the development and implementation of S3?**

- Frequent and structured engagement
- Occasional and informal engagement
- Limited engagement

**E3. What are, in your experience, the primary benefits of interregional cooperation for your national/ regional S3 priority areas?**

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*between 1 and 5 choices*

- Improved policy alignment and coherence
- Increased competitiveness of local business
- Enhanced cross-border collaboration
- Knowledge and expertise sharing
- Strengthened research and development partnerships
- Facilitated technology transfer and commercialisation
- Improved infrastructure and facilities
- Access to new markets
- Strengthened engagement in EU value chains
- Access to funding opportunities
- Others (please specify)
- I don't know

**\*E3a. If "Other", please specify:**

**E4. How effective are the measures planned under the current S3 in your region/ Member State in facilitating interregional cooperation in the following areas?**

|  | Not effective         | Slightly effective    | Moderately effective  | Effective             | Very effective        | I don't know          |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Fostering value chains relevant to your region's /country's interests      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Creating and exploring new value chains of interest to your region/country | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Supporting or preparing joint interregional investment projects            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Bringing research results to market (commercialisation)                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Establishing interregional partnerships                                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (please specify)   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**\*E4a. If "Other", please specify.**

**E5. In which S3 sectors or areas of value chains does your region/ Member State collaborate with other regions?** Please select all that apply. Agrifood and sustainable food production

- Renewable energy and green technologies
- Advanced manufacturing and smart industry
- Blue economy
- Health and life sciences
- ICT and digitalization
- Tourism and cultural heritage
- Transport and logistics

- Other sectors (please specify)

**\*E5a. If “Other”, please specify:**

**E6. Is interregional cooperation in complementary S3 areas or value chain areas supported through S3 Thematic Platforms/Thematic Smart Specialisation Partnerships (TSSPs)?**

- Yes
- No
- I don't know

**\*E6a. If yes, which S3 Thematic Platforms/Thematic Smart Specialisation Partnerships (TSSPs) are supported?**

- Agri-food
- Energy
- Industrial Modernisation
- Sustainable Blue Economy
- I don't know

**E7 How important are the following EU funding sources in your region/ Member State for financing interregional investment projects in shared or complementary S3 areas?**

|  | Not important         | Less important        | Important             | Very important        |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| ERDF national or regional programmes                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The Interregional Innovation Investments (I3) instrument | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Interreg Europe programmes                               | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other EU instruments (e.g. Horizon Europe)               | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**E8. What specific factors, in your experience, contribute to the success of interregional cooperation in shared or complementary S3 areas?**

Please select all that apply.

- Strong governance and coordination mechanisms
- Innovation-friendly regulatory frameworks
- Access to technological tools and platforms for collaboration
- Flexibility and adaptability in project management
- Complementary innovation profiles
- Access to funding (e.g., ERDF, I3)
- Long-term commitment from all parties involved
- Engagement of diverse stakeholders (public authorities, private sector, research organisations, clusters)
- Creation of joint initiatives or pilot projects
- Others (please specify)

**\*E8a. If “Other”, please specify:**

**E9. Could you provide examples of successful ERDF-supported investments that have facilitated interregional innovation initiatives and contributed to achieving S3 objectives?**

**E10. What are the main challenges in your region/ country affecting the implementation of interregional investments under the S3 framework?**

|  | Not important         | To a minor extent     | To a large extent     | To a very large extent | I don't know          |
|--|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Insufficient funding opportunities   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Difficulty accessing EU funds  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Insufficient human resources   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Limited expertise, knowledge or experience   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Misalignment of policies, legal frameworks, or governance structures across regions                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Limited knowledge of potential partner regions' capabilities and strengths                             | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Challenges in identifying mutually beneficial areas for collaboration                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Limited opportunities for networking with potential partner regions                                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
|  |                       |                       |                       |                        |                       |
| Limited understanding across regional stakeholders of the benefits of interregional cooperation for S3 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Lack of interest or motivation from regional stakeholders to pursue collaboration                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Insufficient promotion or visibility of interregional cooperation opportunities                        | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |
| Other (please specify)   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> |

**\*E10a. If “Other”, please specify:**

**E11. What reforms, conditionality mechanisms, or existing features of ERDF programmes could be introduced/ leveraged to foster interregional innovation investments in S3 complementary areas?**

**F: Monitoring & Evaluation**

This section explores existing S3 monitoring and evaluation tools which are being implemented to measure performance towards the objectives of the strategy. We aim to gather insights on the characteristics of the applied S3 monitoring and evaluation tools and areas for improvement in the future.

**\*F0. Do you have any experience or knowledge about the monitoring and/or evaluation of the S3 in your region / Member State?**

- Yes
- No

**F1. How is your past experience with monitoring and evaluation of S3 in your Member State/region?** Please describe what has worked particularly well and where there is a need for improvement.

*General experience:*

*What went well:*

*Areas of improvement:*

**F2. Do you use indicators to monitor the progress of your S3?** If so, please select the types of indicators used.

- Input indicators (funding)
- Output indicators
- Result indicators
- Indicators that track reforms linked to the S3
- Others (please specify)
- No

**\*F2a. If "Other", please specify.**

**F2.1 Do you use indicators from the regional competitiveness index (RCI)[1] and the Regional Innovation Scoreboard[2] in your S3 monitoring?**

- Yes, we use the following indicators from the Regional competitiveness index (RCI). (Please specify below)
- Yes, we use the following indicators from the Regional Innovation Scoreboard. (Please specify below)
- No

[1] The EU Regional Competitiveness Index (RCI) is measuring the major factors of competitiveness for all the NUTS-2 level regions across the European Union. The RCI contains 3 Innovation pillars: Technological readiness, Business sophistication and Innovation (see [https://ec.europa.eu/regional\\_policy/sources/work/rci\\_2022/eu-rci2\\_0-2022\\_en.pdf](https://ec.europa.eu/regional_policy/sources/work/rci_2022/eu-rci2_0-2022_en.pdf))

[2] The EU Regional Innovation Scoreboard is measuring the innovation performance of regions across the European Union. (see [https://rese.arch-and-innovation.ec.europa.eu/document/download/5357c81b-9222-464b-8468-38ccd83b5624\\_en?filename=ec\\_rtd\\_ris-2023methodology-report.pdf](https://rese.arch-and-innovation.ec.europa.eu/document/download/5357c81b-9222-464b-8468-38ccd83b5624_en?filename=ec_rtd_ris-2023methodology-report.pdf))

**F2.1a Please select which indicators from the *Regional Competitiveness Index* you use in your S3 monitoring.**

*Technological readiness:*

- Households with broadband access
- Individuals buying over internet the last year
- Access to high-speed broadband
- Individuals with above-basic overall digital skills
- Enterprises having received orders online (at least 1 %)
- Enterprises with fixed broadband access

*Business sophistication:*

- Employment (K-N sectors)
- Gross value added (GVA) (K-N sectors)
- Innovative SMEs collaborating with others
- Marketing or organisational innovators

*Innovation:*

- Total patent applications
- Core creative class employment
- Knowledge workers
- Scientific publications
- Total intramural research and development expenditure
- Human resources in science and technology
- Employment in technology and knowledge-intensive sectors
- Trademark applications
- Design applications
- Sales of new-to-market and new-to-firms innovation

**F2.1b Please select which indicators from the *Regional Innovation Scoreboard* you use in your S3 monitoring.***Framework conditions:*

- Percentage population aged 25-34 having completed tertiary education
- Percentage population aged 25-64 participating in lifelong learning
- International scientific co-publications per million population
- Scientific publications among the top 10% most-cited publications worldwide
- Individuals who have above basic overall digital skills

*Investments:*

- R&D expenditures in the public sector as percentage of GDP
- R&D expenditures in the business sector as percentage of GDP
- Non-R&D innovation expenditures in SMEs as percentage of turnover
- Innovation expenditures per person employed in innovative SMEs
- ICT specialists (as a percentage of total employment)

*Innovation activities:*

- SMEs introducing product innovations as percentage of SMEs

- SMEs introducing business process innovations as percentage of SMEs
- Innovative SMEs collaborating with others as percentage of SMEs
- Public-private co-publications per million population
- PCT patent applications per billion regional GDP
- Trademark applications per billion regional GDP
- Design applications per billion regional GDP

*Impacts:*

- Employment in knowledge-intensive activities (percentage of total employment)
- Employment in innovative SMEs
- Sales of new-to-market and new-to-firm innovations in SMEs as percentage of turnover
- Air emissions by fine particulate matter (PM2.5) in the manufacturing sector

**F3. How openly available are S3 monitoring data/ results made?**

**F3. How openly are the data / results of the S3 monitoring made available to you as a stakeholder?**

*Please select:*

- Monitoring data/ results are presented on open platforms
- Monitoring data/ results are provided otherwise (e.g. public reports, workshops, conferences)
- Monitoring data and results are not provided openly
- Other (please specify)

**\*F3a. If "Other", please specify.** If available, please link to the relevant website/ material.

**F3.1 Please provide the name and website link of the open platform:**

**F4. How is the newly demanded S3 evaluation implemented in the M&E framework in your region/ Member State?**

- S3 evaluation and S3 monitoring are defined separately and carried out in two individual tasks
- S3 evaluations are carried out within ERDF/ ESF programme evaluations
- No clear distinction between S3 evaluation and S3 monitoring (regarding definition and implementation)
- Other (please specify)

**\*F4a. If "Other", please specify:**

**F5. What are the key features of your S3 evaluation approach? Please select the elements that are part of your S3 evaluation plan from the list below. Background and relevance of the evaluation**

- Evaluation approach
- Definition of priorities (e. g. focus on a specific issue)
- Evaluation objectives and research questions
- Methods and data requirements
- Evaluation timetable
- Indicative budget
- Other (please specify)
- No evaluation plan

**\*F5a. If "Other", please specify.**

**F6. Is the evaluation embedded in a theoretical framework? If yes, please name and briefly explain the applied framework.**

For example: an intervention logic in the form of a Theory of Change, or the Logical Framework approach.

**F7. Is the S3 evaluation linked to the S3 monitoring process and the collected data? If yes, please select from the list the corresponding items.**

- **Utilizing monitoring data:** Evaluation uses the data collected during monitoring as a primary source of information. This data provides a foundation for evaluating the project's progress, outcomes, and impact.
- **Assessing indicators:** Monitoring tracks changes in indicators over time. Evaluation then uses these indicators to measure the relevance, efficiency, effectiveness, impact, and sustainability.
- **Analysing trends:** Evaluation interprets the trends and patterns identified through monitoring to draw conclusions.
- **Informing decision-making:** Evaluation uses monitoring data to provide deeper insights for strategic decisions.
- **Adaptive management:** Monitoring provides ongoing information that can be used to adjust project activities. Evaluation then assesses the effectiveness of these adaptations.
- **Other** (please specify)
- No link.

**\*F7a. If “Other”, please specify:**

**F8. Does your organisation provide data to the S3 monitoring system of your region/ Member State?**

- Yes
- No
- I don't know

**F8a. If yes, please describe briefly which data/indicators you provide to the S3 authority of your region/ Member State.**

**F9. How are the results from S3 monitoring and/or evaluation used to improve the implementation or future refinement of the S3 in your region/ Member State?**

**F9. To the best of your knowledge, how are the results of S3 monitoring and/or evaluation used to improve the implementation or future development of the S3 in your region / Member State?**

*Please select all options that apply.*

- **Monitoring** results are used to adapt the S3 **during the programming period**
- **Monitoring** results are used in the development of the **new S3**
- **Evaluation** results are used to adapt the S3 **during the programming period**
- **Evaluation** results are used in the development of the **new S3**
- I don't know

**F10. Regarding performance-based measurements in your S3 monitoring and/or S3 evaluation: Do you measure the achievement of agreed milestones<sup>[1]</sup> and targets<sup>[2]</sup>?**

- Yes, we measure **milestones** linked to the S3 in the **monitoring approach**
- Yes, we measure **targets** linked to the S3 in the **monitoring approach**
- Yes, we measure **milestones** linked to the S3 in the **evaluation approach**
- Yes, we measure **targets** linked to the S3 in the **evaluation approach**
- No measurement of milestones and targets

<sup>[1]</sup> Milestones can be defined as administrative and procedural steps towards a measure, reform or investment (more qualitative and related to phases of implementation).

<sup>[2]</sup> Targets are linked to the expected results of a measure, and they are objectified by quantitative measurements.

**F9.1 Please indicate examples for milestones/targets linked to the S3 monitoring/evaluation model.**

**F9.2 Are the measured milestones and targets linked to the following items?**

- General S3 activities
- Reforms (see definition in Section D)
- Investments
- Other (please specify)

**\*F9.2a. If “Other”, please specify:**

**G: End**

**G1. Do you have any further remarks or comments regarding the implementation of Smart Specialisation or areas for improvement in the future model that you would like to pass on to the European Commission?**

**\*G2. In the coming weeks, we will be holding in-depth interviews with experts (lasting approx. 30-60 minutes). We would be delighted to have you on board. Would you be interested in taking part in such an interview?**

- Yes
- No

**\*G3. Please provide us with your e-mail address.** If you would like us to contact you to arrange an appointment, please agree to the use of this address.

**G4. Consent to data protection**

Please read the following information and consent to the processing of your data by ticking the box.

Your e-mail address will be collected for the registration administration. This will be used by the consortium consisting of Prognos AG & CSIL exclusively to arrange an appointment for the above-mentioned interview and will be deleted by December 2025 at the latest. Your consent can be revoked at any time with effect for the future by sending an e-mail to [datenschutz@prognos.com](mailto:datenschutz@prognos.com). Further information can be found in our privacy policy.

I hereby declare my consent to the collection and processing of my email address to the extent specified above.

**Thank you very much for taking the time to participate in our survey and providing your valuable input for the further development of the S3 framework.**

## 5.3 Annex 3: Methodology to identify and classify S3 priority areas

### Construction of the S3 priorities database

A structured database of S3 priorities for the 2021-2027 period was developed, compiling information from national and regional strategies. The most up-to-date versions of S3 strategies guiding ERDF investments for the 2021-2027 funding period were gathered from the Community of Practice (S3 CoP) portal and cross-checked against a comprehensive list provided by DG REGIO. In the rare instances where the S3 CoP did not host a specific strategy document, or the most updated version, missing information was sourced through desk research.

Four general steps were taken for the creation of S3 priorities database. First, the semantic search was performed on all S3 strategy documents to identify the parts of the strategies that are relevant for priorities extraction. The semantic search was performed by text embedding S3 strategy documents and a carefully crafted priorities-related text. Second, once the relevant parts of the strategies were identified, an LLM was utilized to extract priorities from each S3 strategy document. This process was repeated eight times until the satisfactory quality was achieved. Third, a manual verification took place in which each strategy's priorities were compared with CoP observatory priorities. In the cases where the priorities did not match, we reviewed the S3 strategy documents and identified the correct priorities. Fourth, once the list of priorities was established a second LLM was used to extract up to 15 keywords for each previously established priority. This was done by providing an LLM with a S3 strategy document and its corresponding priorities. Lastly, we manually added a few cases where it was clear for the beginning of the analysis it will not be possible to automate. This resulted in the final list of priorities and their associated keywords.

Moreover, we conducted a thorough manual review of 92% of the strategies to validate the NLP results and identify any missing priorities, particularly horizontal ones that the algorithms may have overlooked.

### Classification of S3 priorities

We developed a **keyword-based classification** approach to classify each S3 priority according to different prioritisation approaches. This classification was based on a framework which positions priorities along a spectrum from more vertical to more horizontal approaches. The initial framework was developed based on a preliminary review of a small sample of strategies. However, as we expanded our analysis to a broader set of S3 documents, we refined the classification and adjusted the definitions of different prioritisation approaches to better align with how priorities are actually defined in practice. Consequently, the classification is grounded in the full set of collected S3 priorities and their documented descriptions.

The process used to classify the priorities followed several steps:

- **Development of word ontologies:** The first step was to create an ontology of keywords (including word combinations) for potential prioritisation approaches. This set of keywords was developed by the team through a review of a sample of S3 documents and was iteratively refined as more strategies were analysed. The ontologies are presented below.

- **Data preparation process for keyword-based classification.** In this step, each word from both the ontology and the priority names was “stemmed”, meaning only the root form of each word was kept. This process, which uses Porter’s algorithm<sup>132</sup>, was essential for preparing the data for the keyword-based classification. It helped ensure that variations of the same word (e.g., “innovation” and “innovative”) would be treated as the same keyword, thus avoiding mismatches caused by different word endings.
- **Keyword matching:** A search was conducted for matches between words in the priority names and the keywords in each ontology of the prioritisation approaches.
- **Assignment of priorities:** Each priority was assigned to the prioritisation approach with the highest number of keyword matches.
- **Manual review:** Finally, the results were manually checked, and some classifications were revised, particularly in cases where more than one approach had an equal number of matching keywords.

This method ensures a balanced approach by combining both the automated classification of priorities and the in-depth review of S3 documents to inform the development of the ontologies and validate the classification, so as to reduce the risk of biased outcomes.

#### List of keywords used to classify the S3 priorities

##### 1) Priorities focused on innovation ecosystems improvement

These priorities emphasise structural improvements to innovation ecosystems. These include initiatives related to education and skills development, infrastructure enhancement, and fostering collaboration and networking, etc. – particularly relevant for regions with lower innovation capacities.

The table below shows the ontology of the key areas for improvement and related keywords. The areas of change in the table reflect the structure of Regional Innovation Scoreboard (RIS) measurement framework.

**Table 23: Ontology of keywords related to priorities focused on innovation ecosystems improvement**

| Topic  | Keywords  |
|--|---|
| Skills and education                                 | Human capital; human resources; education; higher education; educational programmes; skills; smart skills; competencies; up-skilling; re-skilling, talent; lifelong learning; training; higher-education; STEM; talent attraction, talent retention; brain drain mobility; working conditions; wage; migration; accessibility; reduction of inequalities; gender equality |
| Availability and quality of research infrastructures | Research infrastructure; innovation infrastructure; open innovation infrastructure; scientific infrastructure; research centre; R&D facilities; experimental facilities; innovation labs; digital infrastructure; FabLab; third place; scientific equipment; public research; universities; research and innovation system;   |

<sup>132</sup> <https://www.nltk.org/api/nltk.stem.porter.html>

|  |  |
|--|--|
| Access to finance  | R&I financing; innovation funding; innovation grant; innovation public investment; innovation private investment; venture capital; private equity; seed funding; loans; tax incentives; tax breaks; business angels  |
| Collaboration and stakeholders' engagement, incl. linkages between research centres/universities and enterprises | Collaborative innovation; public-private partnership; cross-sector collaboration; cross-disciplinary innovation; cross-fertilization; industrial research; collaborative R&D; co-creation; knowledge spillover; knowledge generation; knowledge transfer; technological transfer; cluster collaboration; innovation network; incubator; accelerator; university-industry linkages; innovation hubs; innovation cluster; open innovation; public engagement; coworking; technology platform; public-private partnerships governance; cooperation; collaboration; interregional collaboration; international collaboration; internationalization; internationalisation |
| Business environment with a focus on intellectual property rights protection                                     | Intellectual property rights protection; patent protection; patent culture; trade secrets; knowledge protection; intellectual property rights enforcement; regulatory barriers; legal barriers; administrative burden; regulatory compliance; safety regulation; product certification; business regulation; regulatory framework; regulatory sandboxes; taxation; productivity; quality management  |
| Demand for innovation  | Entrepreneurship; entrepreneurial culture; innovation diffusion; innovation adoption; procurement; risk aversion; risk-taking; business creation; start-ups; social innovation;  |

Source: Prognos AG/CSIL (2024).

## 2) Priorities focused on multi-sectoral transformations

As for transformational priorities, an ontology of relevant keywords that was developed for the previous study by Prognos and CSIL (2021) based on an understanding of the green and digital transition as laid out by the European Commission in central documents. The webpages and Commission documents were screened, and an automatic keyword extraction algorithm was used. This ontology has been adapted to incorporate findings from the manual review of the S3 documents. The keywords are thematically grouped into the three main transformations (see table).

**Table 24: Ontology of keywords for priorities related to multi-sectoral transformations**

| Transformation | Keywords  |
|----------------|---|
| Greening       | Green transformation; green transition; greening; sustainability; environmental sustainability; sustainable development; decarbonisation; climate; climate neutrality; CO2 emissions reduction; zero carbon emissions; carbon neutrality; carbon neutral economy; climate resilience; climate adaptation; low-carbon economy; low-emission industry; green economy; environment; technologies for the environment; green technologies; clean technologies; cleantech; clean solutions; green transformation for enterprises; recycling; circular economy; circularity; circular transition; circular products; reuse; resource recovery; resource efficiency; optimal use of resources; circular production processes; waste streams; waste minimisation; ecological transition; self-sufficiency; circularity; circularity of materials; industrial changes; industrial transition; industrial transformation; |

|                     |  |
|---------------------|--|
| Digitalisation      | Digitalization; digitalisation; digital transition; digital transformation; digital economy; smart economy; digital solutions across all sectors; digital products and platforms; digitalisation of society; technologies for digital transformation; digital technologies; technologies supporting the digital transition; technologies supporting the twin transition (green and digital); key technologies of the future; deeptech; industrial changes; industrial transition; industrial transformation;   |
| Smart manufacturing | Smart manufacturing; advanced manufacturing; industry 4.0; manufacturing 4.0; industry of tomorrow; innovative industry; industry renewal; digital industry; innovative industry; sustainable industry; business renewal; industrial automation; smart factories; intelligent production; advanced production; industrial IoT; production optimisation; sustainable production processes; renewable industry; economic modernisation; technologies and equipment for industrial transition; productivity increase; productivity; efficient resource management |

Source: Prognos AG/CSIL (2024).

### 3) Priorities related to multi-sectoral societal challenges

The ontology of relevant keywords for priorities related to multi-sectoral societal challenges was prepared using the list of societal challenges or missions identified under Horizon 2020 and Horizon Europe.<sup>133</sup>

**Table 25: Ontology of keywords for priorities related to multi-sectoral societal challenges**

| Societal challenge   | Keywords  |
|--|---|
| Health, demographic change and wellbeing   | Health and wellbeing; wellbeing; well-being active and healthy aging; city of people; silver economy; prevention; welfare; health and quality of life; well-being technologies; healthy lifestyles; healthcare; health and medicine; e-health; health and life sciences; life sciences  |
| Europe in a changing world - inclusive, innovative and reflective societies  | Social innovation; social innovation and citizenship; social inclusion; social economy; social innovations; solidarity; social and solidary economy; social development ecosystem;  |
| Secure societies - protecting freedom and security of Europe and its citizens  | Security; safety; civil security; secure technologies; security and dual use;   |
| Smart, green and integrated transport  | Environmentally friendly transport; sustainable urban flows; inclusive urban space; sustainable mobility; integrated mobility; connected mobility; mobility industries and environment; sustainable mobility and tourism; sustainable and intelligent mobility and logistics; mobility and logistics; sustainable mobility; mobility; |
| Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy | Bioeconomy; sustainable bioeconomy; bioeconomy and circular economy; bioeconomy and biotechnology; food security; nutrition; natural resources; Naturalness; bio-based industries; valorisation of local resource; protection and   |

<sup>133</sup> While the solutions to complex societal challenges may depend on advancements within particular sectors or technologies (see below 4) sectoral / technological specific priorities), this category includes priorities that are framed in broader, thematic terms, typically encompassing multiple sectors or technologies to address societal goals.

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preservation of environment and biodiversity; blue economy; sea economy; blue growth; alpine technologies;

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Source: Prognos AG/CSIL (2024).

To further link S3 priorities with economic, scientific and technological fields, we employed a text-embedding approach to **semantically link** identified S3 priorities with Nomenclature of Economic Activities (NACE)<sup>134</sup>, Fields of Research (FOR)<sup>135</sup> and World Intellectual Property Organisation (WIPO) Technology Fields<sup>136</sup>.

The following keywords of the economic, scientific and technological fields were used to establish a link with S3 priorities and their associated keywords. The keywords were produced by an LLM. Given the wide-spread usage of the NACE, FOR and Technology Fields on the internet, LLM produced highly related keywords. In fact, based on our testing, the matching with the LLM generated keywords produced better results than the official descriptions of the economic, scientific and technology fields that for such an exercise are needlessly detailed and unstructured.

In short, the S3 priority keywords and economic, scientific and technology fields keywords were text-embedded and used to calculate similarity scores which were then further used to identify the most likely matches. After each iteration the results were manually reviewed and with the detection of any inconsistencies or mistakes the process was repeated until the satisfactory quality of the results was reached.

#### **Table 26: The NACE Division (2-digit code level) keywords used for linking S3 priorities**

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<sup>134</sup> See Eurostat (2008). NACE Rev. 2 - Statistical classification of economic activities in the European Community, Publications Office of the European Union, Luxembourg, 2008, ISBN 978-92-79-04741-1.

<sup>135</sup> See [Australian and New Zealand Standard Research Classification \(ANZSRC\), 2020 | Australian Bureau of Statistics](#).

<sup>136</sup> Schmoch, Ulrich. 2008. 'Concept of a Technology Classification for Country Comparisons - Final Report'. [https://www.wipo.int/export/sites/www/ipstats/en/statistics/patents/pdf/wipo\\_ipc\\_technology.pdf](https://www.wipo.int/export/sites/www/ipstats/en/statistics/patents/pdf/wipo_ipc_technology.pdf).

| Code | Division   | Keywords   |
|------|--|--|
| 01   | Crop and animal production, hunting and related service activities | agriculture, farming, livestock, crop production, animal husbandry, hunting, fishing, orchard, grain farming, dairy farming, poultry production, soil management, sustainable agriculture, agricultural technology, organic farming, pesticides, fertilizers, agriculture services, veterinary services, beekeeping, aquaculture, farm machinery, harvesting, crop rotation, field management, ranching, agricultural research, biofuels, farmers markets, land management   |
| 02   | Forestry and logging   | forestry, logging, timber, sawmills, wood production, forest management, reforestation, sustainable forestry, woodland, wildlife habitat, wood processing, tree harvesting, environmental conservation, forest preservation, biodiversity, land management, wood products, forestry equipment, logging operations, non-timber forest products, deforestation, urban forestry, forest policy, carbon sequestration, ecosystem services, community forestry, certified timber, forest economics, forest restoration, timberland management |
| 03   | Fishing and aquaculture  | fishing, aquaculture, marine fishing, freshwater fishing, fish farming, seafood, sustainable fishing, commercial fishing, recreational fishing, aquatic species, catching fish, fish hatcheries, ocean fishing, pond farming, aquatic ecosystems, fisheries management, fish processing, wild caught, breeding aquaculture, fishing gear, net fishing, trawling, aquaculture techniques, marine biodiversity, fish stocks, environmental impact, fed aquaculture, fish health, harvesting seafood  |
| 05   | Mining of coal and lignite   | coal mining, lignite extraction, mineral resources, coal industry, energy production, fossil fuels, mining operations, subsurface mining, surface mining, coal seams, coal processing, environmental impact, coal transport, fluctuating prices, mining regulations, safety standards, geological surveys, underground mining, open-pit mining, mine reclamation, coal reserves, coal power plants, thermal coal, coking coal, coal quality, carbon emissions, sustainable mining, worker safety, mining equipment, mining technology    |
| 06   | Extraction of crude petroleum and natural gas                      | crude petroleum, natural gas, extraction, drilling, oil reserves, gas reserves, hydrocarbons, petroleum industry, offshore drilling, onshore drilling, exploration, geological surveys, oil fields, gas fields, production techniques, petroleum refining, energy sector, fossil fuels, pipeline transport, upstream operations, downstream operations, seismic surveys, well completion, reservoir engineering, oil rigs, gas processing, resource management, environmental impact, economic significance, global markets              |
| 07   | Mining of metal ores   | metal mining, ore extraction, mineral resources, metal ores, iron ore, copper ore, aluminium mining, zinc mining, nickel mining, mining industry, mine operations, geological exploration, mineral processing, resource extraction, open-pit mining, underground mining, mining technology, metal recovery, sustainable mining, mining regulations, mineral rights, environmental impact, Ore quality, geology, sampling techniques, mining equipment, mine safety, economic minerals, processing plants                                 |
| 08   | Other mining and quarrying   | mining, quarrying, mineral extraction, resource extraction, sand quarrying, gravel mining, stone mining, clay extraction, industrial minerals, quarry operations, non-metallic minerals, gemstone mining, coal mining, environmental impact, rehabilitation, ore processing, blasting, stripping, excavation, mining technology, safety regulations, land use, mineral resources, geological surveys, site management, water management, dust control, mining equipment, market trends, sustainable practices                            |

| Code | Division   | Keywords   |
|------|--|--|
| 09   | Mining support service activities                              | mining, support services, exploration, drilling, geological survey, mineral extraction, mining technology, site preparation, mining equipment, environmental management, safety services, mining consultancy, workforce management, mining logistics, resource management, data analysis, site rehabilitation, regulatory compliance, mining operations, geotechnical services, mining assessments, production planning, mining infrastructure, contract mining, ore processing, site maintenance, hydrocarbon extraction, mineral analysis, technical services, supply chain management |
| 10   | Manufacture of food products                                   | food manufacturing, cereal production, dairy processing, meat processing, bakery products, beverage production, packed foods, snack foods, preserved foods, fermented products, condiments, organic foods, frozen foods, canned foods, sugar production, chocolate manufacturing, seafood processing, fruit and vegetable processing, grain milling, spice production, food safety, nutritional products, ready-to-eat meals, plant-based foods, food packaging, wholesale food distribution, sourcing ingredients, food technology, international food trade, culinary innovation       |
| 11   | Manufacture of beverages                                       | beverages, manufacturing, fermented drinks, non-alcoholic drinks, alcoholic beverages, soft drinks, energy drinks, water bottling, juice production, tea processing, coffee roasting, distillation, brewing, packaging, quality control, flavouring, carbonation, sugar syrups, natural ingredients, food safety, market trends, export regulations, wholesale distribution, sustainable practices, branding, marketing, consumer preferences, innovation, production efficiency, cost management  |
| 12   | Manufacture of tobacco products                                | cigarettes, tobacco, snuff, cigar, smokeless, tobacco leaf, processing, blending, flavours, nicotine, packaging, distribution, production, filters, chewing tobacco, roll-your-own, premium cigars, tobacco industry, health regulations, marketing, tobacco control, import/export, agricultural practices, consumer products, additives, smoking accessories, sustainability, research and development, trends, e-cigarettes   |
| 13   | Manufacture of textiles  | textiles, fabric production, clothing manufacturing, textile design, knitting, weaving, dying process, textile industry, apparel, textile machinery, cotton processing, synthetic fibres, textile finishing, nonwovens, geotextiles, technical textiles, woven fabrics, textile dyeing, fibre production, fashion textiles, textile supply chain, sustainable textiles, textile innovation, textile sourcing, historical textiles, automated textile production, textile quality control, clothing accessories, textile market trends, textile waste management                          |
| 14   | Manufacture of wearing apparel                                 | clothing, apparel, fashion, design, textiles, garments, tailoring, sewing, production, manufacturing, retail, uniforms, accessories, workwear, sportswear, textile industry, leather goods, outerwear, fabrics, patterns, quality control, supply chain, trends, fast fashion, sustainable apparel, customization, wholesale, market segmentation, eco-friendly, clothing brands   |
| 15   | Manufacture of leather and related products of other materials | leather, manufacturing, footwear, handbags, belts, jackets, wallets, accessories, upholstery, animal hides, tanning, synthetic materials, textile integration, quality control, production processes, craftsmanship, durability, fashion, customization, sustainability, eco-friendly, raw materials, design, wholesaling, retail, distribution, market trends, export, innovation, technology adoption, branding  |

| Code | Division  | Keywords   |
|------|---|--|
| 16   | Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials | wood, wood products, cork, cork products, plywood, particle board, wood panels, wooden structures, wooden packaging, wood preservation, wood composites, sawdust, wood milling, wood turning, joinery, wood veneers, wood carving, straw products, woven straw, plaiting materials, wooden toys, biodegradable products, eco-friendly materials, wooden crafts, renewable resources, forest products, sustainable forestry, woodworking, wood industry, craftsmanship  |
| 17   | Manufacture of paper and paper products   | paper manufacturing, paper products, pulp production, recycling paper, printing paper, kraft paper, cardboard, notebooks, packaging solutions, writing materials, newsprint, paperboard, stationery, paper mills, paper cups, biodegradable paper, specialty papers, paper bags, custom packaging, corrugated boxes, copy paper, toilet paper, tissue paper, paper industry, sustainability, forest management, digital printing, paper coating, lamination, paper machinery   |
| 18   | Printing and reproduction of recorded media   | printing, reproduction, recorded media, graphics, publishing, offset printing, digital printing, flexographic printing, screen printing, photo printing, label printing, book printing, magazine printing, packaging printing, commercial printing, printing technology, prepress, post-press, bindery, media copying, audio reproduction, video reproduction, data storage media, inkjet printing, toner cartridge, graphic design, colour management, print production, media duplication, print sales   |
| 19   | Manufacture of coke and refined petroleum products  | coke production, petroleum refining, oil industry, hydrocarbons, crude oil, fuel production, petroleum derivatives, chemical processes, energy sector, refinery operations, oil refining technology, environmental impact, petrochemicals, biodiesel production, gasoline manufacturing, fuel additives, asphalt production, natural gas, synthetic fuels, refined oils, distillation processes, petroleum exploration, sustainability in refining, global oil market, refinery safety, process optimization, emission control, oil and gas supply chain, refinery maintenance, advanced refining technologies |
| 20   | Manufacture of chemicals and chemical products  | chemicals, chemical products, manufacturing, synthesis, industrial chemicals, organic chemicals, inorganic chemicals, petrochemicals, pharmaceuticals, fertilizers, pesticides, cosmetics, plastics, resins, solvents, biochemicals, polymers, cleaning agents, additives, chemical processing   |
| 21   | Manufacture of basic pharmaceutical products and pharmaceutical preparations  | pharmaceuticals, medications, drug manufacturing, active ingredients, formulations, biotechnology, healthcare products, prescription drugs, over-the-counter medications, pharma industry, biopharmaceuticals, chemical compounds, medical supplies, clinical trials, quality control, research and development, pharmacology, drug safety, packaging, regulatory compliance, pharmaceutical technology, therapeutics, production facilities, wholesale pharmaceuticals, pharmaceutical distribution, market access, innovation, dosage forms, medical research, supply chain management                       |
| 22   | Manufacture of rubber and plastic products  | rubber, plastic, manufacturing, production, industry, polymers, extrusion, moulding, composite materials, synthetic rubber, natural rubber, plastic injection, thermoplastics, thermosetting plastics, materials science, industrial design, automotive parts, packaging solutions, medical devices, consumer goods, construction materials, adhesives, coatings, recycling, biodegradable plastics, textiles, tire manufacturing, sealants, machinery, quality control  |

| Code | Division   | Keywords  |
|------|--|---|
| 23   | Manufacture of other non-metallic mineral products                       | non-metallic minerals, manufacturing, glass production, ceramics, clay products, lime production, cement, aggregate, insulation materials, silica sand, mineral aggregates, tiles, bricks, enamels, pottery, stone processing, asphalt, synthetic mineral products, related services, natural stone, quarries, mineral extraction, refractories, construction materials, fertilizers, paving, chemical products, dental ceramics, safeguarding minerals   |
| 24   | Manufacture of basic metals  | metallurgy, steel production, non-ferrous metals, iron casting, aluminium processing, copper refining, metal alloys, foundry, smelting, rolling mills, metal fabrication, casting techniques, metal extraction, industrial metals, ferrous metals, metal recycling, forging, metal shaping, welding techniques, annealing, heat treatment, surface coating, mining operations, metalworking, quality control, machining, production efficiency, sustainability in metals, specialty metals, composite materials   |
| 25   | Manufacture of fabricated metal products, except machinery and equipment | fabricated metal products, metalworking, metal fabrication, sheet metal, welding, metal stamping, metal forming, metal casting, machining, metal cutting, assembly, surface treatment, finishing, metal alloys, structural steel, custom fabrication, industrial design, product development, tooling, quality control, welding techniques, metal recovery, production processes, precision engineering, contract manufacturing   |
| 26   | Manufacture of computer, electronic and optical products                 | electronics, optical products, computer manufacturing, semiconductors, software, hardware, microelectronics, circuit boards, telecommunications, data storage, display technology, sensors, communication devices, robotics, embedded systems, integrated circuits, consumer electronics, cloud computing, artificial intelligence, automation, networking equipment, data processing, electronic components, photonic devices, precision instruments, industrial electronics, smart devices, IoT, wearable technology, renewable energy technology                                     |
| 27   | Manufacture of electrical equipment                                      | Electrical manufacturing, Circuit breakers, Transformers, Motors, Generators, Electrical components, Power tools, Control systems, Wiring devices, Electrical connectors, Capacitors, Switchgear, Coils, Batteries, Relay systems, Lighting fixtures, Power distribution, Measurement devices, Industrial electronics, Home appliances, Telecommunications equipment, Energy management, Renewable energy solutions, Robotics, Automation technology, HVAC systems, Electrical installation, Electrical safety devices, Electromechanical devices, Signal processing, Testing equipment |
| 28   | Manufacture of machinery and equipment n.e.c.                            | machinery, equipment, manufacturing, industrial machinery, automation, robotics, engineering, tooling, production machinery, process equipment, heavy machinery, mechanical engineering, precision tools, CNC machines, packaging machinery, agricultural machinery, construction equipment, aerospace components, electrical machinery, power tools, material handling equipment, maintenance equipment, machinery assembly, custom machinery, machine tools, textile machinery, food processing equipment, machine parts, industrial automation, equipment repair                     |
| 29   | Manufacture of motor vehicles, trailers and semi-trailers                | automobiles, motor vehicles, trucks, trailers, semi-trailers, vehicle manufacturing, automotive industry, car production, electric vehicles, vehicle assembly, automobile parts, engine manufacturing, car chassis, heavy vehicles, light vehicles, vehicle design, safety features, fuel efficiency, truck trailers, bus manufacturing, motorcycle production, commercial vehicles, transportation equipment, automotive technology, supply chain management, vehicle testing, emission standards, automotive aftermarket, industrial vehicles, driving technology                     |

| Code | Division  | Keywords   |
|------|---|--|
| 30   | Manufacture of other transport equipment                        | aerospace, marine, automotive, railway, bicycle, motorcycle, bus, trailer, vessel, aircraft, spacecraft, transportation, parts manufacturing, engine assembly, carbon fibre, aerodynamics, navigation systems, logistics, safety equipment, transport design, prototype development, sustainable transport, electric vehicles, fleet management, road safety, heavy machinery, custom fabrication, quality control, composite materials, innovation  |
| 31   | Manufacture of furniture  | furniture, manufacturing, woodworking, design, upholstery, interior design, home decor, commercial furniture, custom furniture, sustainable materials, ergonomic design, furniture accessories, production techniques, craftsmanship, assembly, retail furniture, outdoor furniture, office furniture, bedding, millwork, case goods, finishing, textiles, furniture hardware, kitchen cabinets, furniture trends, modern furniture, vintage furniture, repurposed materials, furniture quality  |
| 32   | Other manufacturing   | manufacturing, production, assembly, crafts, custom fabrication, industrial equipment, precision engineering, textiles, woodworking, jewellery making, metal fabrication, composite materials, 3D printing, moulds, die casting, prototype development, handcrafted items, sustainable manufacturing, electronics, specialty chemicals, adhesives, consumer goods, tools, machinery, technical ceramics, bamboo products, artisanal goods, batteries, furniture, home decor  |
| 33   | Repair, maintenance and installation of machinery and equipment | repair, maintenance, installation, machinery, equipment, servicing, mechanical, electrical, industrial, tools, technicians, upkeep, troubleshooting, repairs, residential, commercial, overhauling, refurbishment, replacement, diagnostics, safety, preventive, predictive, components, machinery breakdown, emergency repairs, service contracts, quality assurance, parts supply, technical support   |
| 35   | Electricity, gas, steam, and air conditioning supply            | electricity, gas, steam, air conditioning, energy supply, utility services, renewable energy, power generation, electric power, natural gas, steam production, cooling systems, heat supply, energy distribution, infrastructure, smart grids, energy efficiency, emission reduction, sustainable energy, fossil fuels, energy management, energy consumption, district heating, thermoelectric, cogeneration, biomass energy, hydropower, solar energy, wind energy, electrical services  |
| 36   | Water collection, treatment, and supply                         | water collection, water treatment, water supply, drinking water, wastewater management, water purification, filtration, pipe distribution, aqueducts, water reservoirs, desalination, groundwater extraction, water quality monitoring, hydrological studies, rainwater harvesting, sewage treatment, recycling water, water service providers, pipeline maintenance, treatment facilities, municipal water systems, industrial water use, environmental impact, water conservation, infrastructure development, stormwater management, public health, regulatory compliance, sustainable water practices, hydraulic engineering |
| 37   | Sewerage  | Sewerage, Wastewater Management, Sanitation, Waste Treatment, Sewage Disposal, Water Recycling, Effluent Treatment, Drainage Systems, Septage Management, Stormwater Management, Pollution Control, Sewer Systems, Wastewater Infrastructure, Groundwater Protection, Public Health, Environmental Compliance, Sustainable Water Practices, Liquid Waste, Collections Systems, Waste Processing, Treatment Plants, Industrial Waste, Sludge Management, Bio-solids, Contaminated Water, Pipeline Maintenance, Drain Cleaning, Odor Control, Flow Management, Waste Reduction   |

| Code | Division   | Keywords   |
|------|--|--|
| 38   | Waste collection, recovery, and disposal activities                  | waste collection, waste disposal, waste recovery, recycling, landfill, hazardous waste, solid waste, industrial waste, electronic waste, composting, waste treatment, waste management, biodegradable waste, waste segregation, organic waste, waste minimization, circular economy, environmental protection, waste processing, landfill management, resource recovery, pollution prevention, waste reduction, sustainable waste practices, e-waste recycling, waste transfer stations, waste transportation, waste audits, community recycling, waste regulations  |
| 39   | Remediation activities and other waste management service activities | remediation, waste management, hazardous waste, environmental cleanup, recycling services, waste disposal, soil remediation, water treatment, industrial waste, e-waste management, contaminated land, environmental assessment, waste minimization, pollution control, sanitation services, sustainable waste solutions, waste recycling, decommissioning, waste audit, landfill management, biohazard cleanup, environmental engineering, waste-to-energy, circular economy, brownfield redevelopment, landfill diversion, wastes of concern, waste collection, municipal waste management, environmental regulations                                    |
| 41   | Construction of residential and non-residential buildings            | Construction, Residential Buildings, Non-Residential Buildings, Building Services, Site Preparation, Building Design, Construction Materials, Project Management, Structural Engineering, Architectural Services, Urban Development, Renovation, Sustainable Building, Construction Safety, Cost Estimation, Contract Management, Construction Techniques, Real Estate Development, Pre-construction Planning, Building Inspection, Interior Design, Construction Codes, Commercial Construction, Residential Development, Building Regulations, Infrastructure Development, Quality Control, Construction Equipment, Environmental Impact, Green Building |
| 42   | Civil engineering  | construction, infrastructure, project management, roadways, bridges, public works, urban development, geotechnical, environmental engineering, transportation, surveying, water resources, structural engineering, site development, construction materials, civil design, quality assurance, pavement engineering, engineering consultancy, building codes, land use planning, cost estimation, sustainability, soil mechanics, flood control, traffic engineering, construction safety, drainage systems, urban planning, facility management  |
| 43   | Specialised construction activities                                  | specialised construction, construction activities, contractors, renovation, building services, infrastructure, project management, construction management, civil engineering, construction techniques, demolition services, scaffolding, landscaping, excavation, site preparation, foundation work, tiling, plumbing, electrical services, HVAC installation, masonry, carpentry, interior finishing, road construction, paving, insulation, waterproofing, welding, steelwork, construction consulting  |
| 46   | Wholesale trade  | Wholesale, Trade, Distribution, Retail, Commerce, Merchandising, Supply Chain, Logistics, B2B, Bulk Sales, Export, Import, Dealers, Market Analysis, Inventory Management, Price Negotiation, Sales Strategy, Consumer Goods, Wholesale Agents, Trade Financing, E-commerce, Channel Management, Product Sourcing, Warehouse Management, Trade Shows, Business Transactions, Financial Services, Market Access, Drop Shipping, Wholesale Networks  |

| Code | Division  | Keywords  |
|------|---|---|
| 47   | Retail trade  | retail, trade, consumer goods, shopping, store, merchandise, clothing, electronics, supermarket, grocery, department store, e-commerce, wholesale, discount store, customer service, inventory, sales, point of sale, online shopping, boutique, specialty store, franchise, shopping mall, hypermarket, retail marketing, product display, service industries, cash register, shopping experience, local businesses  |
| 49   | Land transport and transport via pipelines                      | land transport, transportation, pipelines, logistics, freight transport, public transportation, roadways, railways, transit, cargo, shipping, transport services, vehicle transport, commuting, underground rail, long-distance transport, urban transport, rural transport, goods movement, transport networks, transport infrastructure, pipeline transport, intermodal transport, transport efficiency, traffic management, vehicle fleet, specialised transport, heavy haulage, transport regulation, transport safety, transport technology                            |
| 50   | Water transport   | water transport, shipping, maritime, freight, cargo, boats, vessels, navigation, harbours, ports, river transport, ferry services, ocean shipping, logistics, container shipping, fishing, passenger transport, coastal shipping, barge transport, shipping lines, naval transport, shipbuilding, seafarers, marine services, tugs, bulk carriers, international waters, marine trade, navigation services, transportation logistics  |
| 51   | Air transport   | airlines, aviation, passenger transport, cargo transport, air freight, airports, flight operations, air traffic control, air safety, aircraft maintenance, ticketing, flight scheduling, air travel, logistics, airline management, ground handling, jet fuel, airport services, security screening, boarding processes, international flights, charter flights, airline alliances, directory services, baggage handling, customs clearance, airline tariffs, travel agencies, route planning   |
| 52   | Warehousing, storage, and support activities for transportation | warehousing, storage, transportation, logistics, supply chain, inventory management, distribution, freight handling, cargo services, material handling, third-party logistics, container storage, packaging services, cold storage, fulfilment centre, order processing, transport support, shipment tracking, loading and unloading, transportation planning, cross-docking, safety regulations, dock management, transportation infrastructure, automated storage, warehouse operations, delivery services, supply chain optimization, asset management, warehouse safety |
| 53   | Postal and courier activities                                   | postal services, courier services, mail delivery, parcel shipping, express delivery, postal logistics, address verification, postal routes, international shipping, package tracking, last-mile delivery, mail sorting, postal regulations, courier fleet management, drop-off points, bulk mailing, letter distribution, postal network, transit times, delivery notifications, registered mail, return services, same-day delivery, postal automation, customs clearance, mail forwarding, secure shipping, postal operations, customer service, supply chain logistics   |
| 55   | Accommodation   | hotels, motels, bed and breakfast, resorts, hostels, guesthouses, lodging, hospitality, travel accommodation, short-term rentals, vacation homes, self-catering, business travel, event hosting, conferences, catering services, room service, online booking, hotel management, concierge services, tourism, destination accommodation, luxury hotels, eco-friendly lodging, budget accommodation, service apartments, timeshare, holiday parks, campgrounds, business accommodations  |

| Code | Division   | Keywords   |
|------|--|--|
| 56   | Food and beverage service activities   | restaurants, cafes, bars, food service, beverages, catering, fast food, fine dining, takeout, delivery services, coffee shops, pubs, food trucks, buffets, breakfast service, lunch service, dinner service, meal preparation, banquets, event catering, wine service, cocktail service, customer service, menu planning, table service, hospitality, themed restaurants, quick service restaurants, food safety, beverage management  |
| 58   | Publishing activities  | Publishing, Books, Magazines, Newspapers, Digital media, Content creation, Editing, Graphic design, Print production, E-books, Journalism, Distribution, Copyright, Editorial services, Typesetting, Marketing materials, Freelance writing, Copyediting, Proofreading, Self-publishing, Literary agents, Research, Press releases, Online publishing, Multimedia, Content management, Author services, Subscription services, News aggregators, Publishing software   |
| 59   | Motion picture, video and television programme production, sound recording and music publishing activities | motion picture, video production, television production, sound recording, music publishing, film industry, broadcast media, digital media, entertainment, audio recording, post-production, film editing, television programs, record labels, film distribution, content creation, documentary production, animation studios, music videos, live sound, music composition, theatrical releases, audiobooks, sound engineering, media production, scriptwriting, cinematography, voice-over production, video editing, broadcasting   |
| 60   | Programming, broadcasting, news agency and other content distribution activities                           | Programming, Broadcasting, News Agency, Content Distribution, Television Production, Radio Broadcasting, Movie Production, Digital Media, Content Creation, Streaming Services, Video Production, Audio Production, Media Planning, Advertising, Journalism, News Reporting, Social Media Content, Podcasting, Content Marketing, Documentary Production, Live Streaming, Creative Writing, Scriptwriting, Public Relations, Media Distribution, Television Networks, Online Broadcasting, Press Releases, Media Production, Entertainment   |
| 61   | Telecommunication  | telecommunication, telecom, phone services, internet services, data transmission, wireless communication, broadband, mobile networks, satellite communication, VoIP, telephony, fibre optics, network infrastructure, cable television, digital communication, telecom equipment, telecommuting, signal processing, telecom regulation, 5G technology, connectivity, communication networks, mobile services, customer service, telecom consulting, telecom security, network management, telecom infrastructure, international call services, telecom innovation                                      |
| 62   | Computer programming, consultancy, and related activities  | software development, IT consultancy, system analysis, application programming, web development, database management, cloud services, cybersecurity, technical support, project management, software engineering, data analysis, user experience, mobile app development, network design, information technology, IT project consulting, software testing, agile methodology, DevOps, artificial intelligence, machine learning, blockchain technology, digital transformation, business intelligence, ERP solutions, frontend development, backend development, API integration, open source software |
| 63   | Computing infrastructure, data processing, hosting, and other information service activities               | data processing, cloud computing, web hosting, IT services, information technology, data management, server hosting, data storage, network security, software as a service, managed services, IT infrastructure, database management, big data analytics, virtualisation, cybersecurity, business intelligence, data analytics, disaster recovery, information systems, backup and recovery, digital services, data centre operations, technical support, application hosting, internet services, telecommunications, software solutions, system integration, IT consulting                            |

| Code | Division   | Keywords   |
|------|--|--|
| 64   | Financial service activities, except insurance and pension funding             | financial services, banking, investment, assets management, securities, financial consulting, trading, credit institutions, money market, retail banking, corporate finance, capital markets, financial planning, wealth management, loan services, payment processing, foreign exchange, portfolio management, financial analysis, credit rating, financial advisory, venture capital, fund management, hedge funds, private equity, currency exchange, financial technology, regulatory compliance, market research, financial regulation, debt management   |
| 65   | Insurance, reinsurance, and pension funding, except compulsory social security | Insurance, Reinsurance, Pension Funding, Financial Services, Risk Management, Underwriting, Claims Processing, Investment Management, Actuarial Services, Life Insurance, Health Insurance, Property Insurance, Liability Insurance, Reinsurance Contracts, Pension Plans, Retirement Savings, Employee Benefits, Social Security Alternatives, Insurance Brokers, Insurance Adjusters, Insurance Agents, Pension Schemes, Asset Management, Financial Risk Assessment, Premium Collection, Risk Assessment, Regulatory Compliance, Customer Service, Insurance Policies, Financial Security   |
| 66   | Activities auxiliary to financial services and insurance activities            | financial services, insurance activities, finance, investment, banking, risk management, portfolio management, claims processing, underwriting, brokerage, financial analysis, investment advisory, asset management, compliance, money management, financial planning, pension funds, insurance brokerage, reinsurance, financial consulting, actuarial services, financial technology, payment processing, credit ratings, customer service, financial reporting, wealth management, fund administration, liquidation services, insurance underwriting   |
| 68   | Real estate activities   | real estate, property management, real estate investment, residential real estate, commercial real estate, real estate development, real estate brokerage, property appraisal, leasing, real estate marketing, land development, building sales, tenant representation, real estate transactions, property management services, real estate services, property valuation, housing market, real estate consultancy, investment properties, landlord services, real estate analysis, commercial leasing, real estate regulations, real estate financing, property maintenance, condominium management, real estate listings, real estate agents, title services  |
| 69   | Legal and accounting activities  | Legal services, Accounting services, Tax advisory, Corporate law, Litigation support, Auditing, Bookkeeping, Compliance management, Contract management, Financial consulting, Intellectual property, Real estate law, Family law, Criminal law, Labour law, Financial auditing, Management consulting, Tax compliance, International law, Employment law, Notary services, Forensic accounting, Business law, Accounting software, Legal consulting, Estate planning, Corporate governance, Risk management, Mediation services, Tax planning   |
| 70   | Activities of head offices and management consultancy                          | management consultancy, head office activities, strategic planning, business advisory, corporate management, organisational development, executive management, consulting services, business growth strategies, financial advisory, project management, risk management, business efficiency, performance improvement, market analysis, leadership development, organisational restructuring, business process optimization, client relationship management, staff training, change management, competitive analysis, business audits, management training, resource allocation, stakeholder engagement, strategic partnerships, compliance consulting, business development, management information systems |

| Code | Division   | Keywords   |
|------|--|--|
| 71   | Architectural and engineering activities; technical testing and analysis | architectural design, engineering services, technical analysis, testing services, architectural consultancy, engineering consultancy, project management, building survey, environmental impact assessment, structural engineering, civil engineering, mechanical engineering, electrical engineering, quality control, material testing, safety assessments, geotechnical analysis, urban planning, land surveying, 3D modelling, CAD services, feasibility studies, risk assessments, environmental engineering, molecular testing, prototype development, system analysis, construction management, regulatory compliance |
| 72   | Scientific research and development                                      | research, development, innovation, technology, laboratories, scientific studies, biotechnology, social sciences, engineering, data analysis, methodology, experimentation, research projects, academic research, applied science, fundamental research, clinical trials, environmental studies, market research, statistical modelling, research institutions, intellectual property, collaborative research, grant funding, scientific publications, peer review, data collection, hypothesis testing, science policy, technological advancement  |
| 73   | Activities of advertising, market research and public relations          | advertising, market research, public relations, branding, campaign management, digital marketing, market analysis, consumer behaviour, media planning, social media strategy, content marketing, publicity, advertising strategy, analytics, target audience, customer insights, surveys, focus groups, b2b marketing, b2c marketing, event marketing, SEO, SEM, advertising agencies, communication strategy, reputation management, creative services, promotions, advertising tools, data-driven marketing  |
| 74   | Other professional, scientific and technical activities                  | consulting, research, scientific, engineering, technical, development, design, innovation, analysis, laboratories, project management, environmental services, market research, quality assurance, IT services, patent services, data analysis, social research, statistical services, academic services, healthcare consulting, legal services, surveying, architecture, biotechnology, accounting services, training, auditing, forensic services, policy development  |
| 75   | Veterinary activities  | Veterinary, Animal care, Pet healthcare, Veterinary services, Animal hospitals, Veterinary clinics, Animal surgery, Pet nutrition, Animal behaviour, Vaccination, Veterinary diagnostics, Veterinary medicine, Animal welfare, Companion animals, Emergency veterinary care, Veterinary research, Farm animal health, Equine veterinary, Pet grooming, Veterinary education, Clinical pathology, Veterinary technology, Animal rehabilitation, Zoos veterinary care, Wildlife veterinary, Euthanasia services, Preventative care, Veterinary pharmaceuticals, Veterinary consultancy, Pet insurance                          |
| 77   | Rental and leasing activities  | Rental, Leasing, Property Rental, Vehicle Rental, Equipment Leasing, Short-term Rentals, Long-term Leasing, Commercial Leasing, Residential Rental, Car Leasing, Asset Leasing, Leasing Services, Rental Agreements, Lease Contracts, Rental Businesses, Property Management, Fleet Leasing, Consumer Rentals, Business Rentals, Furniture Rental, Office Space Leasing, Real Estate Leasing, Lease-to-Own, Subleasing, Renting Equipment, Real Estate Rental, Public Transport Leasing, Rental Platforms, Leasing Industry, Rental Market   |
| 78   | Employment activities  | employment, recruitment, staffing, human resources, job placement, workforce, talent acquisition, employee relations, labour market, job training, onboarding, consulting, skills assessment, career counselling, temporary staffing, permanent placement, performance evaluation, payroll services, employment services, headhunting, staff augmentation, talent management, labour relations, job fairs, benefits administration, compliance, workforce planning, diversity hiring, employee development, succession planning  |

| Code | Division  | Keywords   |
|------|---|--|
| 79   | Travel agency, tour operator and other reservation service and related activities | travel agency, tour operator, reservation service, booking services, holiday packages, travel planning, itinerary management, group travel, business travel, travel consultancy, destination management, travel insurance, customer service, online travel agencies, ticketing services, travel accommodations, vacation rentals, transportation services, guided tours, travel promotions, local attractions, sightseeing tours, vacation packages, event planning, travel coordination, travel logistics, adventure travel, cultural tourism, travel advice, expedition services                                   |
| 80   | Investigation and security activities   | investigation, security, activities, private security, crime prevention, loss prevention, surveillance, risk assessment, background checks, security consulting, guard services, physical security, cybersecurity, forensic analysis, intelligence gathering, threat detection, asset protection, brand protection, emergency response, investigative services, verification, monitoring, data protection, incident response, personal security, physical access control, threat analysis, security audits, digital forensics, patrol services   |
| 81   | Services to buildings and landscape activities                                    | building services, landscape management, cleaning services, maintenance activities, landscape design, gardening, groundskeeping, property management, landscape construction, pest control, janitorial services, snow removal, exterior maintenance, interior maintenance, utility services, environmental services, landscaping supplies, fertilization, grounds maintenance, tree care, irrigation systems, fencing services, hardscaping, outdoor lighting, facility management, waste management, lawn care, public space maintenance, urban forestry, land use management                                       |
| 82   | Office administrative, office support and other business support activities       | office administration, business support, office management, administrative services, secretarial services, data entry, customer service, office supplies, financial administration, project management, human resources support, business consulting, document management, office organisation, staff training, virtual assistance, call centre operations, meeting coordination, office equipment, business logistics, report generation, scheduling services, clerical work, company policies, office procedures, workflow optimization, mail handling, client relations, budgeting support, government compliance |
| 84   | Public administration and defence; compulsory social security                     | public administration, defence, compulsory social security, government services, military, civil service, social welfare, policy making, legal enforcement, public safety, veteran affairs, administrative services, tax collection, law enforcement, regulatory agencies, national security, public finance, civic engagement, emergency management, public health, local government, civil rights, social justice, pension schemes, employment services, grant management, international relations, community development, citizen services, infrastructure development  |
| 85   | Education   | Education, Schools, Higher Education, Vocational Training, Adult Education, Special Education, Online Learning, E-learning, Training Programs, Educational Institutions, Curriculum Development, Teaching, Learning, Student Services, Teacher Training, Educational Resources, Distance Learning, Non-formal Education, Education Policy, Early Childhood Education, Post-secondary Education, Continuing Education, Public Education, Private Education, Educational Administration, Assessment and Evaluation, Education Technology, Educational Psychology, Workforce Development, Research in Education         |

| Code | Division   | Keywords  |
|------|--|---|
| 86   | Human health activities                                    | healthcare, medical services, hospital care, nursing, health clinics, physician services, mental health, dental services, health insurance, rehabilitation, public health, diagnostic services, surgical care, emergency medical services, palliative care, consulting physicians, health management, hospice care, preventive care, outpatient care, physical therapy, occupational therapy, home health care, health technology, medical research, geriatric care, pharmacy services, wellness programs, family health, integrative medicine  |
| 87   | Residential care activities                                | residential care, assisted living, nursing homes, mental health services, elderly care, disability services, group homes, rehabilitation centres, child care, social care, long-term care, personal care services, supportive housing, aging population, palliative care, hospitality services, caregiver support, family services, community support, patient care, respite care, substance abuse treatment, vocational rehabilitation, sheltered accommodation, residential treatment, crisis intervention, day care services, senior living, foster care, youth services, specialised care |
| 88   | Social work activities without accommodation               | social work, community support, mental health, counselling, child welfare, family services, substance abuse support, elderly care, disability assistance, domestic violence prevention, refugee support, employment services, crisis intervention, therapeutic services, social justice, advocacy, nonprofit organisations, case management, mental health services, rehabilitation, social services, community outreach, group therapy, peer support, health education, resource coordination, volunteer management, outreach programs, public policy, program development                   |
| 90   | Arts creation and performing arts activities               | arts, performing arts, theatre, dance, music, visual arts, creative professions, art production, cultural activities, art exhibitions, art galleries, live performances, artistic expression, art festivals, multimedia performances, art education, community arts, art therapy, performance art, artistic innovation, arts collaboration, cultural heritage, artistic projects, art studios, interdisciplinary arts, festive events, cultural programming, artist residencies, art grants, creative industries  |
| 91   | Libraries, archives, museums and other cultural activities | libraries, archives, museums, cultural activities, information services, collection management, cultural heritage, educational programs, cultural preservation, public access, exhibitions, art galleries, historical artifacts, digital archives, community outreach, reading programs, research services, cultural events, art education, preservation techniques, local history, archival sciences, museum education, cultural enrichment, nonprofit organisations, literacy programs, tourism development, performing arts, cultural organisations, heritage conservation                 |
| 92   | Gambling and betting activities                            | gambling, betting, casino, wagering, lottery, poker, sports betting, online gambling, gambling industry, gaming establishments, slot machines, bookmakers, raffles, pools, gambling regulations, gambling licenses, gaming technology, gambling addiction, gaming research, gambling analytics, virtual casinos, online poker, gambling software, gaming innovations, gambling trends, sportsbooks, gambling events, gambling marketing, gaming management, gambling finance  |
| 93   | Sports activities and amusement and recreation activities  | sports, amusement, recreation, leisure, fitness, athletics, outdoor activities, indoor activities, team sports, individual sports, competitive games, playgrounds, sports facilities, fitness centres, hiking, yoga, dance, sports management, event planning, sports coaching, therapy, game design, sports tourism, youth programs, community events, recreational therapy, arts and crafts, athletic training, physical education, sporting goods  |

| Code | Division  | Keywords  |
|------|---|---|
| 94   | Activities of membership organisations  | membership, organisations, associations, non-profits, advocacy, community, networks, clubs, societies, halls, unions, support, charitable, civic, professional, educational, service, cultural, recreational, sports, religious, fraternal, political, interest groups, affiliations, collaboration, events, conferences, meetings, outreach  |
| 95   | Repair and maintenance of computers, personal and household goods, and motor vehicles and motorcycles | repair, maintenance, computers, personal goods, household goods, motor vehicles, motorcycles, servicing, replacement parts, software updates, hardware upgrades, electronic repairs, vehicle maintenance, tuning, diagnostics, restoration, customization, appliance repair, home electronics, IT services, automotive repair, car servicing, bike servicing, upkeep, inspections, technical support, repair shops, warranty services, customer service, equipment maintenance  |
| 96   | Personal service activities   | personal services, beauty services, health services, wellness, personal trainers, barbershops, hair salons, manicurists, massage therapy, spa services, household services, cleaning services, childcare services, elderly care, pet care, fitness services, counselling, therapeutic services, tutoring, event planning, personal shopping, reflexology, naturopathy, nutrition services, psychology, private investigators, laundry services, photography services, wedding planning, tax preparation   |
| 97   | Activities of households as employers of domestic personnel   | households, employers, domestic personnel, personal services, household management, cleaning services, childcare, elder care, gardening, cooking, domestic help, household staff, nanny services, home maintenance, security services, household labour, laundry services, tutoring, pet care, personal assistants, daycare, companionship, caregivers, household administration, meal preparation, household expenses, task management, family support, domestic employment, household contracts   |
| 98   | Undifferentiated goods- and service-producing activities of private households for own use            | goods production, service production, private households, own use, undifferentiated activities, household economy, personal services, home-based production, self-sufficiency, domestic labour, non-market activities, informal economy, food preparation, gardening, childcare, household maintenance, personal care, craft production, laundry services, utility management, hobbies, repurposing, repairing, cleaning, voluntary work, unpaid labour, self-provisioning, community sharing, resource management, domestic services                                 |
| 99   | Activities of extraterritorial organisations and bodies   | extraterritorial, international organisations, bodies, global governance, non-profit, transnational, multilateral, diplomacy, civil society, humanitarian aid, development assistance, foreign aid, policy advocacy, global health, peacekeeping, environmental protection, human rights, economic cooperation, trade agreements, international law, cultural exchange, education programs, social justice, community engagement, research programs, capacity building, disaster relief, sustainable development, volunteer programs, intergovernmental collaboration |

Source: Prognos AG/CSIL (2025). Source: NACE Rev. 2.1 Classification with LLM generated keywords.

**Table 27. The WIPO 35 Technology Fields keywords used for linking S3 priorities**

| Number | Technology Field                        | Keywords  |
|--------|---|---|
| 1      | Electrical machinery, apparatus, energy | Power generation, electric motors, transformers, lighting, batteries, electric circuits, switchgear, power distribution, electro-mechanical, renewable energy, photovoltaic, wind turbines, electric transportation, energy storage, smart grids, automation, control systems, electrical safety, electromagnetic compatibility, electric appliances, high voltage, electric transmission, electrical maintenance, power electronics, microelectronics, semiconductors, solar energy, electric generators, electric drivetrains, energy efficiency.   |
| 2      | Audio-visual technology                 | Television, video recording, audio systems, digital cameras, broadcasting, signal processing, loudspeakers, microphones, display technology, projectors, optical media, audio coding, video coding, compression, home theatre, virtual reality, augmented reality, 3D technology, surround sound, multimedia, streaming, smart TVs, audio amplifiers, holography, image processing, content creation, editing software, video conferencing, sound design, acoustic engineering.   |
| 3      | Telecommunications                      | Wireless communication, mobile networks, fibre optics, broadband, satellite communication, radio frequencies, cellular technology, VoIP, data transmission, network protocols, communication satellites, Internet services, telephony, signal processing, telecom infrastructure, 5G networks, routers, modems, network security, optical communication, telecommunications equipment, antennas, spectrum management, communication software, voice communication, video calling, broadband internet, telecommunications standards, networking devices, communication systems.                                |
| 4      | Digital communication                   | Data transmission, encoding, decoding, modulation, digital signals, error correction, wireless communication, fibre optics, multiplexing, digital networks, internet protocol, digital modulation, data compression, network security, cryptography, digital switching, bandwidth, asynchronous transfer, packet switching, digital broadcasting, communication protocols, digital interfaces, signal processing, digital telephony, information theory, digital media, video conferencing, satellite communication, telecommunication networks, broadband technologies.                                      |
| 5      | Basic communication processes           | Signal processing, information theory, modulation, demodulation, encoding, decoding, noise reduction, channel capacity, bandwidth, data transmission, analogue signals, digital signals, error detection, error correction, sampling, quantization, signal-to-noise ratio, frequency domain, time domain, waveform, Fourier transform, Shannon's theorem, communication channels, transmission media, wireless communication, fibre optics, modulation schemes, communications theory, spectrum analysis, data compression.   |
| 6      | Computer technology                     | Software, hardware, microprocessors, computer architecture, operating systems, programming languages, data storage, networking, cybersecurity, cloud computing, artificial intelligence, machine learning, algorithms, databases, user interfaces, computer graphics, virtualisation, distributed systems, quantum computing, embedded systems, network architecture, cryptography, data analysis, big data, blockchain, computer vision, IoT, human-computer interaction, computational theory, parallel processing.   |
| 7      | IT methods for management               | Enterprise software, CRM systems, ERP systems, data analytics, cloud computing, project management, IT infrastructure, business intelligence, data warehousing, cybersecurity, information management, network management, IT governance, workflow automation, process optimization, digital transformation, IT strategy, supply chain management, decision support, risk management, remote collaboration, software integration, IT consulting, IT service management, predictive analytics, IT asset management, knowledge management, performance monitoring, data visualisation, enterprise architecture. |

| Number | Technology Field                 | Keywords  |
|--------|----------------------------------|---|
| 8      | Semiconductors                   | Integrated circuits, microprocessors, transistors, diodes, silicon wafers, semiconductor fabrication, photolithography, doping, electronic components, chip design, semiconductor materials, nanotechnology, IC packaging, cleanroom, semiconductor devices, conductive properties, gallium arsenide, silicon carbide, CMOS technology, MEMS, semiconductor testing, yield optimization, semiconductor manufacturing, fabrication plants, semiconductor physics, wafer processing, doping techniques, photomasks, electronic circuits, thin films.          |
| 9      | Optics                           | Lenses, prisms, mirrors, diffraction, refraction, reflection, optical fibres, lasers, optical imaging, photonics, optical sensors, polarization, light waves, holography, optical coatings, spectroscopy, optical instruments, fibre optics, infrared technology, optical communication, optical engineering, microscopy, telescopes, optical design, waveguides, optical materials, luminescence, optical amplification, nonlinear optics, optical tweezers, laser technology.   |
| 10     | Measurement                      | Calibration, instruments, sensors, precision, accuracy, metrology, data acquisition, analysis, gauge, transducers, standards, measurement error, uncertainty, diagnostics, control systems, monitoring, detection, weighing, instrumentation, signal processing, environmental measurement, testing, benchmarking, quantitative analysis, dimensional measurement, flow measurement, thermometry, spectrometry, quality control, timekeeping, measurement technology.   |
| 11     | Analysis of biological materials | Biochemical analysis, DNA sequencing, mass spectrometry, chromatography, electrophoresis, microscopy, biomarker detection, protein analysis, metabolomics, genomics, proteomics, immunoassays, cell culture, blood analysis, tissue analysis, enzyme assays, radiolabelling, flow cytometry, bioinformatics, PCR, spectroscopy, biosensors, diagnostics, bioimaging, microarrays, molecular biology, nucleic acids, sample preparation, biocompatibility, analytical methods.   |
| 12     | Control                          | Automation, control systems, feedback, regulation, PID controllers, sensors, actuators, process control, robotics, stability, system dynamics, control theory, optimization, industrial control, real-time systems, PLCs, adaptive control, digital control, modelling, simulation, SCADA, servo systems, embedded control, networked control, disturbance rejection, state estimation, system identification, predictive control, nonlinear control, automatic control, control engineering.   |
| 13     | Medical technology               | Medical devices, diagnostics, imaging, telemedicine, implants, prosthetics, surgical instruments, medical robotics, laboratory equipment, respiratory devices, monitoring systems, wearable technology, health informatics, medical imaging, ultrasound, MRI, CT scans, diagnostic tools, endoscopy, nanomedicine, regenerative medicine, biosensors, personalised medicine, medical software, electronic health records, biocompatibility, drug delivery, medical lasers, radiology, healthcare technology.  |
| 14     | Organic fine chemistry           | Synthesis, catalysts, pharmaceuticals, agrochemicals, polymers, petrochemicals, natural products, chemical reactions, biochemistry, chiral compounds, molecular design, organic compounds, chemical intermediates, reaction mechanisms, stereochemistry, organic synthesis, drug discovery, bioactive compounds, chemistry research, industrial chemistry, renewable resources, green chemistry, functional groups, synthesis routes, chemical properties, synthetic pathways, organometallics, analytical chemistry, chemical structure, chemical bonding. |
| 15     | Biotechnology                    | Genetic engineering, DNA cloning, biopharmaceuticals, bioinformatics, gene therapy, CRISPR, synthetic biology, molecular biology, protein engineering, fermentation, bioprocessing, tissue engineering, bioreactors, biotech industry, monoclonal antibodies, recombinant DNA, biosensors, enzyme technology, genomics, metabolomics, proteomics, biofuels, agricultural biotechnology, microbial engineering, cell culture, stem cell research, biocatalysis, immunotechnology, bioremediation, biopolymers.   |

| Number | Technology Field                    | Keywords  |
|--------|-------------------------------------|---|
| 16     | Pharmaceuticals                     | Drug development, formulation, active ingredients, clinical trials, pharmacology, medicinal chemistry, biopharmaceuticals, dosage forms, drug delivery, pharmacokinetics, pharmacodynamics, generics, vaccines, therapeutic agents, biotechnology, regulatory compliance, drug discovery, pharmaceutical synthesis, APIs, synthetic drugs, natural products, biotechnology, quality control, pharmaceutical production, personalised medicine, nanomedicine, over-the-counter drugs, prescription drugs, pharmacogenomics, drug approval.                     |
| 17     | Macromolecular chemistry, polymers  | Polymer synthesis, polymerization, macromolecules, biopolymers, thermoplastics, thermosetting plastics, elastomers, polymer blends, copolymers, crosslinking, polymer composites, molecular weight, polymer structure, polymer processing, polymer modification, biodegradable polymers, polymer properties, polymer applications, nanocomposites, synthetic polymers, natural polymers, polymer solutions, polymer gels, polymer films, polymer foams, polymer recycling, polymer degradation, polymer characterization, crystallinity, industrial polymers. |
| 18     | Food chemistry                      | Nutritional analysis, food additives, flavour compounds, food preservation, proteins, carbohydrates, lipids, vitamins, minerals, enzymes, food processing, antioxidants, food safety, emulsifiers, food texture, colorants, stabilizers, fermentation, food packaging, pH balance, food quality, shelf life, food testing, aroma compounds, dietary fibre, fortification, food contaminants, food analysis, food composition, food biotechnology, sensory evaluation.   |
| 19     | Basic materials chemistry           | Nanomaterials, catalysis, crystal structure, ceramics, alloys, polymers, composites, thin films, surface chemistry, material synthesis, chemical bonding, electronic materials, photonic materials, conductive materials, semiconductors, corrosion, phase transitions, chemical properties, physical properties, thermodynamics, materials characterization, solid-state chemistry, synthesis techniques, magnetic materials, optical materials, structural materials, adsorption, desorption, porosity, material reactivity.                                |
| 20     | Materials, metallurgy               | Alloys, casting, forging, heat treatment, welding, corrosion, composite materials, material properties, nanomaterials, ferrous metals, non-ferrous metals, material testing, crystallography, phase diagrams, metal forming, thermomechanical processing, surface treatment, metallurgy processes, metallurgical engineering, powder metallurgy, extractive metallurgy, material fatigue, microstructure, solidification, deformation, material innovation, tensile strength, ductility, metallographic analysis, structural integrity.                       |
| 21     | Surface technology, coating         | Electroplating, galvanization, anodizing, thermal spraying, PVD, CVD, painting, anti-corrosion, film deposition, surface modification, adhesion, thin films, surface finishing, hard coatings, wear resistance, surface engineering, nanocoatings, plasma coating, surface treatment, friction reduction, scratch resistance, decorative coatings, lubricant coatings, sealing, surface cleaning, etching, surface texture, interface bonding, coating thickness, barrier coatings.   |
| 22     | Micro-structural and nanotechnology | Nanomaterials, nanostructures, microfabrication, nanofabrication, quantum dots, nanolithography, MEMS, NEMS, nanoelectronics, nanocomposites, carbon nanotubes, graphene, nanophotonics, nanomedicine, nanomechanics, self-assembly, scanning probe microscopy, nanotechnology, nanodevices, thin films, nanosensors, nanocarriers, nanoscale, molecular machines, microstructures, surface nanostructuring, nanoengineering, nanochemistry, micro-machining, bottom-up synthesis.  |
| 23     | Chemical engineering                | Process design, reaction engineering, catalysis, thermodynamics, fluid dynamics, transport phenomena, process simulation, separation processes, chemical reactors, process control, heat transfer, mass transfer, chemical kinetics, process optimization, pilot plants, chemical synthesis, safety engineering, environmental engineering, biochemical engineering, energy efficiency, petrochemicals, polymers, materials processing, industrial chemistry, process scale-up, distillation, extraction, filtration, process integration, waste management.  |

| Number | Technology Field                | Keywords   |
|--------|---------------------------------|--|
| 24     | Environmental technology        | Pollution control, waste management, renewable energy, water treatment, air quality, emission reduction, sustainable development, recycling, wastewater treatment, soil remediation, environmental monitoring, green technology, eco-friendly materials, climate change mitigation, energy efficiency, resource conservation, environmental assessment, carbon footprint, bioremediation, habitat restoration, clean technology, environmental impact, sustainable agriculture, circular economy, environmental compliance, noise pollution, environmental sensors, environmental policy, toxicology, conservation technology. |
| 25     | Handling                        | Material handling, automation, logistics, conveyors, robotics, packaging, warehousing, lifting equipment, sorting systems, industrial vehicles, palletizing, inventory management, automated systems, ergonomics, supply chain, transportation, handling safety, loading, unloading, distribution, storage solutions, cargo management, handling efficiency, material flow, bulk handling, cranes, hoists, stackers, order picking, handling optimization.   |
| 26     | Machine tools                   | CNC machines, lathes, milling machines, drilling machines, grinding machines, precision machining, computer-aided manufacturing, tool design, cutting tools, automation, metalworking, machining centres, tool precision, machine tool maintenance, high-speed machining, surface finishing, toolholding systems, machining accuracy, multi-axis machining, numerical control, die casting, turning, tooling systems, EDM machines, machine tool innovation, process optimization, machining simulation, jig boring, manufacturing technology, tool efficiency.  |
| 27     | Engines, turbines               | pumps, Internal combustion engines, gas turbines, steam turbines, hydraulic pumps, centrifugal pumps, piston engines, rotary engines, turbochargers, fuel efficiency, power generation, fluid dynamics, pump design, turbine blades, energy conversion, mechanical efficiency, propulsion systems, thermodynamics, compressor technology, turbo machinery, renewable energy, engine components, pump systems, lubrication, cooling systems, emission control, performance optimization, engine testing, gear pumps, axial flow, reciprocating engines.   |
| 28     | Textile and paper machines      | Weaving machines, textile spinning, knitting machines, looms, dyeing machines, finishing machines, nonwoven fabric production, fabric inspection, textile printing, paper manufacturing, pulp processing, paper recycling, fibre processing, carding machines, winding machines, textile machinery, drying equipment, bleaching equipment, cutting machines, sewing machines, threading machines, embossing machines, machine maintenance, quality control, automation, textile innovation, yarn processing, textile testing, paper coating, papermaking efficiency.   |
| 29     | Other special machines          | Vending machines, packaging machines, 3D printers, labelling machines, engraving machines, industrial robots, assembly machines, sewing machines, woodworking machines, agricultural machinery, textile machinery, welding machines, food processing machinery, CNC machines, laser cutters, embroidery machines, printing machines, bottle filling machines, cutting machines, pharmaceutical machinery, glass processing machines, tool making machines, mining equipment, specialised automation, customization, machine integration, high-precision machines, robotics, machine innovation.                                |
| 30     | Thermal processes and apparatus | Heat exchangers, boilers, furnaces, combustion, refrigeration, HVAC, thermal insulation, heat transfer, thermodynamics, cooling systems, drying systems, thermal energy storage, cryogenics, heat recovery, thermal efficiency, incinerators, kilns, thermal oxidation, heat pumps, solar thermal systems, conduction, convection, radiation, thermal cycling, evaporators, condensers, thermal control, energy management, phase change materials, thermal processing.  |

| Number | Technology Field     | Keywords   |
|--------|----------------------|--|
| 31     | Mechanical elements  | Bearings, gears, shafts, couplings, fasteners, springs, seals, bushings, pulleys, linkages, brakes, clutches, cams, flywheels, levers, actuators, valves, chains, sprockets, dampers, mechanical joints, rotary elements, linear motion, vibration control, mechanical drives, transmission systems, structural components, mechanical linkages, gearboxes, mechanical assemblies.   |
| 32     | Transport            | Automobiles, railways, aviation, shipping, public transport, electric vehicles, logistics, transportation infrastructure, traffic management, propulsion systems, vehicle design, automotive technology, navigation systems, transport safety, sustainable transport, freight transport, mobility solutions, autonomous vehicles, transportation networks, fuel efficiency, urban transport, intermodal transport, transport policy, train systems, mass transit, transport engineering, traffic flow, smart transportation, vehicle emissions, cargo handling.                      |
| 33     | Furniture, games     | Seating design, tables, cabinetry, game design, furniture materials, ergonomic furniture, outdoor furniture, home décor, office furniture, furniture manufacturing, board games, video games, gaming accessories, upholstery, modular furniture, playground equipment, furniture innovation, gaming consoles, furniture aesthetics, educational games, virtual reality games, interactive furniture, smart furniture, furniture assembly, game mechanics, furniture sustainability, space-saving furniture, recreational equipment, furniture customization, gaming software.        |
| 34     | Other consumer goods | Household appliances, personal care items, cleaning products, home electronics, kitchenware, toiletries, clothing, footwear, toys, home décor, beauty products, sports equipment, stationery, textiles, leisure goods, gardening tools, pet products, luggage, watches, jewellery, eyewear, DIY tools, health products, wearable technology, hobby kits, fitness equipment, consumer electronics, bedding, cookware, seasonal decorations.   |
| 35     | Civil engineering    | Structural engineering, geotechnical engineering, transportation engineering, construction management, infrastructure, bridges, dams, buildings, environmental engineering, water resources, urban planning, surveying, road construction, hydraulic engineering, tunnelling, earthquake engineering, sustainable design, drainage systems, pavement design, construction materials, soil mechanics, foundation engineering, project management, traffic engineering, coastal engineering, land development, site analysis, civil design, construction technology, waste management. |

Source: Prognos AG/CSIL (2025). Source: WIPO Technology Fields Classification with LLM generated keywords.

**Table 28: The Fields of Research keywords used for linking S3 priorities**

| Division | Name                                       | Keywords  |
|----------|--|---|
| 30       | AGRICULTURAL, VETERINARY AND FOOD SCIENCES | Agronomy, Animal husbandry, Crop science, Soil science, Food technology, Plant pathology, Veterinary medicine, Horticulture, Dairy science, Pest management, Nutrition, Biotechnology, Sustainable agriculture, Food safety, Animal welfare, Agricultural economics, Agroecology, Genomics, Food preservation, Livestock production   |
| 31       | BIOLOGICAL SCIENCES                        | Genetics, Evolution, Ecology, Microbiology, Biochemistry, Cell biology, Botany, Zoology, Biotechnology, Physiology, Neuroscience, Immunology, Taxonomy, Molecular biology, Biodiversity, Palaeontology, Genomics, Marine biology, Bioinformatics, Parasitology  |
| 32       | BIOMEDICAL AND CLINICAL SCIENCES           | Pathology, Epidemiology, Oncology, Pharmacology, Genomics, Immunology, Neurology, Cardiology, Radiology, Surgery, Haematology, Anaesthesiology, Dermatology, Psychiatry, Endocrinology, Gastroenterology, Rheumatology, Nephrology, Paediatrics, Obstetrics   |
| 33       | BUILT ENVIRONMENT AND DESIGN               | Architecture, Urban planning, Landscape architecture, Interior design, Sustainable design, Construction management, Building technology, Environmental design, Structural engineering, Urban design, Historic preservation, Housing studies, Transportation planning, Green building, Space planning, Environmental psychology, Urban studies, Infrastructure, Design theory, Real estate development |
| 34       | CHEMICAL SCIENCES                          | Organic chemistry, Inorganic chemistry, Physical chemistry, Analytical chemistry, Biochemistry, Theoretical chemistry, Materials chemistry, Polymer chemistry, Catalysis, Spectroscopy, Thermodynamics, Electrochemistry, Quantum chemistry, Medicinal chemistry, Environmental chemistry, Supramolecular chemistry, Chemical kinetics, Nanochemistry, Petrochemistry, Stereochemistry                |
| 35       | COMMERCE, MANAGEMENT, TOURISM AND SERVICES | Accounting, Finance, Marketing, Entrepreneurship, Human resources, Supply chain, Business strategy, Organisational behaviour, E-commerce, Retail management, Hospitality, Tourism management, Service management, Operations management, Risk management, Corporate governance, International business, Consumer behaviour, Event management, Innovation  |
| 36       | CREATIVE ARTS AND WRITING                  | Literature, Poetry, Fiction, Nonfiction, Drama, Screenwriting, Playwriting, Visual arts, Painting, Sculpture, Photography, Digital media, Performing arts, Music, Dance, Film, Art history, Criticism, Creative process, Storytelling   |
| 37       | EARTH SCIENCES                             | Geology, Seismology, Oceanography, Meteorology, Volcanology, Geophysics, Palaeontology, Climatology, Mineralogy, Geochemistry, Hydrology, Geomorphology, Petrology, Environmental science, Sedimentology, Tectonics, Glaciology, Atmospheric science, Soil science, Remote sensing  |
| 38       | ECONOMICS                                  | Microeconomics, Macroeconomics, Econometrics, International trade, Monetary policy, Fiscal policy, Labour economics, Development economics, Game theory, Behavioural economics, Economic theory, Public economics, Industrial organisation, Health economics, Environmental economics, Economic growth, Finance, Market structure, Income distribution, Economic history                              |
| 39       | EDUCATION                                  | Pedagogy, Curriculum, Instruction, Assessment, Learning theories, Educational psychology, Special education, Distance learning, Curriculum development, Teacher education, Educational policy, Early childhood education, Higher education, Educational technology, Literacy, Multicultural education, Classroom management, Vocational education, Educational leadership, Lifelong learning          |
| 40       | ENGINEERING                                | Mechanical, Civil, Electrical, Chemical, Aerospace, Biomedical, Environmental, Software, Materials, Structural, Industrial, Robotics, Systems, Nuclear, Automotive, Telecommunications, Geotechnical, Mechatronics, Engineering management, Nanotechnology  |

| Division | Name                                | Keywords   |
|----------|-------------------------------------|--|
| 41       | ENVIRONMENTAL SCIENCES              | Ecology, Conservation, Climate change, Pollution, Biodiversity, Sustainability, Environmental policy, Natural resources, Renewable energy, Environmental chemistry, Ecosystem services, Soil science, Marine biology, Atmospheric science, Wildlife management, Environmental health, Geospatial analysis, Hydrology, Waste management, Deforestation                                |
| 42       | HEALTH SCIENCES                     | Public health, Epidemiology, Nutrition, Biostatistics, Health policy, Global health, Occupational health, Mental health, Health promotion, Epidemiological research, Health education, Community health, Health services, Health informatics, Environmental health, Disease prevention, Clinical trials, Health disparities, Chronic diseases, Health administration                 |
| 43       | HISTORY, HERITAGE AND ARCHAEOLOGY   | Historiography, Cultural heritage, Archaeological methods, Ancient civilizations, Artifacts, Historical preservation, Oral history, Documentary analysis, Palaeontology, Archival research, Ethnohistory, Public history, Cultural landscapes, Historical archaeology, Preservation, Artifact analysis, Interpretation, Heritage management, Museum studies, Historical anthropology |
| 44       | HUMAN SOCIETY                       | Sociology, Anthropology, Demography, Culture, Social structure, Gender studies, Race, Ethnicity, Inequality, Social change, Urban studies, Globalisation, Education, Family, Political science, Migration, Religion, Identity, Social policy, Community  |
| 45       | INDIGENOUS STUDIES                  | Decolonization, Indigenous knowledge, Sovereignty, Cultural heritage, Traditional practices, Language revitalisation, Land rights, Self-determination, Identity, Storytelling, Elders, Indigenous governance, Environmental stewardship, Cultural preservation, Oral history, Colonization impact, Indigenous health, Indigenous art, Customary law, Tribal communities              |
| 46       | INFORMATION AND COMPUTING SCIENCES  | Computer science, Information systems, Software engineering, Artificial intelligence, Data mining, Cybersecurity, Databases, Machine learning, Human-computer interaction, Networking, Cloud computing, Algorithms, Big data, Internet of Things, Robotics, Virtual reality, Computational theory, Data analytics, Blockchain, Bioinformatics  |
| 47       | LANGUAGE, COMMUNICATION AND CULTURE | Linguistics, Semantics, Pragmatics, Phonetics, Multilingualism, Discourse analysis, Sociolinguistics, Intercultural communication, Media studies, Translation, Interpretation, Language acquisition, Semiotics, Cultural studies, Rhetoric, Communication theory, Language preservation, Sign language, Literary studies, Popular culture  |
| 48       | LAW AND LEGAL STUDIES               | Jurisprudence, Constitutional law, Criminal law, Civil law, International law, Human rights, Legal theory, Environmental law, Intellectual property, Commercial law, Family law, Labour law, Administrative law, Tax law, Tort law, Contract law, Legal history, Comparative law, Mediation, Arbitration   |
| 49       | MATHEMATICAL SCIENCES               | Algebra, Calculus, Geometry, Statistics, Probability, Topology, Number theory, Mathematical logic, Applied mathematics, Mathematical modelling, Discrete mathematics, Geometry, Abstract algebra, Differential equations, Combinatorics, Mathematical analysis, Computational mathematics, Cryptography, Linear algebra, Real analysis   |
| 50       | PHILOSOPHY AND RELIGIOUS STUDIES    | Metaphysics, Epistemology, Ethics, Aesthetics, Logic, Phenomenology, Existentialism, Buddhism, Christianity, Islam, Hinduism, Judaism, Taoism, Religious ethics, Theology, Spirituality, Comparative religion, Philosophy of mind, Ancient philosophy, Ontology  |
| 51       | PHYSICAL SCIENCES                   | Physics, Chemistry, Astronomy, Geology, Meteorology, Thermodynamics, Quantum mechanics, Optics, Astrophysics, Nuclear physics, Electromagnetism, Condensed matter, Materials science, Geophysics, Physical chemistry, Crystallography, Spectroscopy, Atomic physics, Computational physics, Cosmology  |

| Division | Name       | Keywords   |
|----------|------------|--|
| 52       | PSYCHOLOGY | Cognition, Behaviour, Neuropsychology, Developmental, Clinical, Social, Personality, Perception, Emotion, Motivation, Psychotherapy, Memory, Learning, Psychopathology, Intelligence, Attitude, Stress, Mental health, Counselling, Neuroscience |

*Source: Prognos AG/CSIL (2025). Source: Fields of Research Classification with LLM generated keywords.*

## 5.4 Annex 4: Methodology for the text analysis of ERDF programmes and TJTPs

### Automated analysis of ERDF programmes

The study applied a methodology to consistently and automatically examine the ERDF programmes for the current programming period and extract information useful for different study tasks. The latest programme versions available in January 2025 were considered for the analysis.

In the context of the analysis of S3's role in industrial transformation (see Chapter 3.2), the analysis aimed to address two goals:

- Develop an inventory of policy measures programmed by ERDF, relevant to industrial transformation objectives.
- Investigate if and how S3 is referenced in relation to Specific Objectives beyond 1.1 and 1.4.

Using a funnel approach, we began by extracting all programmed actions and measures under various Specific Objectives (SOs) to create a comprehensive inventory. This inventory encompassed:

- **All Specific Objectives of Priorities 1-5 ERDF and CF-funded (RSOs)** included in the programme, tailored to the specific regional needs and priorities within the framework of the broader ERDF goals. These include STEP-related objectives (SO 1.6 and 2.9), where already integrated by the Managing Authorities into the programmes, highlighting initiatives that support critical technologies such as digital innovation, biotechnology, and advancements in resource-efficient technologies.<sup>137</sup>
- **The Specific Objectives under Priority 4 funded by ESF+ (ESOs)**, which aims to support Member States and regions to achieve high employment levels, fair social protection and a skilled and resilient workforce ready for the future world of work.
- **The Specific Objective JTF-funded (JSO 8.1)**, which provides dedicated support to enabling regions and people to address the social, employment, economic and environmental impacts of the transition towards the Union's 2030 targets for energy and climate and a climate-neutral economy of the Union by 2050.

To perform this task, AI-based Natural Language Processing (NLP) tools were used. In the ERDF programmes, each Priority and Specific Objective includes a textual description of the programmed policy interventions, which may be presented in an unstructured format. To extract these policies effectively, an Open Generative Question Answering (QA) algorithm was employed. This algorithm analyses and understands the text, aiming to extract both the list of policies and a brief description for each.

In practice, the Open Generative QA was carried out by large language models (LLMs) through prompting – i.e. providing the model with specific instructions without changing its core structure. The Llama 3.1 model was chosen for this task due to its open-source nature and ability to be deployed locally. The model was used iteratively, with the text chunks describing policies as context for generating answers. During a trial-and-error phase,

<sup>137</sup> Only RSO 2.4, 2.5, 4.3, 4.4 and ESO 4.3, 4.4, 4.8-4,13 were entirely excluded as not particularly relevant for industrial transformation.

various prompts were tested and compared. The following prompt was ultimately selected and applied to all the text chunks:

*“Your task is to identify the one or more main interventions described in the chunk of text below. You will return a JSON where you associate each intervention to its corresponding description. Remember that some interventions include various elements (or sub-intervention). Your task is to focus on the main ones. If you identify sub-elements you can include them in the description of the main interventions (in a discursive way).”*

*Chunk of text: {chunk}”*

For each programme and for each SO, we extracted information such as the name of actions, the description of the policy action, and the target groups. Thanks to the robustness and precision of the algorithm used in the initial extraction,<sup>138</sup> this validation process was highly efficient and required minimal time to complete. The resulting policy inventory included 9,576 distinct policy actions, extracted from all 160 ERDF national/regional programmes and spanning all possible SOs.

Based on the text analysis of the descriptions of these policies, we added additional specifications to the inventory on the types of policies implemented. This was done to enable a subsequent horizontal comparative analysis of policies across different regions (as presented in Chapter 3.2). Actions with similar objectives were grouped together to ensure consistency and comparability across programmes. More specifically, we carried out a keyword analysis to identify and classify measures (see Table below). This method allowed us to attribute 7.3% (432 out of 5915) policy measures extracted from the programmes to one of the following objectives.

**Table 29: Keywords used to identify different types of policy measures**

| Type of policy measure   | Keywords searched   |
|--|---|
| <b>Diversification:</b> Measures aimed at supporting regions with weaker innovation and industrial ecosystems in diversifying their economies towards new sectors and niche markets.   | “diversification”, “diversify”, “new sectors”, “new industry”, “emerging sectors”   |
| <b>Company growth:</b> Measures designed to support the scaling-up of firms, facilitating their transition from start-ups to SMEs, mid-cap firms, and large enterprises.   | “scale up”, “scaling up”, “economies of scale”, “acceleration”, “startup growth”, “company growth”  |
| <b>Risk-taking investments:</b> Measures that encourage innovation-driven and high-risk investments, including support for disruptive technologies and new business models.  | “risky”, “high-risk”, “uncertain”, “venture”, “experimental”, “disruptive”, “experimentation”, “research results”                                       |
| <b>Support for the workforce in industries:</b> Measures focused on upskilling and reskilling workers, especially to enable capabilities related to innovation and support the twin green and digital transitions.   | “upskilling”, “reskilling”, “workers”, “skills”, “competences”, “capabilities”  |
| <b>Education programmes tailored to industry and labour market needs:</b> Measures to strengthen education systems through initiatives such as industry-academia collaboration, applied research programmes, and vocational education and training (VET) aligned with industrial demand. | “vocational training”, “labour market needs”, “training programmes”, “academic training”, “changing needs”, “technical training”, “work-based training” |

<sup>138</sup> Based on our assessment, the error rate of the algorithm was less than 3%.

**Finally, to investigate if and how the S3 is directly referenced in the ERDF documents a keyword matching algorithm was employed.** For each territory in the documents, each section was parsed, and it was checked the presence of one of the following terms: "S3", "Smart Specialisation Strategy", "Smart Specialization Strategy", "RIS3", "RSI3", "Regional Innovation Strategy", "Intelligent Specialisation". For each SO under each priority in each document the resulting number of mentions and the sentences where the matches appeared were returned in a structured excel format.

### **Automated analysis of the Territorial Just Transition Plans**

Similarly to what is described above, a dedicated methodology was also developed to consistently and automatically analyse the Territorial Just Transition Plans (TJTPs). The analysis aimed to achieve two main objectives:

- To identify the sectors of the economy targeted by the TJTPs and assess their alignment with the corresponding S3. In other words, the goal was to understand which sectors or areas of the economy are supported by the TJTP planned transition, and to assess their alignment with the priorities of the relevant S3 Smart Specialisation Strategy (i.e., the S3 of the region or country concerned).
- To investigate whether, and how, the S3 is explicitly referenced in the TJTPs.

In cases where a country has multiple territories under its plan, the TJTPs may be structured as either separate documents or consolidated into a single document with dedicated sections for each territory. These documents typically share only a common introduction. Since the planning and intervention are territory-specific, **the analysis focused on the 100 territories covered by the 73 TJTPs.**

To identify the targeted sectors, a Natural Language Processing (NLP) tool, similar to that used for the policy measure inventory described earlier, was applied. Specifically, each territory's TJTP contains a section (Section 2.2: *“Development needs and objectives by 2030 in view of reaching a climate-neutral economy of the Union by 2050”*) outlining the main economic sectors and areas to be supported. To extract this information, an **Open Generative Question Answering (QA)** approach was used. This method involved applying large language models (LLMs) to read and understand the relevant text and to extract both a list of sectors and brief descriptions for each.

In practice, the Open Generative QA was performed using prompting techniques, i.e., giving the model specific instructions without modifying its architecture. The **Llama 3.1** model was chosen for its open-source nature and ability to be deployed locally. Text from each territory's relevant section was processed iteratively using carefully designed prompts. After a trial-and-error phase to compare different formulations, the following prompt was selected and applied consistently:

*“You are an AI assistant specialised in the analysis of text. The following text refers to {territory name}. This territory will be hit by the green transition.*

*What is the goal of industrial transformation in the territory? In other words, which sectors or industries will be developed or transformed by the industrial transformation plan described in the text below?*

*Here is the text:*

*{text}.”*

Once the sectors were extracted, the next step was to assess their alignment with the relevant S3 priorities. This was done using a **keyword matching** approach between the

names of the identified sectors and the priorities of the corresponding region. The comparison was based on the **names of the S3 priorities** and the associated list of 15 keywords for each priority (see Annex 3). A match was considered valid if the sector name corresponded either to a priority name or to one of its associated keywords. To improve accuracy, matches were assessed using **word stems**, the base part of words that conveys meaning, via the **Porter stemming algorithm**. This allowed the method to detect matches even when words appeared in different grammatical forms.

Finally, to examine if and how the S3 is explicitly referenced in the TJTPs, a keyword search algorithm was used. Each section of the TJTPs for all territories was parsed to check for the presence of terms such as: "S3", "*Smart Specialisation Strategy*", "*Smart Specialization Strategy*", "*RIS3*", "*RSI3*", "*Regional Innovation Strategy*", and "*Intelligent Specialisation*". For each territory, the number of occurrences and the corresponding sentences were extracted and compiled into a structured Excel format.

## 5.5 Annex 5: Parameters used for the assessment of S3s and ERDF programmes for the dimension “interregional collaboration”

Each S3 document was examined to assess the extent to which it addresses the identified parameters. The subsequent analysis covered the following collaborative dimensions:

**Table 30: Parameters for the dimension "Interregional cooperation" in S3 documents**

|     | Parameter  | Description   | Categories of assessment   |
|-----|--|---|----------------------------|
| 1.  | Geographical coverage (Yes/ No)                        | It refers to <u>cooperation with partners outside a given Member State</u> . This parameter specifies regions outside a given MS involved in the joint initiatives.                           | If yes, which regions/ MS  |
| 2.  | Type of collaboration (Yes/ No)                        | This parameter relates to the form of collaboration, e.g., bilateral, cross-border, transnational, international  | If yes, which one(s)       |
| 3.  | General reference to shared or complementary S3 areas  | It generally refers to shared or complementary S3 areas in which joint activities are focused   | Yes/ No                    |
| 4.  | Reference to specific shared or complementary S3 areas | It refers to specific shared or complementary S3 areas in which joint activities are focused, e.g., blue economy, biotechnology, renewable energy, digitalisation, or advanced manufacturing. | If yes, which one(s)       |
| 5.  | General reference to value chains                      | It refers to EU/ international value chains.  | Yes/ No                    |
| 6.  | Reference to specific value chains                     | It refers to specific value chains, such as agri-food, energy, blue economy, industrial modernisation, etc.   | If yes, which value chains |
| 7.  | Reference to ERDF programmes (Yes/ No)                 | This parameter assesses whether an programmes already includes references to ERDF programmes e.g., the I3 Instrument, Interreg.   | If yes, which one(s)       |
| 8.  | Reference to other funding sources (Yes/ No)           | This parameter refers to the indication of one or more funding sources for interregional collaboration (e.g., Innovation Fund, Horizon Europe)  | If yes, which one(s)       |
| 9.  | Reference to EU macroregional strategies (Yes/ No)     | This parameter refers to the indication of one or more the EU macroregional strategies e.g., the Baltic Sea Region, the Danube Region, the Alpine Region                                      | If yes, which one(s)       |
| 10. | Reference to interregional initiatives (Yes/ No)       | This parameter assesses whether the S3 refers to any interregional initiative (e.g. TSSPs, the S3 Thematic Platforms, PRI, IPCEI)   | If yes, which one(s)       |

|     | Parameter                                     | Description   | Categories of assessment  |
|-----|---|---|---|
| 11. | Reference to interregional networks (Yes/ No) | This parameter assesses whether a programme refers to any network for interregional collaboration (e.g., Vanguard Initiative, ECCP, Eureka, ERRIN, EURADA, EEN) | If yes, which one(s)  |
| 12. | Type of joint actions (Yes/ No)               | This parameter refers to the specific form of interregional cooperation between partners.   | If yes, which type of activities, i.e., commercialisation of research results, joint provision of research infrastructure, coordinated programmes/ calls, joint strategies, capacity building, creation of partnerships, etc. |
| 13. | Type of partners (Yes/ No)                    | It refers to specific type of partners.   | If yes, business, SMEs, large companies, universities, research organisations, innovation support organisations, public authorities, clusters, etc.   |

Source: Prognos AG/CSIL (2025).

In parallel, **the analysis of ERDF programmes** focused on the interregional, cross-border and transnational actions set out, where relevant, under Specific Objective 1.1 (enhancing research and innovation capacities) and Specific Objective 1.4 (skills for smart specialisation), which contain measures specifically focused on S3 priority areas. The ERDF programmes were classified based on the following parameters:

**Table 31: Parameters for the dimension "Interregional cooperation" in ERDF programmes**

|                    | Parameter                       | Description   | Categories of assessment  |
|--------------------|---------------------------------|---|---------------------------|
|                    | Relevance (Yes/ No)             | This parameter assesses whether interregional collaboration is relevant to the programme being analysed. It determines if interregional collaboration is addressed as a pertinent aspect of the programmes. | Relevant/ irrelevant      |
| <b>IF RELEVANT</b> |                                 |   |                           |
| 1.                 | Geographical coverage (Yes/ No) | It refers to <u>cooperation with partners outside a given Member State</u> . It specifies regions outside a given MS involved in the joint initiatives.   | If yes, which regions/ MS |
| 2.                 | Type of collaboration (Yes/ No) | This parameter relates to the form of collaboration, for example bilateral, cross-border, transnational, international  | If yes, which one(s)      |

|     | Parameter   | Description   | Categories of assessment   |
|-----|---|---|--|
| 3.  | Explicit reference to national/ regional/ cross-border S3 | This parameter highlights a clear link between interregional collaboration initiatives and the S3.  | Yes/ No  |
| 4.  | General reference to shared or complementary S3 areas     | It generally refers to shared or complementary S3 areas in which joint activities are focused.  | Yes/ No  |
| 5.  | Reference to specific shared or complementary S3 areas    | It refers to specific shared or complementary S3 areas in which joint activities are focused, e.g., blue economy, biotechnology, renewable energy, digitalisation, or advanced manufacturing. | If yes, which one(s)   |
| 6.  | General reference to value chains                         | It refers to EU/ international value chains.  | Yes/ No  |
| 7.  | Reference to specific value chains                        | It refers to specific value chains, such as agri-food, energy, blue economy, industrial modernisation, etc.   | If yes, which one(s)   |
| 8.  | Reference to other ERDF programmes (Yes/ No)              | This parameter assesses whether an programmes already includes references to other ERDF programmes e.g., the I3 Instrument, Interreg.   | If yes, which one(s)   |
| 9.  | Reference to other funding sources (Yes/ No)              | This parameter refers to the indication of one or more funding sources for interregional collaboration (e.g., Innovation Fund, Horizon Europe)  | If yes, which one(s)   |
| 10. | Reference to EU macroregional strategies (Yes/ No)        | This parameter refers to the indication of one or more the EU macroregional strategies, e.g., the Baltic Sea Region, the Danube Region, the Alpine Region                                     | If yes, which one(s)   |
| 11. | Reference to interregional initiatives (Yes/ No)          | This parameter assesses whether a programme refers to any interregional initiative (e.g. TSSPs, S3 Thematic Platforms, PRI, IPCEI)  | If yes, which one(s)   |
| 12. | Reference to interregional networks (Yes/ No)             | It assesses whether a programme refers to any network for interregional collaboration (e.g., Vanguard Initiative, ECCP, Eureka, ERRIN, EURADA, EEN)   | If yes, which one(s)   |
| 13. | Type of joint actions (Yes/ No)                           | This parameter refers to the specific nature or form of interregional cooperation between parties.  | If yes, which type of joint actions, i.e., commercialisation of research results, joint provision of research infrastructure, coordinated programmes/ calls, joint strategies, capacity building, creation of partnerships, etc. |
| 14. | Type of partners (Yes/ No)                                | It refers to specific type of partners.   | If yes, business, SMEs, large companies,   |

|  | Parameter | Description | Categories of assessment   |
|--|-----------|-------------|--|
|  |           |             | universities, research organisations, innovation support organisations, public authorities, clusters, etc. |

Source: Prognos AG/CSIL (2025).

## 5.6 Annex 6: Categories to classify S3 reforms

**Table 32 – Categories of reforms by components of the ecosystem**

| Components of the Ecosystem                             | Description  |
|---|--|
| Capabilities of Stakeholders                            | This component refers to the ability of stakeholders (e.g., in firms, public authorities...) to integrate innovation into their organisational and production practices. It has a managerial and a technical dimension.  |
| Education and Research system                           | This component deals with the performance of the education (basic, vocational, tertiary and lifelong learning) and research systems (universities and research centres). It can include topics such as curriculum definition, researcher careers, etc.   |
| Labour Market   | This component deals with the performance of the labour market, regarding employment structure and skills (e.g., mismatches...), but also mobility/attractiveness (e.g., brain drain or retention issues...). It has strong interlinkages with the Education System / Capabilities of Stakeholders.              |
| Infrastructures   | This component refers to the infrastructures supporting research and innovation, notably university and related infrastructures, but also ICT infrastructures and other types whenever relevant (transportation...). This component is usually tackled as part of complex reforms targeting multiple components. |
| Access to Finance                                       | This component refers to the ability to channel public or private funding towards research development and innovation activities.  |
| Governance, collaboration, and stakeholders' engagement | This component refers to the quality of the governance and the interactions between stakeholders of the ecosystem, including different types of collaborations (e.g., cross and within sector...) and the S3-specific governance.  |
| Business environment                                    | This broad component refers to the business context under which stakeholders cooperate, including the regulatory framework (intellectual property, innovation...) but also administrative burdens, taxation, trade, energy, etc. Complex strategies covering multiple components often integrate this component. |
| Demand for Innovation                                   | This component deals with the demand-side of innovation, i.e., innovation culture (e.g., risk aversion, propensity to innovate) as well as the approaches to boost this demand (e.g., innovation procurement).   |

Source: Authors based on OECD, UN, World Bank, EU

**Table 33 – Categories of reforms by delivery modality**

| Delivery modalities         | Description  |
|-----------------------------|--|
| Administrative reform       | Changes introduced by adjustments in administrative processes or requirements  |
| Awareness-raising           | Changes introduced by improving the knowledge/awareness of targeted stakeholders (especially relevant for innovation culture).                     |
| Capacity-building           | Changes introduced by enhancing skills, knowledge, or institutional capabilities through training and education (formal or informal)               |
| Incentives                  | Changes introduced by influencing actions without imposing obligatory rules  |
| Organisation                | Changes introduced by restructuring public or private institutions, creating new organisations, or adjusting responsibilities across existing ones |
| Regulation or legislation   | Changes setting formal and obligatory rules introduced via laws, regulations, or ordinances  |
| Standards or certifications | Changes introduced by setting standards, certifications, or other voluntary rules  |
| Strategy                    | Changes introduced by setting/articulating priorities, and linking them to specific means  |

Source: Authors based on OECD, UN, World Bank, EU

## 5.7 Annex 7: Database of bottlenecks indicators

- We built a database of contextual indicators that can be matched to the different categories of bottlenecks defined in our conceptual framework. Its aim is to perform descriptive statistics to check whether the reforms considered in the S3 are aligned with areas of weaknesses. This must be interpreted carefully, due to the multiple potential explanations for the patterns (e.g., distribution of competences between different levels of governance).
- We retrieved 28 unique indicators from multiple sources (mainly Eurostat, but also other organisations such as the OECD) covering the 2014-2023 period that can be reasonably linked to components of the ecosystem addressed by reforms. Indicators were retrieved at the regional level whenever possible, or the national one when not available. The matching of indicators to bottlenecks was defined manually based on the ability of the indicators to describe the underlying notion of the bottlenecks. The following table outlines how the different bottlenecks are described by indicators.

**Table 34: Overview of indicators on bottlenecks**

| <b>Component of the ecosystem: Education and Research system</b>  |                                |
|---|--------------------------------|
| <b>Indicator</b>  | <b>Source</b>                  |
| Share of 25-64 population with tertiary education   | Eurostat                       |
| Early leavers from education and training   | Eurostat                       |
| NEET share  | Eurostat                       |
| Adult participation in learning in the last 4 weeks   | Eurostat                       |
| R&D personnel and researchers in the non-business enterprise sector as share of total employment  | Eurostat                       |
| Regional Innovation Scoreboard: Scientific publications among the top 10% most-cited publications worldwide   | Regional Innovation Scoreboard |
| <b>Component of the ecosystem: Labour Market</b>  |                                |
| <b>Indicator</b>  | <b>Source</b>                  |
| Regional Innovation Scoreboard: Individuals who have above basic overall digital skills (as share of total population aged between 25 and 64 years) | Regional Innovation Scoreboard |
| R&D personnel and researchers as share of total employment  | Eurostat                       |
| R&D personnel and researchers in the business enterprise sector as share of total employment  | Eurostat                       |
| High-tech employment as share of total employment   | Eurostat                       |
| Regional Innovation Scoreboard: ICT specialists (as a percentage of total employment)   | Regional Innovation Scoreboard |
| Regional Innovation Scoreboard: Employment in innovative SMEs (as share of total employment)  | Regional Innovation Scoreboard |
| Net migration plus adjustment   | Eurostat                       |
| <b>Component of the ecosystem: Access to finance</b>  |                                |
| <b>Indicator</b>  | <b>Source</b>                  |
| Non-Business R&D expenditure (BERD) as a share of GDP (total - business)  | Eurostat                       |
| Business R&D expenditure (BERD) as a share of GDP   | Eurostat                       |
| <b>Component of the ecosystem: Governance, collaboration, and stakeholders' engagement</b>  |                                |
| <b>Indicator</b>  | <b>Source</b>                  |
| European Quality of Government: Quality pillar  | EQI                            |
| European Quality of Government: Impartiality pillar   | EQI                            |
| European Quality of Government: Corruption pillar   | EQI                            |
| Regional Innovation Scoreboard: Innovative SMEs collaborating with others as percentage of SMEs   | Regional Innovation Scoreboard |
| Regional Innovation Scoreboard: Public-private co-publications (as share of total publications)   | Regional Innovation Scoreboard |
| Regional Innovation Scoreboard: International scientific co-publications per million population   | Regional Innovation Scoreboard |
| <b>Component of the ecosystem: Business environment</b>   |                                |
| <b>Indicator</b>  | <b>Source</b>                  |
| Business demography and high growth enterprises by NACE Rev. 2 activity and NUTS 3 region   | Eurostat                       |
| Regional Innovation Scoreboard: PCT patent applications   | Regional Innovation Scoreboard |
| Regional Innovation Scoreboard: Trademark applications  | Regional Innovation Scoreboard |
| Regional Innovation Scoreboard: Design applications   | Regional Innovation Scoreboard |
| OECD Product Market Regulation Indicators – synthetic indicator   | OECD                           |
| OECD Product Market Regulation Indicators - administrative burden indicator   | OECD                           |
| Regional Innovation Scoreboard: Sales of new-to-market and new-to-firm innovations (as share of total turnover for SMEs)                            | Regional Innovation Scoreboard |

*Source: Prognos AG/CSIL (2025).*

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