European Commission | S3 COMMUNITY OF PRACTICE

S3 CoP Working Group
Industrial Transition

POLICY PAPER

S3 as a tool for developing industrial policy at regional level

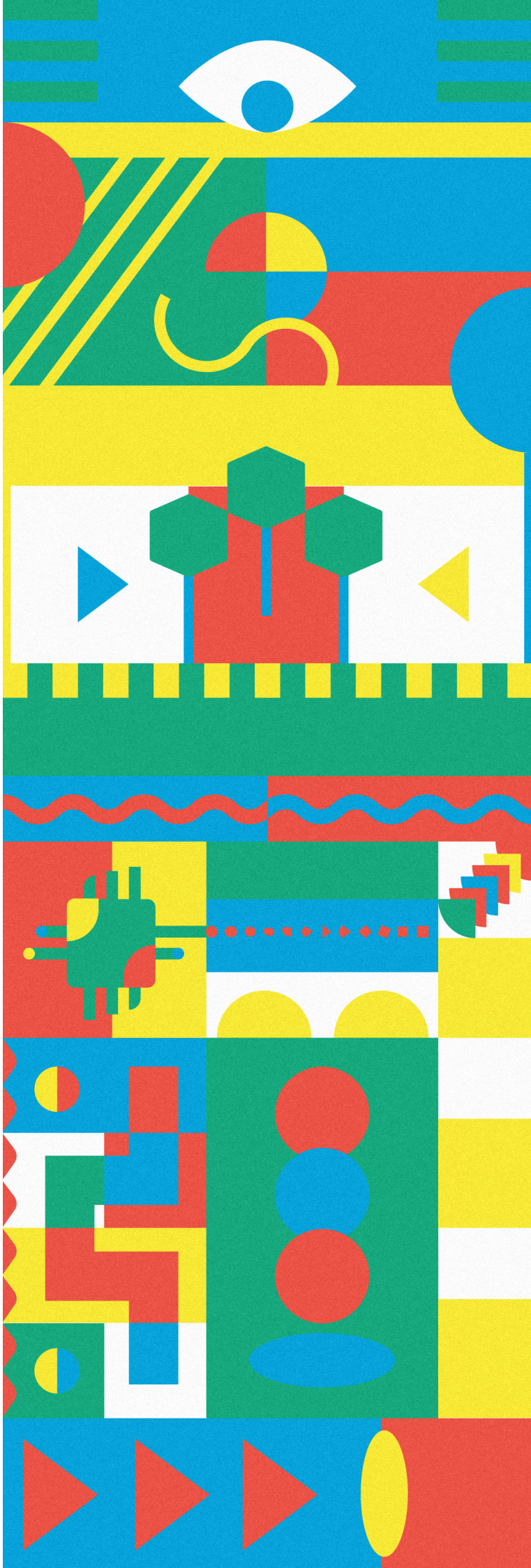

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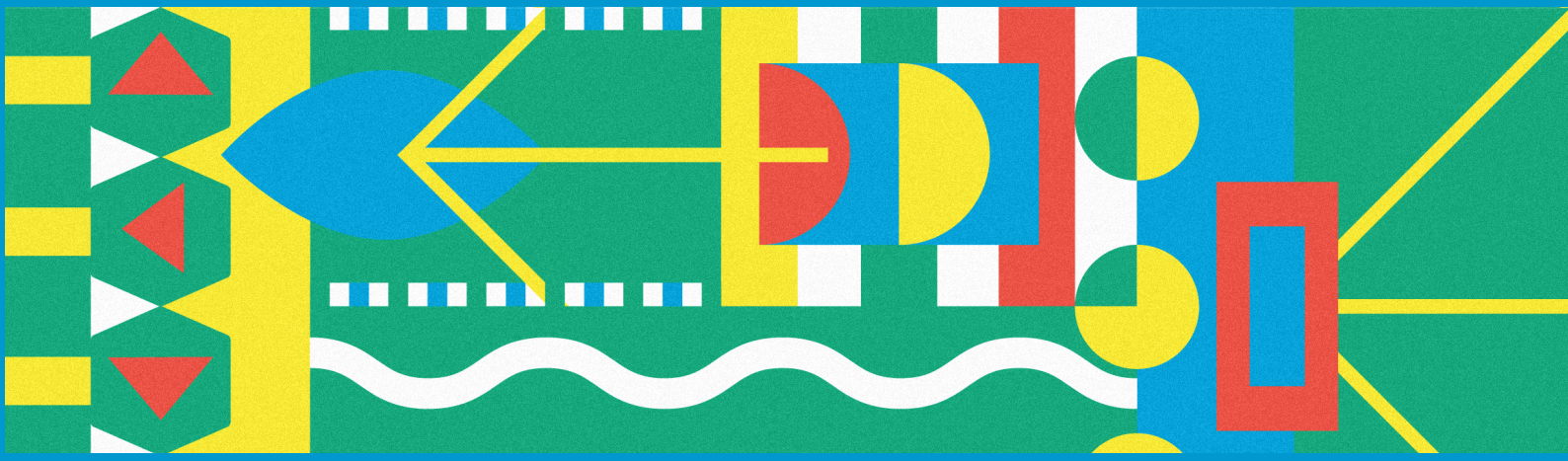
Table of Contents

Table of Figures

List of Acronyms

CC	Competence Centre
ECCP	European Cluster Collaboration Platform
EDP	Entrepreneurial Discovery Process
EIB	European Investment Bank
EU	European Union
FDI	Foreign Direct Investment
JTF	Just Transition Fund
MOIP	Mission-Oriented Innovation Policy
R&D	Research and Development
RVC	Regional Value Chain
S3	Smart Specialisation Strategies
SII	Strategic Innovation Initiative
SME	Small and Medium Enterprise
SPIN	Strategic Partnership for Innovation
STEM	Science Technology Engineering and Mathematics
S3CoP	S3 Community of Practice
TSI	Technical Support Instrument
WG	Working Group



Executive Summary

The “S3 CoP Working Group: Industrial Transition” paper titled “S3 as a Tool for Developing Industrial Policy at Regional Level” explores the role of Smart Specialisation Strategies (S3) in enhancing regional industrial policies for industrial transitions within the European Union (EU).

Leveraging evidence gathered from policymakers and practitioners through the S3 CoP Working Group on Industrial Transition, the paper explores how S3 can support the EU’s ambitions for green, digital, and inclusive transformation while strengthening industrial competitiveness. The urgency for strong strategies has increased with challenges like COVID-19, the war in Ukraine, demographic changes, global economic transformations, and rising competition in key technologies. Reports by Mario Draghi and Enrico Letta highlight the need for strong industrial strategies, better regulation, and efficient allocation of resources to close Europe’s productivity and innovation gaps.

The paper outlines how S3 can help regions define industrial transition pathways by mapping regional capacities, identifying niche opportunities, and aligning with broader European priorities. Effective regional roadmaps are key to ensuring that strategies are not only participatory and tailored to regional strengths but also contribute to EU-wide objectives such as achieving resilience, sustainability, and competitiveness. Examples from EU regions, included in boxes throughout the paper, illustrate how S3 can be practically applied to regional industrial policy.

The report also highlights the importance of inclusive industrial transition policies that close intra-regional development disparities and address local social and environmental challenges. By promoting innovation based on local demand and supporting less developed regions, S3 can drive equitable growth and ensure that no region is left behind.

Ultimately, the “S3 CoP Working Group: Industrial Transition” paper reinforces the value of Smart Specialisation Strategies as a dynamic framework for supporting regional industrial policies. By enhancing governance structures, promoting experimentation, and enabling flexibility in funding frameworks, S3 offers a pathway to robust, resilient, and competitive regional economies across Europe.

1. Introduction

The European Union aims to enhance industrial competitiveness while achieving green, digital, and inclusive transformations. These efforts address challenges like recurring crises (e.g., COVID-19, the war in Ukraine), demographic changes, global economic transformations and rising technological competition in areas such as semiconductors, artificial intelligence, and green technologies. The "multi-crises" have highlighted the vulnerabilities of European value chains, emphasising the need for strategic interventions to ensure resilience.

Recent reports by Mario Draghi[1] and Enrico Letta[2] highlight the urgency of a bold European response. Draghi emphasises the need to close Europe's productivity and innovation gap, calling for a sound industrial strategy, better regulation and appropriate allocation of financial resources. The report highlights sector-specific measures in energy, AI, semiconductors, and green technologies as crucial for security and sovereignty. Meanwhile, Letta stresses the importance of the Single Market, particularly in capital markets, telecommunications, and energy, in line with the need to address skill gaps and digital innovation, thereby strengthening Europe's global positioning.

The future of cohesion policy raises questions about **balancing EU-wide industrial priorities with reduction of regional disparities.** Studies show that the green and digital transition may benefit more advanced regions, while less developed regions risk falling further behind[3],[4]. President Von der Leyen's 2024–2029 guidelines stress the importance of "cohesion and growth policy" to address disparities and ensure all regions thrive. The "right to stay" approach integrates cohesion and industrial goals to ensure equitable growth in all regions[5].

Smart Specialisation Strategies (S3) remain central to EU cohesion policy, using a place-based approach to innovation. By leveraging each region's unique strengths and fostering participatory governance, S3 can align EU, national, and regional priorities. However, to maximise their potential, regions should strengthen key S3 features, including systemic policy coordination (whole-of-government approach), stakeholder engagement, further focus on narrower and clearer thematic priorities as well as strengthen its experimentalism and adaptability[6].

Objectives

The objective of this paper is to explore how Smart Specialisation Strategies (S3) can serve the new European industrial and competitiveness policies by leveraging evidence gathered from policymakers and practitioners through the S3 CoP Working Group on Industrial Transition. While the paper does not aim to validate or prove the connections between S3 and the new European industrial and competitiveness policies, it seeks to articulate some key dimensions of industrial transition policies via examples, recommendations and best practices of WG members to inform the policy debate on the future of S3 and set the basis for more detailed investigations and discussions.

1 Mario Draghi report: The future of European competitiveness – A competitiveness strategy for Europe (September 2024) ((https://commission.europa.eu/topics/strengthening-european-competitiveness/eu-competitiveness-looking-ahead_en)

2 Enrico Letta's report: Much more than a market (April 2024) (https://single-market-economy.ec.europa.eu/news/enrico-lettas-report-future-single-market-2024-04-10_en)

3 Ambre Maucorps, Roman Römisch, Thomas Schwab, Nina Vujanovic. (October 2022).The Future of EU Cohesion. Effects of the Twin Transition on Disparities across European Regions). Bertelsmann Stiftung. https://www.bertelsmann-stiftung.de/fileadmin/files/PicturePark/2022-11/221012_EZ_Study_The_Future_of_EU_Cohesion.pdf

4 Andrés Rodríguez-Pose, Federico Bartalucci. (July 2024). The green transition and its potential territorial discontents. https://academic.oup.com/cjres/article/17/2/339/7427086

5 President Von der Leyen priorities of the new European Commission for 2024-2029 presented to the European Parliament the day of her election, 18th of July 2024. https://commission.europa.eu/about/commission-2024-2029_en

6 Francesco Molica (2024). Reassessing Cohesion Policy Through the Lens of the New EU Industrial Policy. Journal of Common Market Studies. https://onlinelibrary.wiley.com/doi/pdf/10.1111/jcms.13616#:~:text=The%20research%20note%20explores%20the%20role%20of%20cohesion,anchor%20it%20in%20the%20new%20industrial%20policy%20paradigm.?msockid=05e9bbace13965831db8af30e055645d

Through S3, regions can develop comprehensive programmes for industrial transition, enhancing regional competitiveness, inclusion and sustainability. However, for these industrial programmes to have an impact, alignment and coordination of policies at multiple levels, combining European, national and local funds and programmes, is crucial.

2. Defining Regional Programmes for Industrial Transition

S3 demonstrates clear added value for EU regions in aligning regional capacities with European priorities by setting the ground for identifying their unique strengths, mapping innovation potential, and activating ecosystems. Regions can define transition pathways by focusing on key sectors and niche opportunities aligned with future market needs.

1. European Industry Priorities

The EU's industrial agenda, including the Critical Raw Materials Act, Net Zero Industry Act, and Strategic Technologies for Europe Platform, aims to foster resilient, sustainable, and interconnected value chains. The New Industrial Strategy prioritises 14 ecosystems, which offer niches of opportunity driven by net-zero requirements, process innovations, and shorter logistics chains. **Regional roadmaps**, supported by traditional and innovative measures, can target these niches, combining transversal and vertical approaches to stimulate growth (see Illustrative example 1).

Illustrative example 1 – *Navarra's regional industrial law – horizontal and vertical measures*

Navarra combines two approaches to support its industrial sector. First, a **participatory process** brought together 57 stakeholders, generating 900 proposals for the region's first industrial law. Over a six month period, nine thematic groups were formed - covering areas like governance, digital and green transitions, and funding - and 76% of the proposals were included in the bill.

Second, a mid-term review of Navarra's **Smart Specialisation Strategy** refined its industrial focus, adapting its priorities to regional economic needs. The Smart Specialisation Strategy also identifies innovation opportunities arising from digital and green transitions, helping modernise traditional industries.

2. Roadmaps for Implementation

Co-designed roadmaps, or transition pathways, are key for **aligning local priorities with broader EU goals**. They ensure that strategies are participatory, tailored to regional strengths, and contribute to European objectives. These roadmaps help regions transition to new value chains, boost competitiveness, achieve sustainable growth, diversify economies, and unlock new development opportunities.

Roadmaps should clearly outline how to implement industrial transition strategies. They must take a systemic view of production and consumption, connect current capacities with future demand, and address gaps in technology, skills, entrepreneurship, and infrastructure. Effective roadmaps detail actions to fill these gaps, combining policy areas with defined timelines, milestones, and performance indicators.

A structured methodology for creating roadmaps is provided in the JRC report **"Projecting Opportunities for Industrial Transitions (POINT)[7]"**. It is a broad approach that analyses production and consumption

7 Pontikakis, D., Fernández Sirera, T., Janssen, M., Guy, K., Marques Santos, A., Boden, J.M. and Moncada Paterno` Castello, P., Projecting Opportunities for INdustrial Transitions (POINT): Concepts, rationales and methodological guidelines for territorial reviews of industrial transition, EUR 30375 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-22152-4, doi:10.2760/590389, JRC121439. https://publications.jrc.ec.europa.eu/repository/handle/JRC121439

systems, identifies the interconnections across value chains, and pinpoints key intervention areas. This creates pathways for industrial development, supported by coordinated planning and action. The methodology involves four steps:

- **Choosing an industrial focus** that aligns with global goals of transformative change and defining the scope of analysis.
- **Mapping the current system** to understand its structure and conditions.
- **Envisioning a desirable future** by identifying missing components and setting a clear direction for the transition.
- **Identifying leverage points** for action, offering guidance on governance, coalition building, managing resistance, and creating policies, reforms, and experiments.

Together, these steps form a coherent plan for systemic industrial transformation. The S3 approach emphasises participatory governance, regional diagnostics, future visioning, and innovation priorities, providing a comprehensive toolkit for implementing roadmaps. This paper, therefore, outlines key elements for crafting effective roadmaps to achieve successful industrial transitions, focusing on practical examples from regions on:

- Mapping regional ecosystem capacities
- Technological approaches
- Skills and entrepreneurship
- Governance and dynamisation models
- Coordination of EU funding
- Inclusive industrial transition

Illustrative example 2 – *Roadmaps of Wallonia region, Belgium*

In Wallonia, each **Strategic Innovation Domain (DIS)** within the S3 has **a dedicated roadmap** co-created with stakeholders, which outlines ambitions, areas of specialisation, intervention logic, and links to EU priorities. The five DIS focus on circular materials, health innovations, sustainable energy, agro-food systems, and advanced production methods. See more here.

Additionally, **Wallonia's roadmap for industrial decarbonisation** addresses challenges such as CO_2 emissions and energy efficiency. It presents tailored solutions, including the integration of renewable energy, carbon capture, and the use of biomass. This roadmap provides practical guidance to help companies in aligning with EU's 2030 and 2050 carbon neutrality targets, while enhancing their competitiveness and resilience. See more here.

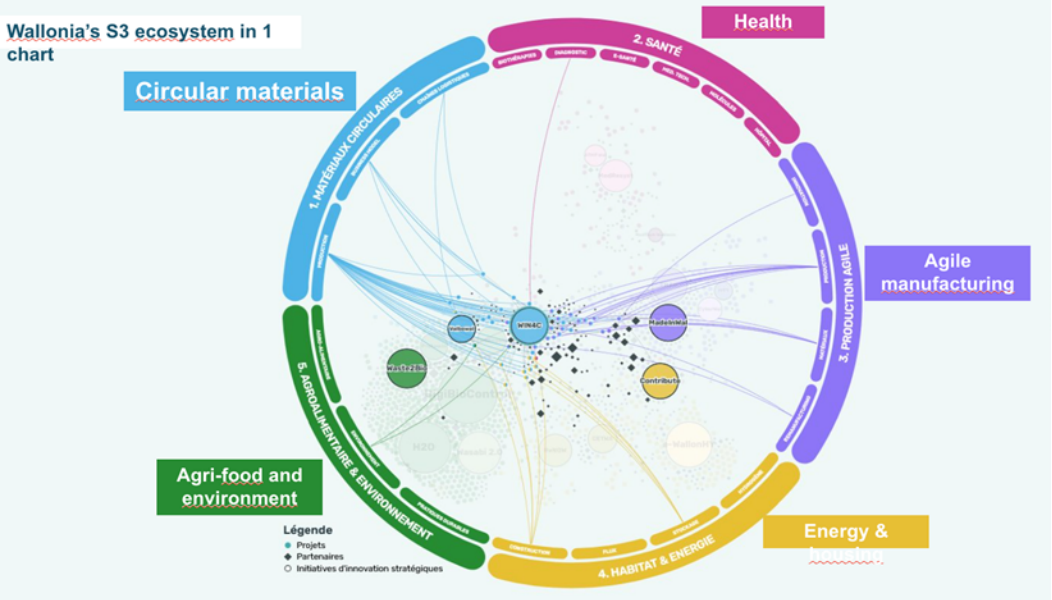
3. Defining Regional Programmes for Industrial Transition

1. Mapping regional ecosystem capacities

Mapping regional ecosystems – including sectors, industries, expertise, research capacities, market potential, workforce skills, infrastructure, and societal needs – is key to successful industrial transitions. This process helps identify strategic innovation areas, highlighting regions' competitive advantages and growth opportunities (see Illustrative example 3 – Wallonia S3 ecosystem mapping). It also facilitates the categorisation of businesses and areas of specialisation, providing a clear picture of regional expertise (e.g., Illustrative example 4 - Mapping and monitoring S3 at national and regional levels, Italy). Indicators like R&D investment, workforce skills, and technological readiness offer actionable data for guiding industrial transition strategies. Regional ecosystems mapping can be further supported by EU-level tools, such as the **Territorial Economic Data Viewer**[8], which provides valuable insights on sectors, ecosystems and their vulnerability to transition. Additionally, the **ECCP's interactive map**[9] provides useful information on clusters distribution and actor data.

Illustrative example 3 – *Wallonia S3 ecosystem mapping*

Wallonia has developed a web application to map stakeholders and projects involved in the S3 ecosystem. The tool visualises connections between actors, projects, and regional priorities and includes search functionalities. It highlights 5 Strategic Innovation Areas (SI) and 19 Strategic Innovation Initiatives (SII), supported by over 500 projects and 1,000 partners. Coloured lines and dots illustrate relationships between ecosystem actors and projects and can be simulated through different parameters and filters. See more here.



8 https://web.jrc.ec.europa.eu/dashboard/TEDV/index.html

9 https://reporting.clustercollaboration.eu/

Illustrative example 4 – *Mapping and monitoring S3 at national and regional levels, Italy*

Istat (Italian National Institute of Statistics) publishes 34 indicators for each area of specialisation under the S3 strategy, at both national and regional levels. These indicators are updated with data from the Istat business census and register for the years 2022 and 2024. They focus on five key dimensions: innovation, R&D, human capital, business relations, environmental sustainability, and territorial development, and reflect a new classification of enterprises. This classification, along with its sub-dimensions, indicators and variables, provides a comprehensive view and monitoring parameters on how enterprises contribute to regional development. See Annex 1 for more details on the parameters used.

1.1. Entrepreneurial Discovery Process

Mapping key sectors involves a bottom-up approach, engaging businesses, researchers, and local authorities to align priorities with regional strengths. The functioning of stakeholder cooperation, also known as **Entrepreneurial Discovery Process (EDP)**, which is central to the S3 methodology, ensures that identified areas reflect regional realities through participatory design. This approach avoids reliance on "usual suspects" and fosters fresh dynamics, enabling collaborative strategies (see Illustrative example 5 - Croatia's Regional Value Chains (RVCs). Structured frameworks bring stakeholders together around shared regional priorities, promoting collaboration in research, training, and investment (see Illustrative example 6 - Strategic Innovation Initiatives of Wallonia).

Illustrative example 5 – *Croatia's Regional Value Chains (RVCs)*

Croatia's industrial transition began with the preparation of the Industrial Transition Plans (2021) and the approval of the Integrated Territorial Program (2021–2027) by the European Commission in December 2022.

The goal is to drive regional economic change by investing in the **diversification and modernisation** of operations in key areas. Central to this is the **Entrepreneurial Discovery Process (EDP)**, which involved workshops, meetings, and surveys at the regional level to identify priority areas and foster collaboration in innovation and skills development.

The EDP is ongoing, supported by strategic forums in the Adriatic, Pannonian, and Northern Croatia regions. These forums guide the transition, with the Ministry of Regional Development and EU Funds implementing a flexible model that allows for regular adjustment of policies. This model ensures alignment with national and European goals while exploring new growth paths. See more here.

See also a complementary illustrative example in Annex 1 on how **Strategic Partnership for Innovation (SPIN)** in Croatia support the RVCs.

Illustrative example 6 – *Strategic Innovation Initiatives of Wallonia*

In Wallonia, **19 Strategic Innovation Initiatives (SIIs)** have been selected as part of the S3. These initiatives bring together a range of stakeholders and projects focused on shared priorities that align with regional S3 goals. The aim is to create synergies through action plans that integrate R&I, training, internationalisation, investment, and collaboration, all aimed at strengthening regional innovation ecosystems. The initiatives also promote EU-level cooperation, expanding their impact beyond the region. This approach encourages **local stakeholder involvement** and **drives innovation-led growth**. See more here.

2. Technological Approaches

Technology-driven strategies are essential for building resilient, future-ready economies. Regions are increasingly **adopting transformative technologies** like artificial intelligence, biotechnology, and circular economy solutions as part of their industrial transition plans. For instance, Wallonia focuses on market-driven technological priorities, while Croatia integrates strategic technologies into its Regional Value Chains.

These approaches not only boost productivity and attract investments but also contribute to upskilling the workforce. The integration of technology has the potential to modernise industries and maintain the competitiveness of regions (see Illustrative example 7 – Applying S3 to Technological innovation in Brittany, France). Regions can also create spaces for experimentation, prototyping, and supporting Small and medium-sized enterprises (SMEs) to foster technological ecosystems and innovation (see Illustrative example 8 - Manufacturing Innovation Valley - (DIH) in Vilnius, Lithuania).

Illustrative example 7 – *Applying S3 to Technological innovation in Brittany, France*

Digital technologies are a key focus of Brittany's Smart Specialisation Strategy (S3). The region has developed digital ecosystems in sectors like maritime, agriculture, and healthcare. Initiatives such as the **Bretagne Cyber Alliance** foster innovation and strengthen digital infrastructure through public-private partnerships, supported by Horizon Europe and the ERDF. For example, the **Brest Institute of Research and Technology (IRT)** plays a key role in this by connecting researchers, businesses, and public institutions.

Brittany's **Paimpol-Bréhat tidal energy project** is an example in renewable energy. Supported by the **Bretagne Ocean Power (BOP)** cluster, it develops advanced tidal turbines to harness the region's strong tidal currents. By bringing together public institutions, research labs, and businesses, the BOP cluster drives R&D in renewable energy, positioning Brittany as a leader in marine technology.

Illustrative example 8 – *Manufacturing Innovation Valley - (DIH) Digital Innovation Hub in Vilnius, Lithuania*

The Manufacturing Innovation Valley in Vilnius, Lithuania, serves as a one-stop shop to help companies enhance their competitiveness through digital and green technologies. It offers "test before invest" services, enabling SMEs to prototype, test, and validate technologies before large-scale implementation, thereby mitigating risks such as selecting unsuitable solutions or digitising inefficient processes. Services include technology demonstrations, legacy system integration with digital and bio-intelligent technologies, small-scale manufacturing, and proof-of-concept development.

The hub is part of the Next Generation of Digital Innovation Hubs (DIH4C), focusing on twin green and digital transitions. By connecting SMEs and innovation clusters with funding opportunities and EU R&D networks, it facilitates the seamless adoption of advanced technologies, supports upskilling, and promotes integration into sustainable industrial value chains. See also Annex 1 for details on operating model of DIH4C.

2.1. Circular Economy as a new industrial paradigm

The circular economy is increasingly becoming a central pillar of regional industrial strategies, offering **significant potential for decarbonisation, resource efficiency, and cost savings.** By enabling the more efficient use of resources, circular economy initiatives and practices can help industries reduce waste, lower costs, and boost competitiveness. Regions can specialise in areas such as recycling technologies, renewable energy, and bio-based materials, creating opportunities for innovation and economic growth.

Illustrative example 9 – *Centro's Regional Agenda for Circular Economy*

Centro's Regional Agenda for Circular Economy, which is part of its Smart Specialisation Strategy (S3), builds on existing governance models and aligns with regional priorities to promote sustainable practices. It focuses on raising awareness of circular economy principles through initiatives for schools, businesses, and communities.

For example, schools teach students on resource efficiency and waste reduction, while businesses participate in training and pilot programmes to adopt circular production models. A dedicated funding call also supports businesses in transitioning to circular practices, driving innovation and sustainability. This approach supports regional transformation and aligns with European sustainability goals. Centro's Innovation Hubs play a key role in coordinating efforts to modernise industries, particularly through circular economy and decarbonisation initiatives.

Industrial Symbiosis, which is one of the key sub-areas of Circular Economy, demonstrates the substantial potential of **place-based circular economy practices,** as its success is inherently tied to the local context. This includes the availability of resources, infrastructure, and collaboration among businesses within a specific industry complex (e.g., an ecopark), a city (e.g., industrial-urban symbiosis), or a region. Industrial symbiosis promotes cooperation between companies, enabling one company's waste or by-products to become inputs for another's operations, thereby fostering innovation in materials use and production processes. The location and development of new business opportunities will heavily depend on the regional provisions and flows of these new sustainable resources. For example, regions with strong **industrial clusters can develop symbiotic initiatives,** such as repurposing surplus heat from manufacturing for local heating systems or transforming food waste from one industry into bioenergy or animal feed[10].

3. Skills and Entrepreneurship for Industrial Transformation

A successful industrial transition depends on equipping the regional workforce with the right skills for emerging industries. Upskilling, reskilling, and skill development are essential for promoting entrepreneurship, as new business models and technologies require a skilled and adaptable workforce.

Incorporating skills mapping into S3 roadmaps allows regions to target training initiatives, improve workforce adaptability, and strengthen links between education, industry, and innovation. Collaboration between educators, industry, and policymakers is key to identifying skill gaps and aligning regional strengths with innovation goals. To ensure continued relevance, regular monitoring is crucial, allowing regions to stay informed about technological advances, market trends, and economic changes (See Illustrative example 12 – Istituti Tecnici Superiori, Southern Italy).

Illustrative example 10 – *Green Ray, Málaga TechPark*

The Green Ray, or "El Rayo Verde," is a collaborative initiative between the University of Málaga (UMA) and Málaga TechPark (Parque Tecnológico de Andalucía). Located within the university's campus, this partnership aims to bridge the gap between academic research and business innovation, fostering **a vibrant ecosystem that nurtures technological advancements and entrepreneurial ventures.** By providing a shared meeting space, The Green Ray facilitates collaboration among entrepreneurs, researchers, and students, promoting the exchange of ideas and the development of innovative solution and joint ventures, such as partnerships with companies like Samsung. See more here.

10 For EU-level examples, see also the European Community of Practice for Hubs4Circularity (H4C), which connects actors from industry, regions and cities, H4C initiatives, and research and development organisations. This platform facilitates knowledge sharing, exchange of experiences, and provides tools and resources on industrial and industrial-urban symbiosis, as well as circular value chains. https://www.h4c-community.eu/

Illustrative example 11 – *Competence Centres for Skills and Employment, Greece*

Greece has three Competence Centres (CC) for Skills & Employment, located in Just Transition Cities. These centres support unemployed people and workers facing job displacement due to the transition, as well as self-employed individuals and entrepreneurs. The CCs utilise various tools such as desk research, industry exhibitions, studies, workshops, B2B tools, and masterclasses to assist their work.

Illustrative example 12 – *Superior Technical Institutes ITS, Southern Italy*

Southern Italy's industrial transformation requires a larger pool of skilled workers, especially in manufacturing, construction, and ICT. However, it has fewer Science Technology Engineering and Mathematics (STEM) graduates than the national average. The Superior Techical Institutes (ITS) provide post-secondary training to create 'super technicians' in high-demand areas such as Mechatronics, ICT, and Energy Efficiency. The two-year courses (1800 hours) combine education, field training, and work experience, leading to a Higher Technician Diploma.

The proposal is to increase funding for ITS programmes, upskilling courses, and green and digital start-up incubation, while also developing European projects like "Net Zero Industry Academies" to enhance both technical and cross-disciplinary skills.

4. Governance and Dynamisation Models

S3 Governance and Dynamisation Models play a critical role in supporting innovation ecosystems for industrial transition by fostering **collaboration, adaptability, and strategic alignment** among key elements and actors within these ecosystems. Governance structures enable coordinated policy design, implementation, and monitoring, ensuring that innovation efforts reflect regional strengths and priorities. Dynamisation models, complementarily, encourage active engagement between businesses, universities, and research institutions, promoting co-creation and knowledge exchange to develop new technologies and business models. In this collaboration, **innovation hubs and clusters can serve as focal points** for stakeholder engagement, policy development, and strategic coordination (see Illustrative example 15 - Centro's regional innovation hubs). Together, these models ensure **agile adaptation to industrial challenges** while facilitating the coordination of initiatives and funding.

Illustrative example 13 – *Usti region - Innovation ecosystem model for Industrial Transition*

The Ústí Region has built an innovation ecosystem with knowledge agents, including regional and Prague-based universities. Its strategic location, with a fast train link to Prague and Dresden, supports connectivity. Startups and industrial research are key parts of the ecosystem.

Business support is provided by the Innovation Center of the Ústí Region ICUK (eDIH - Digital Innovation Hub), national partners, and the EDP platform. The region offers R&D facilities for testing and validation in areas like energy engineering, geothermal technologies, nanotechnology, cleantech, as well as spaces like Digilab and a maker space.

The ecosystem also includes Startup and Growth programmes, international cooperation, events, and efforts to attract Foreign Direct Investments (FDI). Workforce development is supported by HR programs, Job Watch, and a Welcome Office. Funding is available through vouchers, soft loans, R&D funding from the Just Transition Fund (JTF), and equity financing.

Illustrative example 14 – *North Middle Sweden - Governance model for Inustrial Transition*

The **Challenge Lab initiative** in North Middle Sweden shows how effective governance and stakeholder engagement can drive industrial transformation. The project, which focused on hydrogen's role in low-carbon industries, succeeded due to early involvement of stakeholders and the provision of incentives to promote participation.

By creating a strong network across public, private, academic, and civil sectors, the project maintained a dynamic and flexible approach. The governance structure allowed for continuous feedback and active involvement, ensuring the the project remained aligned with regional goals. This demonstrates how good governance can ensure the success of transformation initiatives such as the Challenge Lab. See more on **Regions in Industrial Transition 2023** here.

Illustrative example 15 – *Centro's regional innovation hubs*

Centro's S3 strategy led to the creation of four regional innovation hubs, each addressing specific challenges while capitalising on the region's strengths in production and science. These hubs focus on transformative agendas that guide projects and investments towards regional strengths and global sustainability goals.

For example, the "Developing Sustainable Industrial Solutions" hub promotes a greener, more efficient industrial ecosystem. It focuses on five key areas:

- Sustainable processes and materials, such as biodegradable packaging for food.
- Resource efficiency and reducing environmental impact, for example, water recycling in textiles.
- Circular Economy and Decarbonisation, including turning industrial waste into raw materials.
- Digitalisation and advanced tech, such as AI and IoT to optimise factory operations.

5. Coordinating funding instruments

Aligning EU funding to support industrial transition policies requires strategic integration across different programmes. This allows S3 to evolve into a practical framework for successful implementation of territorial policies, ensuring cohesion and impact in achieving regional transition goals.

Cohesion Policy instruments, including the **European Regional Development Fund** and the **Just Transition Fund**, as well as EU Research and Innovation programmes like **Horizon Europe** play a pivotal for industrial transitions. These instruments support a wide set of activities from research and innovation to experimentation, implementation and scale-up of new technologies and stages.

In addition, private finance is crucial in accelerating industrial transitions, complementing public funding by leveraging investments from banks, institutional investors, and businesses. Blended finance - the strategic use of public funds to de-risk private investments – can enhance the impact of EU funding by mobilising additional resources, such as loans or equity, for high-risk or early-stage projects. InvestEU and the European Investment Bank (EIB) are key players in blending public and private finance to support industrial transformation across crucial sectors. For example, InvestEU can facilitate investments by providing guarantees that attract private investors, as seen in the ELENA Facility[11], which helped local governments finance green projects with investments in energy efficiency and renewable energy. Similarly, the EIB co-finances large-scale industrial innovation by, for instance, providing loans to public sector. An example of this is its collaboration with InvestEU to jointly fund hydrogen infrastructure for H2 Green Steel[12], a Swedish plant that is replacing coal with hydrogen.

11 https://www.eib.org/en/products/advisory-services/elena/index

12 https://www.eib.org/en/projects/pipelines/all/20200902

Moreover, private financing can also be used to **close funding gaps** where matching funds are required by funding programmes, as is often the case with the EU's Cohesion and Regional Development funds. Annex 1 contains further information and examples on how EU funding instruments can be combined. Additionally, regions can capitalise on EU Technical assistance programmes, such as JASPERS[13] and Technical Support Instrument (TSI)[14].

Illustrative example 16 – *Multilevel governance of JTF, Centro, Portugal*

Closing all coal power plants is essential for decarbonising the energy sector, but it will result in the loss of over 400 jobs. To address this, the Regional Coordination and Development Commission (CCDR) Centro, the Municipality of Abrantes, and the Intermunicipal Community (CIM Médio Tejo) are coordinating efforts, using the Just Transition Fund (JTF) for economic diversification. CCDR Centro manages the JTF funds for Médio Tejo in response to the plant's closure.

The IEFP (National Employment Institute), in close contact with the Workers' Union, supports affected workers, while local Higher Education Institutions and Technological Centers focus on reskilling in line with regional needs and specialisation areas. Meanwhile, Endesa, Generación Portugal, S.A. plans significant investments in renewable energy and skilled jobs. The Portuguese Agency for Competitiveness and Innovation (IAPMEI), the Portuguese Trade & Investment Agency (AICEP), and the Subregion Entrepreneurial Association in cooperation with CCDR Centro are also working to attract new investments through regional initiatives.

13 JASPERS provides free assistance to local authorities and promoters in delivering high-quality projects for EU-funded investments, with a focus on cohesion: https://www.eib.org/en/products/advisory-services/jaspers/index

14 The Technical Support Instrument (TSI) is the EU programme that provides tailor-made technical expertise to EU Member States to design and implement reforms: https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/technical-support-instrument/technical-support-instrument-tsi_en

4. Inclusive Industrial Transition

1. Innovation Based on Local Demand

An inclusive industrial transition requires innovation strategies tailored to regional needs and contexts. Increasingly, regions are adopting demand-driven approaches, where local social and environmental challenges serve as catalyst for innovation. These initiatives not only address immediate needs but also create demand for new business and technology solutions, particularly in the digital and green transitions. Such transitions are key in tackling local issues such as sustainability, energy efficiency, aging populations, and digitalisation. For example, community-led climate solutions show how local challenges can spark innovation and open new market opportunities.

Illustrative example 17 – *Croatia's S3 innovation driven by local and regional demands*

Croatia's S3 focuses on innovation driven by local and regional needs, particularly in digitalisation and green technologies. This approach integrates advanced solutions into traditional industries to tackle key challenges like sustainability, regional resilience, and economic competitiveness.

Key actions include:

- **Mission-Oriented Innovation Policy (MOIP):** Supported by the S3 Community of Practice (S3CoP), Croatia employs MOIP to address complex issues such as pollution, sustainable energy, and health improvements.
- **Regional Value Chain Workshops:** Three pilot workshops brought together regional stakeholders—government, businesses, and research institutions—to co-create solutions tailored to local needs.
- **Strategic Partnerships:** Future calls for Strategic Partnerships will focus on projects that align with locally driven missions, ensuring innovation efforts match the needs of Croatian communities and industries.

2. Dealing with Intra-Regional Development Gaps

A key challenge in an inclusive industrial transition is addressing intra-regional disparities. Many regions, especially those with diverse economies, struggle to balance development between advanced and less developed areas. Both Centro and Croatia have faced this challenge, where industrialised areas have strong innovation ecosystems, while others struggle with a lack of skills and infrastructure. For example, Aveiro and Coimbra lead in R&D, while inland areas face demographic challenges and limited innovation capacity. To bridge these gaps, strategies like targeted support for lagging areas, infrastructure investment, and tailored policies are essential for ensuring an inclusive and equitable transition for all areas.

5. Recommendations and conclusions

The Smart Specialisation Strategies (S3) framework has been instrumental in driving regional industrial transitions across Europe. By leveraging robust governance frameworks, dynamic models, and policy tools that support innovation, skills development, and technological advancements, it has strengthened local capabilities and enabled regions to seize new industrial opportunities. Its participatory and focused approach remains essential to shaping new industrial trajectories.

Looking ahead, future S3 initiatives may adopt a combined "offer and demand" approach, including not only traditional economic and technological strengths (push-driven innovation) but also demand-driven elements that use local needs as early triggers for innovation. This evolution can support tailored transitions, promoting competitive, net-zero, and circular industries while addressing local challenges and enhancing regional resilience.

Several key recommendations emerge:

- **Industrial Transition Policies:** Industrial strategies should align local strengths with European goals by defining clear policies and targeted incentives. Governance models should engage diverse stakeholders to ensure collaboration and maximise local impact. Public procurement may be used as a strategic tool to drive innovation and sustainability by integrating public demand into regional strategies.
- **Developing Regional Industrial Roadmaps:** Industrial roadmaps should be developed based on in-depth knowledge of local capacities and demands to ensure tailored strategies for sustainability and growth. These roadmaps should facilitate the formation of "constellations" of companies and innovation centres around shared industrial topics, while aligning with broader European Industrial Ecosystem roadmaps for coherence and scalability.
- **Strengthening Skills:** Coordinated frameworks, such as the EU-wide"Net Zero Academies," should be established to address workforce gaps in the green and digital economies. Emphasising reskilling and upskilling through partnerships between educational institutions and industries may ensure alignment with local industrial pathways.

- **Enhancing Governance Structures:** Participation in multilevel governance mechanisms is essential to align EU, national, and regional policies. Platforms for stakeholder engagement and public-private partnerships should be created to ensure effective collaboration in deploying industrial transformation strategies.
- **Experimentation and Scaling of Innovative Solutions:** Regions should establish mechanisms for piloting and experimenting with sustainable industrial solutions, focusing on scaling successful innovations to larger markets. Lessons learned from both successes and failures should be systematically shared to refine future strategies.
- **Flexibility in Funding Frameworks:** EU funding frameworks should be adapted to offer greater flexibility, enabling regions to address specific needs more effectively. Tools like blended finance and private financing mechanisms should be employed to support regional actions that align with EU industrial and environmental goals. Access to funding for SMEs should be simplified, and synergies between different funds should be maximised to ensure cohesive and competitive outcomes.
- **Inter-Regional Cooperation:** Strengthening cross-regional collaboration through knowledge-sharing platforms and networks is essential to connect supply-demand chains and foster EU-wide value chains. Collaborative frameworks should be encouraged to promote cross-sectoral partnerships on transversal topics, enhancing collective innovation.

Annex 1 – supporting material

Figure 1 – *Mapping and monitoring S3 at national and regional levels, Italy*

DIMENSIONS	SUB DIMENSIONS	INDICATORS	VARIABLES
1. Research & Development	1.1 Ability to expand knowledge assets and innovation in production	R&D expenditure	1. Intensity of R&D investment 2. Acquisition of R&D services
	1.2 Applications and experimentation in R&D	R&D facilities	1. In-house R&D activities
		Output	1. Acquisition of licenses and patents
2. Innovation	2.1 Product and process innovation	Product and process innovation	1. Technical and aesthetic design 2. Acquisition of machinery/equipment for innovations
	2.2 Organizational and marketing innovation, innovative finance	Organizational and marketing innovation, innovative finance	1. Marketing for launching new goods/services 2. Sources of innovative financing of the enterprise
	2.3 Innovation in technology and digital fields	Digitalization	1. Intensity of investment in digitization 2. Software acquisition/development 3. Acquisition of hardware/network equipment 4. Production of KETs 5. Utilization of KETs
	2.4 Environmental and social sustainability	Environmental and social sustainability	1. Intensity of investment in environmental and social responsibility 2. Measures to improve occupational well-being 3. Collective interest initiatives 4. Investment in installation of power generation facilities 5. Wastewater treatment 6. Containment of water withdrawals and consumption 7. Involvement of suppliers attentive to environmental impact 8. Redesigning the production process for environmental sustainability 9. Drafting environmental/sustainability reports 10. Acquire voluntary process/product certifications
3. Human capital	3.1 Quality of human resources and skills development	Training and skills (level)	1. Training activities other than mandatory training 2. Intensity of investment in human capital and training 3. Employees with tertiary education 4. Staff training on innovations
4. Capacity to drive the development of territories	4.1 Ability to create and expand relationships to increase innovative capacity	Relationship networks	1. Formal agreements with universities/research centers 2. Formal agreements with public administration 3. Formal agreements with enterprises 4. Formal agreements for the development of new products/processes 5. Formal agreements for access to new skills/technologies
	4.2 Openness to new markets and internationalization	Markets and internationalization	1. Intensity of investment in internationalization 2. Formal agreements for access to new markets/customers
5. Economic performance	5.1 Productivity levels	Productivity levels	1. Value added per employee

Figure 2 – *Strategic Partnership for Innovation (SPIN) in Croatia*

Strategic Partnership for Innovation (SPIN) in Croatia

In the EU financial perspective 2021–2027, Croatia recognizes RDI's importance in driving industry transformation, using EU funds to boost innovation in regional economies. Through the industrial transition of the Adriatic, Northern, and Pannonian regions, Croatia leverages regional strengths and competitive advantages via the smart specialisation process at the NUTS 2 level.

14 Regional Value Chains (RVCs) have been identified to foster RDI investment, support growth, and drive industrial transition towards higher-value niches. These RVCs act as catalysts for entrepreneurial discovery and economic transformation.

The key support instrument for RVCs is **Strategic Partnerships for Innovation (SPIN)**, co-financed by EU funds under the **Integrated Territorial Program 2021–2027** with a €320 million budget. SPINs serve as platforms for investing in new technologies and fostering collaboration, guided by RVC Action Plans and stakeholder involvement.

To enhance SPIN's societal relevance, authorities align them with key societal challenges through **"Missions for Research, Development & Innovation (RDI)"**. This links industrial transition with regional development, including urban areas, islands, and other regions, tackling challenges such as:

- Climate change and sustainability
- Cybersecurity
- Food and energy security
- Traffic congestion and pollution
- Natural disasters
- Public health crises

A challenge-based approach brings together resources and knowledge from various disciplines, focusing on research, piloting, and market adoption of innovations.

By stimulating innovation potential and enhancing cross-sectoral partnerships through RVCs, Croatian regions can transition towards modern, knowledge-based economies, close development gaps, and stimulate growth. Connecting innovation to specific challenges not only drives societal innovation but also position Croatian regions prominently on the EU innovation map, offering a model for post-2027 innovation policy.

Technological Approaches

Figure 3 – *Manufacturing Innovation Valley - Operating Model*

DIH4C Operating Model

Implementation of the 'One Stop Shop' concept to ensure that all services—from technology demonstrations and testing to training—are accessible in a single location, thereby facilitating access and interaction between companies and the DIH.

No. Activity Objective Specific Activities Infrastructure Needed Justification

O1. To raise awareness of the potential of the Concept of Smart Factory by promoting Access to Digital and Green Technologies

1. Technology Show Room (demonstration of technologies. Promotion of Innovation diffusion and deployment in EIT RIS countries). Provide companies with access to the latest digital and Net Zero solutions, inspiring practical adoption. Demonstrations of the implementation of innovative digital and Net Zero solutions such as robotics, AI, VR/AR, Certification of Manufacturing, Digital platforms, Process engineering and Factory design, CAM/CAD/ CAE/ BIM/PDM/ PLM software solutions, Shop Floor programmers, Factory simulation. Demonstration facilities, robotics, AI tools, VR systems, Optho electronics, laser-based manufacturing, Net Zero technologies, Machining, micromolding and ext. *First step for companies to experience digital technology applications directly, promoting initial interest and engagement.*

2. Testing Digital and Green Technologies Before Full Deployment ("Test Before Invest"). Enable companies to test digital and Net Zero technologies before full deployment, reducing risks. Development of pre-introduction digital and Net Zero technology testing services. Simulation software, data centre, testing equipment, prototyping tools. *A low-risk solution allowing companies to validate the utility of technology solutions before making substantial investments.*

Services of Next Generation of DIH's 4C aim to:

- Reduce the risk of losses because of the overinvestment
- To increase the scope of R&D&I activities of enterprises
- To provide wide range of "test before invest" services such as providing of evidence-based information, demonstration of technologies and innovative solutions to SME's before investing
- To promote information about savings during the digitization and green transformation of Factories of the Future
- To reduce risk of overinvestment by providing Prototyping and design of the conceptual solutions for the merge of legacy machines with the new digital and green technologies as well as small scale manufacturing and PoC services.
- To provide support and consultancy services in order to mitigate of the risk of implementing digital and solutions (choosing the wrong one, digitizing the wrong one, not foreseeing further digitization steps).

Coordinating funding instruments

Examples provided by Arvea Marieni

Figure 4 – *Coordinating EU Funding instruments - Horizon Europe, ERDF, JTF, Invest EU*

Combining Cohesion Policy Funds with Horizon Europe

Example: Green Technology Innovation Pipelines

- **Objective:** Support green R&D and scale up innovations to market deployment.
- **Approach:**
  - Use Horizon Europe for early-stage research and innovation in green technologies (e.g., hydrogen storage, carbon capture).
  - Transition these technologies into real-world applications using ERDF for infrastructure and commercialisation.
  - Pair with **ESF+ (European Social Fund Plus)** to retrain workers in the new technologies.

Case: Hydrogen Valleys in regions like Northern Netherlands combine Horizon Europe R&D with ERDF infrastructure financing for hydrogen production and storage.

Blending EU Structural Funds with the Just Transition Fund (JTF)

Example: Decarbonization in Coal Regions

- **Objective:** Shift coal-dependent regions toward clean energy and sustainable industries.
- **Approach:**
  - Use the Just Transition Fund for community planning, reskilling, and immediate support to affected workers.
  - Deploy ERDF to develop green industrial parks, wind farms, and solar energy projects.
  - Leverage InvestEU to attract private financing for larger clean energy investments.

Case: The Silesia region in Poland utilizes JTF for worker transition programs, while ERDF funds wind farm infrastructure and InvestEU mobilises private investment for renewable projects.

Figure 5 – *Coordinating EU Funding instruments - JTF, ERDF, Invest EU, ESF+, Erasmus + RRF*

Blending EU Structural Funds with the Just Transition Fund (JTF)

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Case: The Silesia region in Poland utilizes JTF for worker transition programs, while ERDF funds wind farm infrastructure and InvestEU mobilises private investment for renewable projects.

Integrating ESF+ with Recovery and Resilience Facility (RRF)

Example: Green Skills and Workforce Development

- **Objective:** Equip workers with skills for green jobs and sustainable industries.
- **Approach:**
  - Use RRF grants to establish national reskilling programs targeting green sectors.
  - Complement with ESF+ to fund training programs, apprenticeships, and on-the-job training in renewables and energy efficiency.
  - Partner with Erasmus+ to support exchanges and knowledge-sharing in vocational training for green technologies.

Case: Spain's **Green Employment Program** funds vocational training for renewable energy technicians, combining ESF+ and RRF financing.

Figure 6 – *Coordinating EU Funding instruments – LIFE, ERDF, HE, InvestEU, Innovation Fund, Digital Europe Programme*

Linking LIFE Program with ERDF and Horizon Europe

Example: Nature-Based Solutions for Climate Resilience

- **Objective:** Deploy eco-friendly infrastructure to address climate adaptation challenges.
- **Approach:**
  - Use the **LIFE Program** to test and pilot solutions like floodplain restoration or green roofs.
  - Scale up successful pilots with **ERDF** funding to expand green infrastructure at regional and national levels.
  - Support ongoing monitoring and R&D improvements through **Horizon Europe**.

Case: The **Clever Cities Project** integrates LIFE-funded pilots in green urban planning with ERDF resources for scaling solutions in Hamburg, London, and Milan.

Using InvestEU to Complement Structural and Regional Funds

Example: Green Industrial Clusters

- **Objective:** Build large-scale green industrial hubs.
- **Approach:**
  - **ERDF** finances initial site development and infrastructure.
  - **InvestEU** attracts private capital to scale industrial activities, such as renewable energy generation or green hydrogen production.
  - **Innovation Fund** supports cutting-edge industrial decarbonisation technologies.

Case: In **Antwerp**, Belgium, ERDF funded site preparation for a green hydrogen cluster, while InvestEU mobilized private investments for large-scale deployment.

Coordinating Digital Europe with ERDF and Horizon Europe

Example: Smart Grids and Energy Management Systems

- **Objective:** Modernise energy networks for efficiency and sustainability.
- **Approach:**
  - Use **Horizon Europe** to test AI-based energy management systems.
  - Scale implementation with **ERDF** funding for infrastructure upgrades, such as smart grids.
  - Deploy **Digital Europe Program** resources for training workers in data analytics and IoT-based systems.

Case: Italy's **Smart Grid Pilot Projects** combine research grants, regional funds, and digital skills programs to modernise energy distribution.