Cross-Border Smart Specialisation Strategy of the Galicia – Northern Portugal Euroregion

RIS3T
2021-2027

Technical data

TITLE
Update Study of the Cross-Border Smart Specialisation Strategy of the Galicia – Northern Portugal Euroregion for the period 2021-2027 (RIS3T)- Final Report

AUTHOR
Technopolis Portugal

TECHNICAL TEAM

— Coordination:
Augusto Ferreira

— Consultants:
Alexandre Almeida
Américo Veloso Bento
Ana Margarida Lopes
António Ramos
Juan Tomas Hernani

ADJUDICATING BODY
North Regional Coordination and Development Commission (CCDR NORTE)

FINANCING
Interreg programme Spain – Portugal (POCTEP) 2021-2027 (project 14_GOBERNANZA_GNP_1_E)

Cross-Border Smart Specialisation Strategy of the Galicia – Northern Portugal Euroregion

RIS3T 2021-2027

XUNTA DE GALICIA

CCDR NORTE
Comissão de Coordenação e Desenvolvimento Regional do Norte, I.P.

CONTENTS

ÍNDICE

TABLES

FIGURES

ÍNDICE

ACRONYMS AND ABBREVIATIONS

ASN – Analysis of Social Networks

CCDR NORTE – Northern Portugal Coordination and Development Commission

S&T - Science and Technology

EuroSciVoc - European Science Vocabulary

GAIN – Galician Innovation Agency

H2020 - EU Framework Programme for Research and Innovation 2014-2020

Horizon Europe - EU Framework Programme for Research and Innovation 2021-2027

R&D - Research & Development

R&D&I - Research & Development & Innovation

R&I - Research & Innovation

IGE - Galician Institute of Statistics

INE - National Institute of Statistics - Statistics Portugal

INTERREG - European Interregional Cooperation Programme

NUTS - Nomenclature of Territorial Units for Statistics

GDP - Gross Domestic Product

POCTEP - Interreg Spain-Portugal Cross-Border Cooperation Programme

RIS - Regional Innovation Scoreboard

RIS3 – Regional Strategy for Smart Specialisation

RIS3T – Strategy for cross-border specialisation Galicia-Northern Portugal

S3 – Smart Specialisation Strategy

RIS – Regional Innovation System

EU – European Union

The Galicia – Northern Portugal Euroregion is an exemplary model of cross-border cooperation. This geographical area, characterised by its historical, economic, cultural and geographical interconnection, is comprised of Galicia and Northern Portugal, each with its own administrative and political structures. Since 1983, the Euroregion has fostered a robust tradition of institutional cooperation, essential for regional development and the consolidation of European cohesion, revealing the combined potential which can be seen in the increase in R&D&I resources and capabilities.

The introduction of Smart Specialisation (S3) as a key element in the 2014 reform of the EU Cohesion Policy represented an important strategic turning point in the way the EU addresses regional development. The Cross-Border Smart Specialisation Strategy (RIS3T) was adopted as a mechanism to foster cooperation and joint initiatives in areas of common interest and is now recognised as good practice. The joint strategic process began in 2014 with the creation of the Cross-Border Working Group, including representatives of GAIN and CCDR NORTE. This strategy resulted in the definition of a shared vision for the future, including the alignment of Research, Development and Innovation (R&D&I) objectives and the proposition of joint priorities, support actions, as well as an evaluation system with indicators to monitor implementation. In the context of the Galicia – Northern Portugal Euroregion , the pioneering approach to the creation of the Cross-Border Smart Specialisation Strategy for the Galicia – Northern Portugal Euroregion has defined a framework for strategic cooperation in order to provide a coordinated response to the shared challenges that, within the framework of innovation policies, can be treated more effectively and efficiently together, mobilising new initiatives and projects and increasing the uptake of community funding at European level. The update of the Cross-Border Smart Specialisation Strategy for the Galicia – Northern Portugal Euroregion aims to continue in this direction, promoting greater effectiveness and impact of public innovation policies in the Euroregion, ensuring the response to the needs of triple transition (green, digital and fair) and other external constraints that require resilience strengthening.

However, despite the dynamics produced by the S3 approach at European level and the knowledge accumulated around it, significant challenges remain, especially with regard to the operationalisation and governance mechanisms, especially due to the context of innovation policy where practice precedes theory, as illustrated by S3. Therefore, the ability to align the results and objectives of the strategies with the specific conditions in each region remains an important point of reflection, where it is crucial to build continuous revisiting processes with stakeholders. This demonstrates the importance of updating the "Cross-border Smart Specialisation Strategy Galicia - Northern Portugal Euroregion for the period 2021-2027", with the objective of promoting a coordinated approach in the context of smart specialisation strategies that allow greater effectiveness and impact of public innovation policies in the Euroregion.

The main specific objectives of this strategy are:

1. **Align policies to support innovation by increasing the Euroregion's scientific, technological and business critical mass in priority areas of cooperation.**

2. **Strengthen the impact of innovation policies by promoting synergies and complementary relationships between different sources of funding at regional, national and European level.**

3. **To promote greater funding for centralised management at European level in R&D and innovation, such as is the case with Horizon Europe.**

INTRODUCTION

The articulation and fulfilment of all the main stages provided by the methodological approach for the development of the study is demonstrated in the form of this Final Report for the Update of the Strategy of Cross-Border Smart Specialisation of the Galicia - Northern Portugal Euroregion for the period 2021-2027 (RIS3T). The structure of the report is comprised of a detailed exposition of the methodology, especially in its operational application in the development of the diagnosis, mapping and stakeholder consultation (Stage 1). A diagnosis of the characterisation of the territory and the innovation system of the Euroregion based on the diagnoses made within RIS3 (Stage 2). This is followed by the analysis of social networks mobilised for the mapping and characterisation of the regional network of entities that constitute the Euroregion's innovation system (Stage 3). The process of co-creating the SWOT analysis (strengths, weaknesses, opportunities and threats) of the Euroregion's innovation system, covers the shared vision and strategic objectives for the development of the cross-border strategy of intelligent specialisation (Stage 4). Then, the realisation of the strategic convergence analysis results in the identification of priority areas of cooperation in the field of intelligent specialisation, starting from the approved RIS3 regional ones (Stage 5). This gives rise to the identification of actions and instruments to guide the implementation of the cross-border strategy in each of the previously identified areas of collaboration (Stage 6). Subsequently, transversal proposals are established to support the decision for the review of the model and governance and the monitoring and evaluation system (Stages 7 and 8, respectively).

METHODOLOGY

METHODOLOGY

The Final Report on the Update Study of the Cross-Border Smart Specialisation Strategy of Galicia – Northern Portugal Euroregion for the period 2021-2027 translates into eight methodological steps defined (Figure 1) and validated at the initial meeting of the work with the follow-up group and the technical team on 26th February 2024.

The process begins with Stage 1, with defining a methodology for updating the strategy, described in this sub-chapter, including the approach to the entrepreneurial discovery process for the first stakeholder consultation, validated at a meeting on 11th April 2024. The first workshop was rescheduled and held on 7th May in Vigo, fulfilling all the necessary conditions for the preparation and presentation of the results of the Interim Report, with 90 participants (from 61 different entities) and 54 questionnaire respondents. The second workshop took place on 3rd July in Ponte de Lima, with 113 participants (from 80 different entities) and 69 questionnaire respondents, as well as two semi-directive interviews, allowing the Final Report to be delivered on 31st July, 2024.

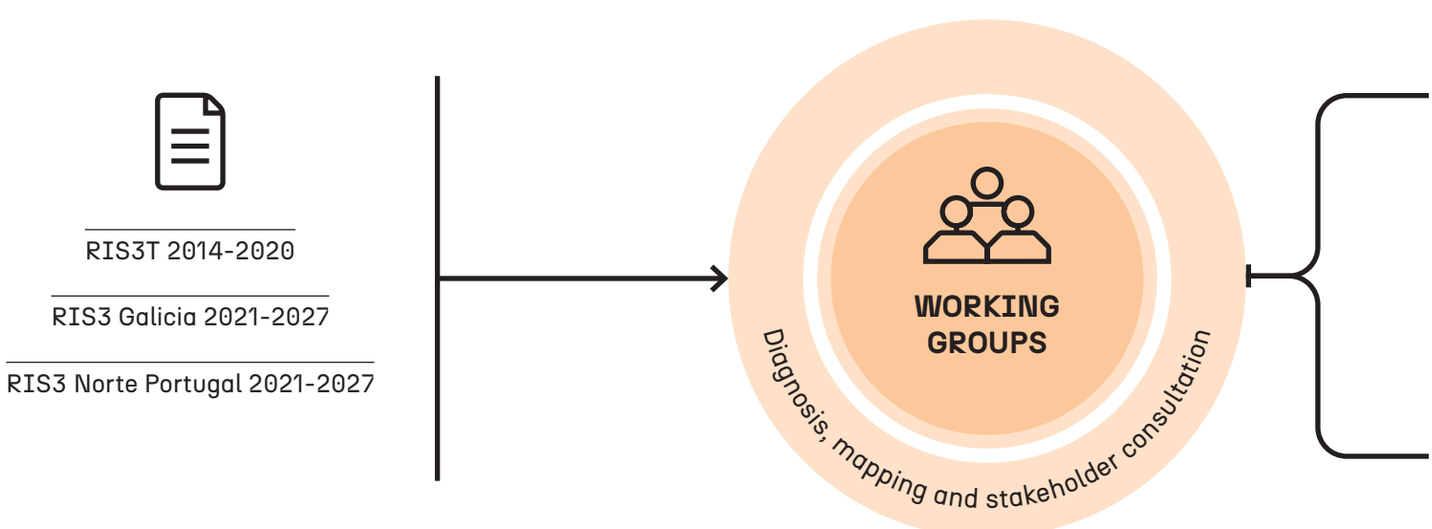
STAGE 2

A diagnosis of the characterisation of the territory and the Euroregion's innovation system, based on the diagnoses made within the RIS3 region

The methodology in this stage consisted of the systematic review and critical analysis of the existing diagnoses of the regional RIS3s, as well as other recent documents, such as the benchmarking study of national and international good practices in regional innovation systems and governance models of regional smart specialisation strategies (North Regional Coordination and Development Commission, 2023), and the Joint Investment Plan for the Galicia – Northern Portugal Euroregion (2021-2027).

The diagnosis to characterise the territory and the Euroregion 's innovation system was supported by the analysis of statistical indicators from sources such as Eurostat, the National Statistics Institute (INE), the Galician Statistics Institute (IGE) and the Regional Innovation Scoreboard, thus making it possible to characterise the territory's strengths and weaknesses, as well as the performance of the Euroregion 's innovation system.

Figure 1. Methodological Stages in the RIS3T Update Process



STAGE 3

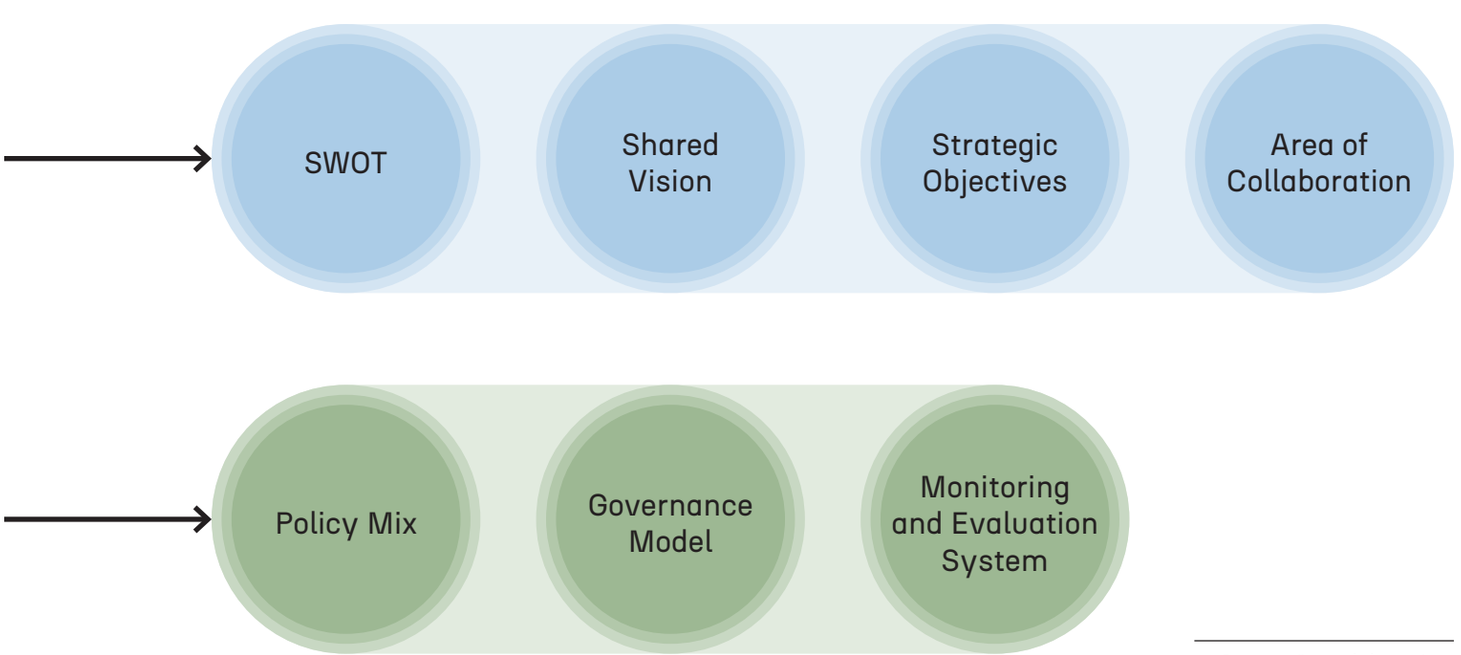
Mapping and characterisation of the regional network of entities that make up the Euroregion's innovation system

This stage involved the identification and analysis of the main entities that make up the innovation system in the Euroregion, as well as the mapping of their systemic relations. In order to characterise the cooperation dynamics in the Euroregion and taking into account the review of previous mapping documents and characterisation of existing regional innovation systems, a social media analysis applied to international cooperation projects was employed, with conditional criterion of participation of at least one entity from Northern Portugal and one entity from Galicia in the same project under H2020, Horizon Europe, POCTEP or the Atlantic Area Programme, allowing the identification of the key actors in the Euroregion's innovation system networks and characterisation of thematic networks.

The data collection represented a mixed approach, where data from programmes to support territorial cooperation projects were made available by CCDR NORTE, namely on the POCTEP and the Atlantic Area Programme (made available on 5th and 14th March 5 respectively). Other data in open repositories were extracted directly from CORDIS, in the case of H2020 and Horizon Europe (extracted on 5th March).

With regard to the analysis technique, the Analysis of Social Networks (ASN) is a technique that provides deep insights into the interactions between participants. By mapping relationships and identifying key actors, ASN allows us to visualise the structure of collaboration, highlighting the central actors of the network and identifying thematic clusters. Through the analysis of centrality and communities, this approach provides a clear understanding of collaborative dynamics, helping to identify strengths and areas of improvement to optimise the efficiency and success of the strategy, while providing an intuitive, visual representation of the system. Gephi software was used for the visualisation and algorithmic performance of the interactions between different entities in the scope of cooperation projects.

The preliminary version of the mapping and characterisation of the regional network of entities that constitute the Euroregion's innovation system was presented at the interactive workshop on entrepreneurial discovery held on 7th May.



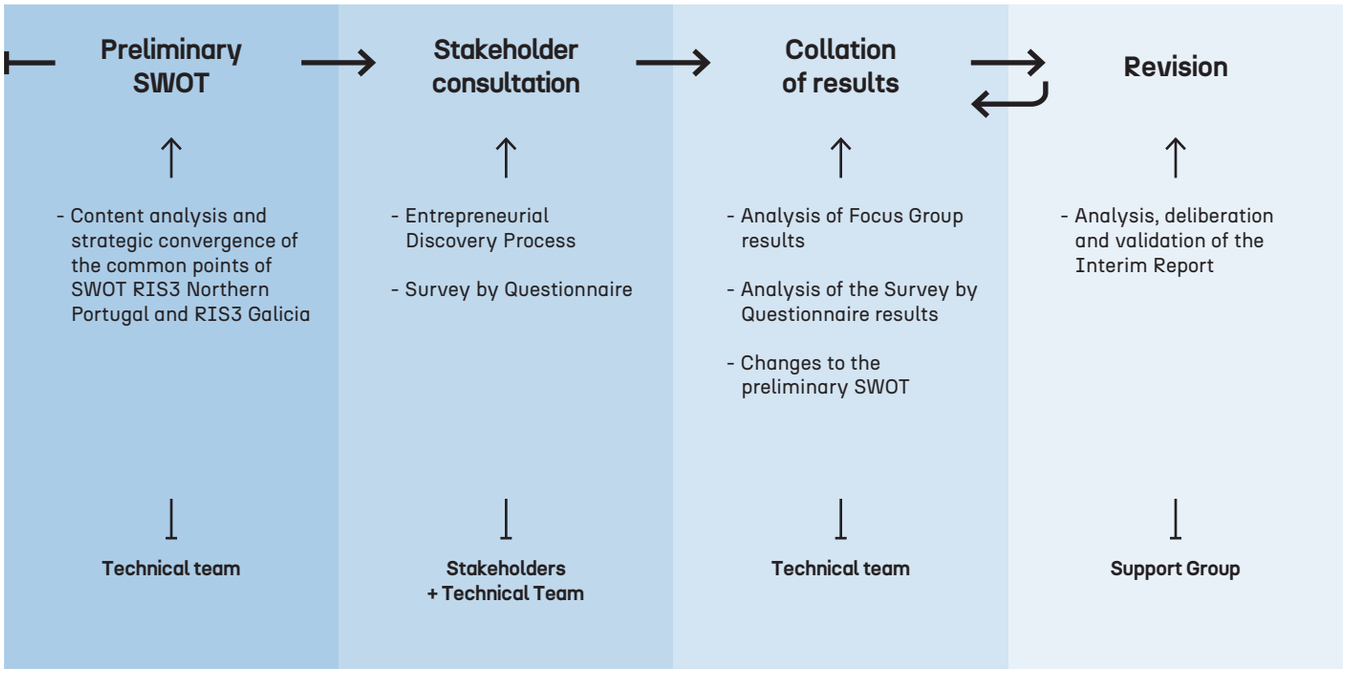
Source: Own elaboration.

STAGE 4

Presentation of the SWOT analysis (strengths, weaknesses, opportunities and threats) of the Euroregion's innovation system, the shared vision and strategic objectives for the development of the cross-border smart specialisation strategy

Based on the cumulative results of the previous stages and a strategic convergence analysis on the documents of RIS3 North and RIS3 Galicia, a preliminary SWOT analysis of the common points identified in the two regions was developed. This provisional product was discussed as part of the first entrepreneurial discovery process with stakeholders, using a *focus group approach*, allowing a space for structured dialogue to validate and refine the preliminary SWOTs. The work was consolidated in a face-to-face session that began the work by presenting stages two and three and listening to the audience on other strategic objectives beyond those mapped. In addition, a first questionnaire survey was conducted on the relevance of each point suggested in the SWOT, completed by 54 participants. The workshop session used co-creation techniques to collect insights and contributions to refine and complete SWOT analysis *on canvas*, allowing the 90 participants to add, change and remove each of the preliminary SWOT points. Through SWOT co-creation exercises, stakeholders based in each group the description of a shared vision through the strategic objectives defined by overlapping areas of common interest in both RIS3, aligning resources and efforts in the areas of greatest potential.

Figure 2. Methodological process of co-creation of SWOT RIS3T

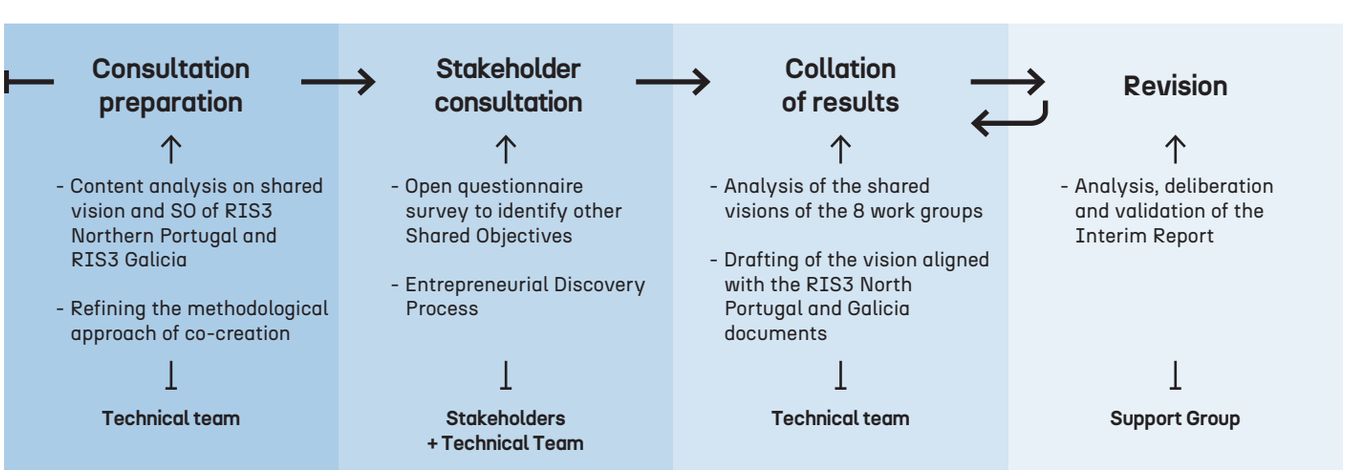


Source: Own elaboration.

In the co-creation session, specific techniques and tools were used, including the creation of a specific *canvas* for SWOT and Shared Vision and the adaptation of Vicente's *Collaborative Backcasting Model* (2016) to structure participatory discussion. In the latter, stakeholders begin by visualising the desired future (co-created vision) and, from there, jointly define different trajectories to overcome the gap between this future and the present. The goal is to create an innovative pathway to the future by establishing chains of change that gradually transform the current scenario into the desired one. This process not only helps generate innovation trajectories, but also allows identifying opportunities and risks in markets, technologies and social environments. This facilitates the identification, prioritisation and planning of future actions, as well as the necessary resources and partners, offering a visual representation of the planned changes, making it easier to develop a detailed and reasoned action plan. From the current state of the selected Strategic Goal, participants identified and listed the changes needed to approach the desired future vision, refining it where necessary.

These tools helped in the collection and treatment of information, promoting consensus in the construction of a shared vision and strategic objectives. In order to mitigate the risks inherent in moderating panels with highly novel tools, and the great diversity of profiles that participated in the working groups, a detailed script was prepared and distributed to each moderator in addition to the workshop preparation session.

Figure 3. Methodological Process of Co-Creation of Shared Vision and Strategic Objectives RIS3T



Source: Own elaboration.

This methodological process took a participatory and inclusive approach, ensuring the involvement in a RIS3T aligned with the needs and perceptions of the Euroregion's stakeholders. Based on the discussions and insights gathered during the workshop, SWOT analysis was reviewed and consolidated. SWOT, shared vision and strategic objectives were reviewed according to the results of the workshop, ensuring that all contributions were integrated and that the result reflected the possible consensus among stakeholders to provide directionality in strategic design. The whole drafting process on the preliminary results and stakeholder consultation is presented in the relevant chapter and annexes.

STAGE 5

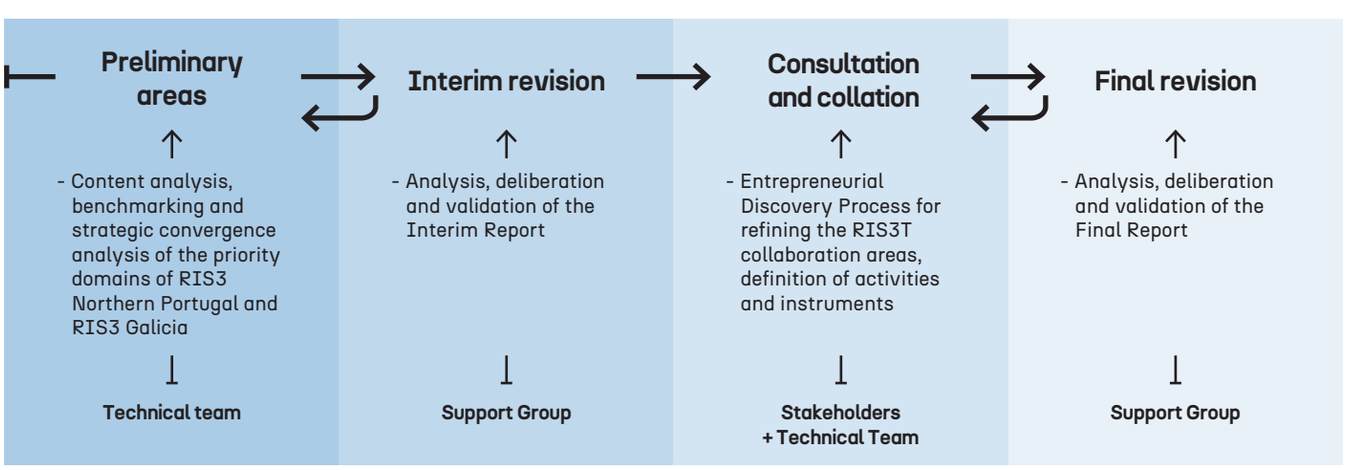
Identification of priority areas of cooperation in the field of smart specialisation, starting from the approved RIS3 regional RIS3s

Then, the undertaking of the strategic convergence analysis results in the identification of priority areas of cooperation in the field of smart specialisation, starting from the approved regional RIS3s. The methodology followed provides for a strong participation of stakeholders in the co-creation of strategic priorities, based on the entrepreneurial discovery process.

It consists of the following phases:

1. Analysis of strategic convergence of Regional Specialisation Strategies 2021-2027 in Northern Portugal and Galicia, identifying common axes;
2. Analysis of the results of previous exercises reviewing strategic priorities 2014-2020 and recommendations of the RIS3T working groups;
3. Conducting an entrepreneurial discovery process that - with the participation of 113 stakeholders , and based on the previous basis and shared vision and strategic objectives - promotes the active participation of economic, social and institutional agents in (re)defining new priority areas, through co-creation exercises;
4. Consolidation and analysis of the results of the interactive workshop on entrepreneurial discovery;
5. Identification and validation of priority areas of cooperation.

Figure 4. Methodological Process in RIS3T Collaboration Areas



Source: Own elaboration.

STAGE 6

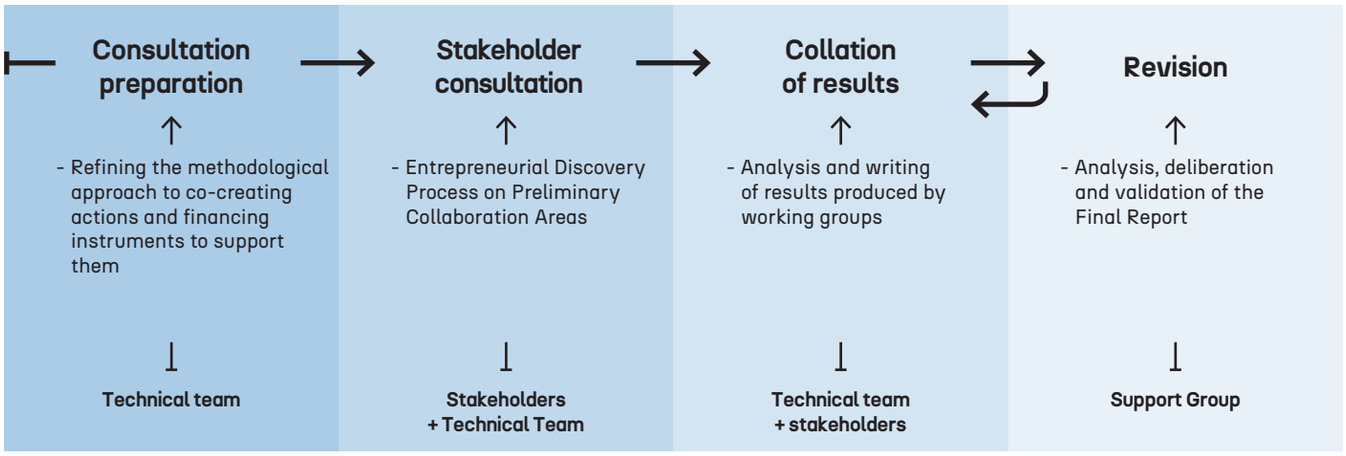
Definition of actions to implement the cross-border strategy and identification of financing instruments

The start of the 2nd phase of the study deepens the primary priority collaboration areas identified in Step 5 through the definition of transformative actions to implement the cross-border strategy, based on cross-border cooperation and with transformative potential for the Euroregion. The entrepreneurial discovery process is the basis for the definition of actions and instruments establishing a mechanism of production of tacit knowledge, mitigating the risks inherent in imperfect information, by *the bottom-up* involvement of stakeholders in 8 working groups with 5 different themes.

The co-creation methodology was operationalised through the thematic focus groups, taking into account the different perspectives of 113 stakeholders and their perceptions regarding the challenges, obstacles and opportunities that the region faces in the selected priority areas, thus allowing us to define realistic actions that will translate into transformative cooperation initiatives for the Euroregion.

In addition to the exercise, the financing instruments available to support these actions were identified. In the consultation process, stakeholders mapped the resources available for the execution of the strategy.

Figure 5. Methodological Process for Actions and Instruments



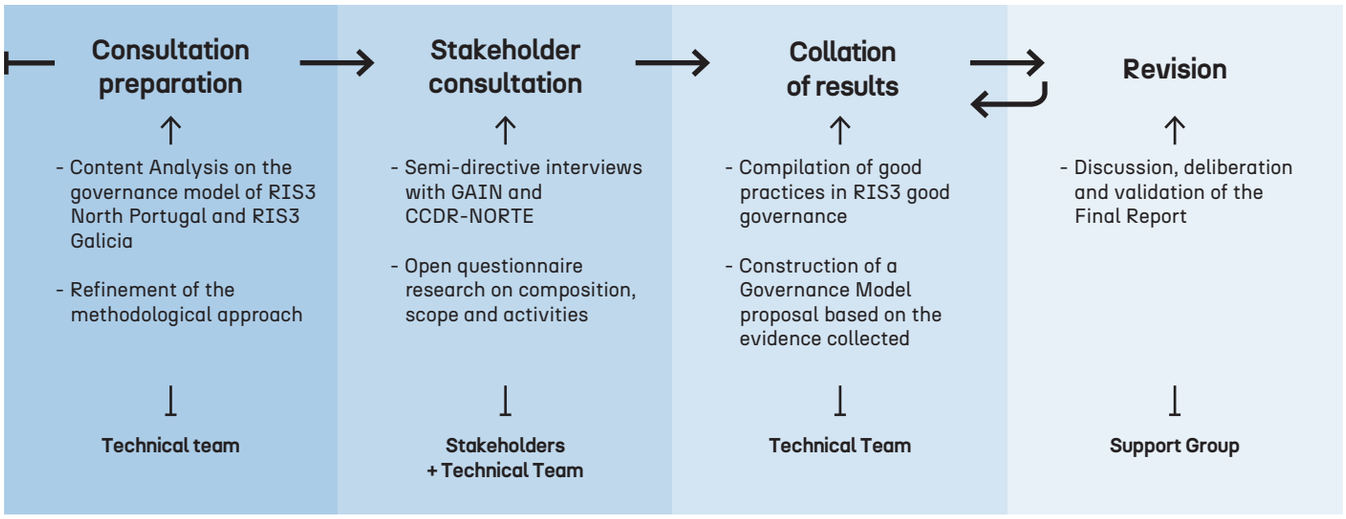
Source: Own elaboration.

STAGE 7

Review of the governance model of the cross-border strategy, including the steering committee, management team and thematic working groups

At this stage, the cross-border RIS3T governance model will be revised and improved against the model in force for the period 2014-2020, defining the composition and scope of action of structures such as the steering committee, the management team and the thematic working groups. This review sought to ensure an efficient and collaborative structure to implement and monitor the strategy on evidence collected from the experimental period of the previous framework programme. To this end, stakeholders were consulted on the proposed governance model, namely through: (I) Two semi-directive interviews with the Monitoring Group assessing challenges, obstacles and good practices and (ii) broad consultation with Euroregion stakeholders through a second questionnaire survey (69 respondents). Once the needs had been identified, a survey of good practices in the good governance of RIS3 was carried out, which formed the basis for a proposal to revise the current governance model.

Figure 6. Methodological Process of Review of the Government Model



Source: Own elaboration.

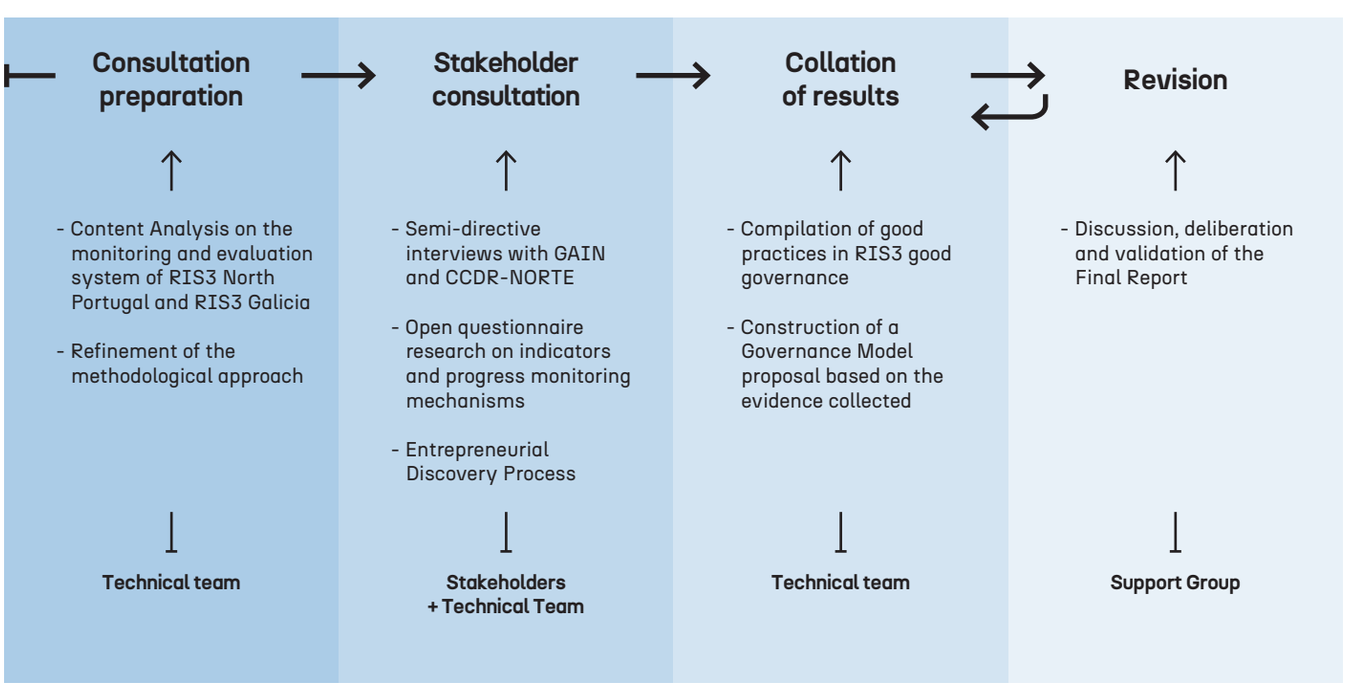
STAGE 8

Monitoring and Evaluation System Update

The last stage of the study focuses on reasoned contributions to the updating of the RIS3T monitoring and evaluation system in the period 2021-2027, prioritising the definition of effective indicators and mechanisms to track progress, evaluate results and make adjustments as necessary.

The methodological approach began by analysing the content produced by both RIS3s and in particular by the results of the Euroregion R&D&I Observatory, followed by two interviews with the Monitoring Group and a second questionnaire survey of stakeholders focusing specifically on the follow-up activities that are priorities for them (from which 69 responses were received). In addition, the entrepreneurial discovery process implemented in Stage 6, aimed to maximise its stakeholder consultations. The exercise requested participants to establish actions, financing instruments and suggest parameters and metrics to follow the implementation of the initiatives. The results obtained made it possible to draw up a proposal to update the monitoring and evaluation system, guided by comprehensive rational logic based on the stakeholder consultations and evidence.

Figure 7. Methodological Process for the Monitoring and Evaluation System Update



Source: Own elaboration.

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

DIAGNOSIS TO CHARACTERISE THE REGION AND THE EUROREGION'S INNOVATION SYSTEM

Land and population

The Galicia – Northern Portugal Euroregion is located in the north-west of the Iberian Peninsula and on the periphery of the European Union. This geographical area, characterised by its historical, economic, cultural and geographical interconnections, is composed of the region of Galicia, Spain, and the Northern region of Portugal, and is divided into 12 NUTS III:

> **In Galicia**: A Coruña, Lugo, Ourense and Pontevedra.
>
> **In Northern Portugal**: Alto Minho, Ave, Cávado, Porto Metropolitan Area, Alto Tâmega e Barroso, Tâmega e Sousa, Douro and Terras de Trás-os-Montes.

The territory of the Galicia – Northern Portugal Euroregion presents a remarkable heterogeneity in the distribution of the population between urban clusters and rural areas, reflecting complex and multifaceted dynamics. In general, it is possible to characterise the region as composed of coastal territories with an urban predominance and inland territories with a more rural makeup (Figure 8).

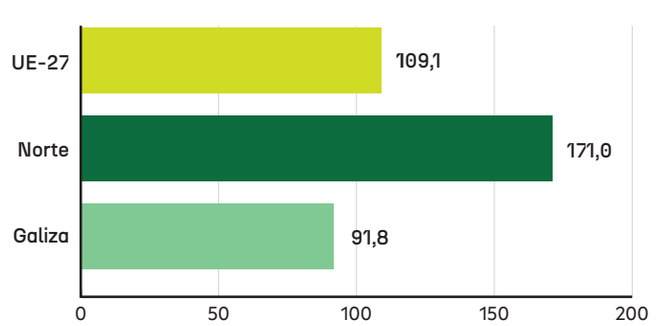
Along the coastal areas, we find a significant concentration of the population in urban centres.

The Porto Metropolitan Area stands out as the only predominantly urban NUTS III region in the Euroregion (that is, where more than 80% of the population resides in urban clusters), reflecting its role as one of the region's economic and population centres. The remaining NUTS III regions of the Atlantic Axis of *Euroregion,* except for Alto Minho, are classified as intermediate regions (where between 50% and 80% of the population resides in urban clusters) close to large urban centres. The main cities in the Euroregion are concentrated on the Atlantic axis between Porto/Vila Nova de Gaia and A Coruña, including cities such as Guimaraes, Braga, Viana do Castelo, Vigo, Pontevedra and Santiago de Compostela.

The inland territories of the Euroregion are predominantly rural areas, in which more than 50% of the population lives in rural grid cells. In Galicia, these regions include the provinces of Lugo and Ourense, which despite the predominantly rural matrix, are also close to large urban centres. In the Northern Portugal region the NUTS III of Terras de Trás-os-Montes, Alto Tâmega e Barroso, and Douro are classified as remote regions, defined as areas where less than half of the local population can drive to the centre of a city with at least 50,000 inhabitants in less than 45 minutes.

In 2022, the Euroregion's population totalled 6,279,338 inhabitants, of whom 3,587,82 were residents in Northern Portugal and 2,691,456 in Galicia[1]. The population concentration differs significantly between the two regions. Northern Portugal has a high population density, as high as 171 inhabitants per km^2, significantly more than the EU-27 average. Galicia, with a population density of 91.8 inhabitants per km^2, has a density lower than the EU-27 average.

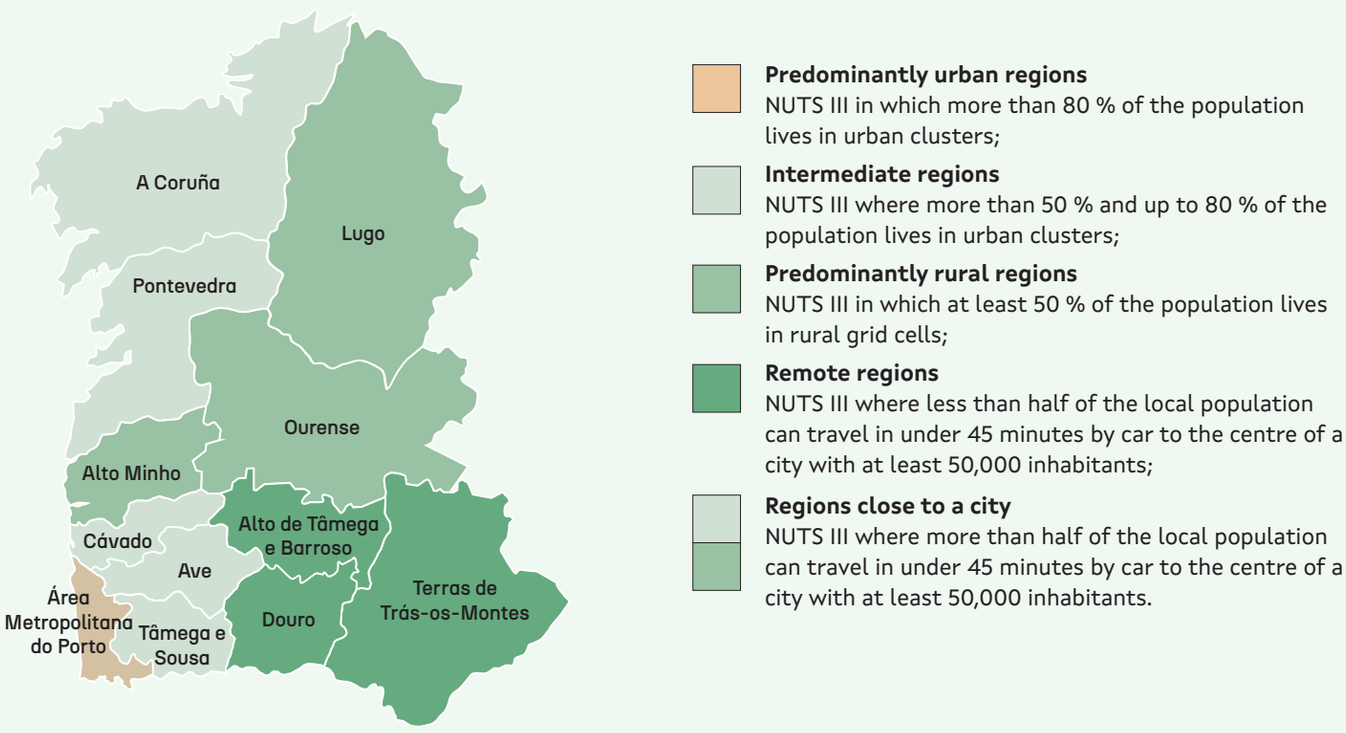
Figure 9. Population density (inhabitants per km 2), 2022



Source: Eurostat (demo_r_d3dens)

1 Eurostat data (demo_r_d2jan), 2024.

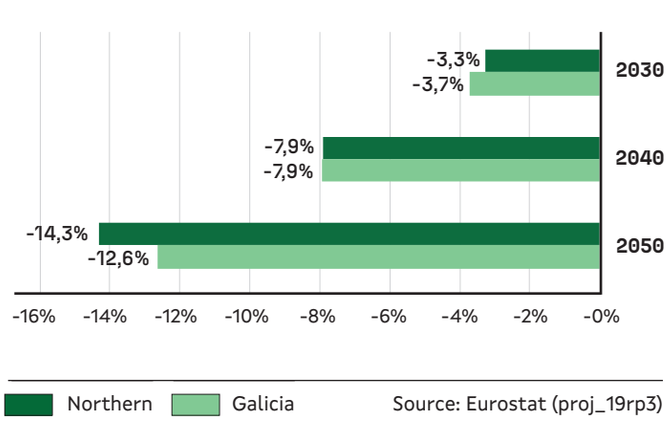
Figure 8. Urban-rural typology of NUTS III in the Euroregion , 2021



Source: Eurostat (GISCO).

Demographic evolution in the Euroregion shows striking contrasts with the European Union in recent decades, where there is a trend toward a slight growth in the population. Comparatively, the resident population in Northern Portugal has stagnated over the last decade, only registering a growth in the resident population after 2021, the result of positive migratory flows. In the last decade, Galicia has seen a slight decline in its population. The projections until 2050 indicate a continuous decline in population both in Northern Portugal and in Galicia, highlighting significant demographic challenges in the region.

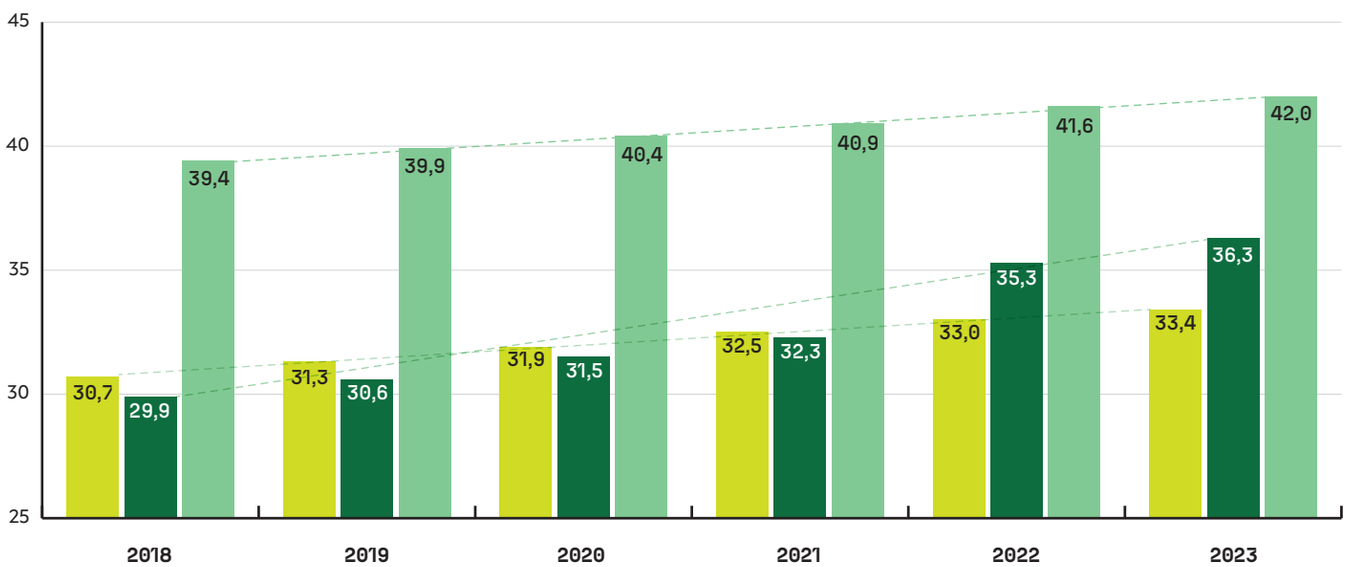
Figure 10. Projection of the relative variation of the resident population compared to 2019, %



Source: Eurostat (proj_19rp3)

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

Figure 11. Old-age dependency ratio, 2018-2023

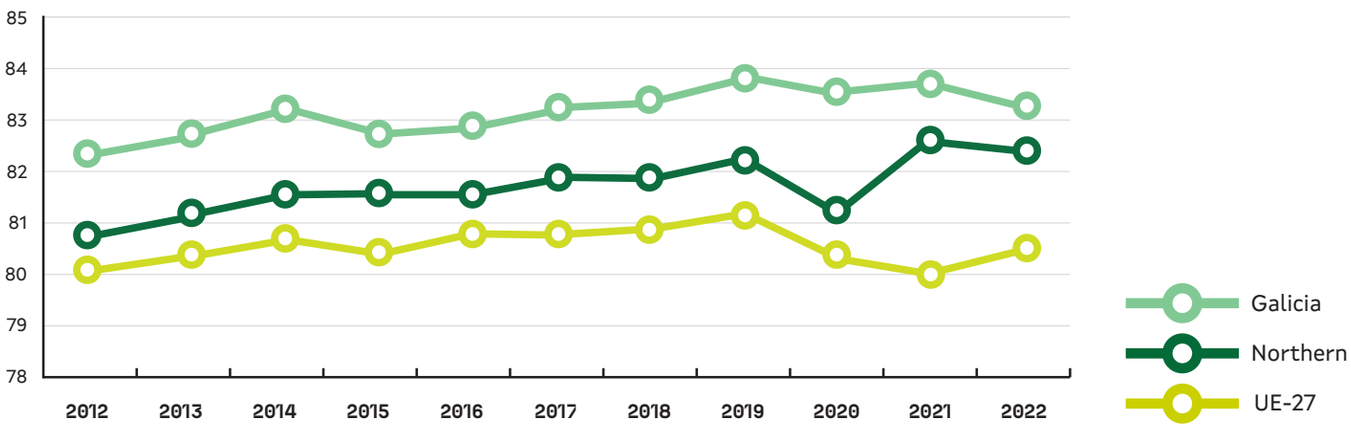


Source: Eurostat (demo_r_d2jan)

Population ageing is a pressing challenge in the Euroregion, where the rate of dependence on elderly people has increased consistently over the years. Compared to the average of the European Union, both Galicia and Northern Portugal have higher rates, indicating a higher proportion of elderly people compared to the working age population. Between the two regions, Galicia consistently shows a higher old-age dependency ratio than the North, suggesting that population ageing is more pronounced there.

Life expectancy in the Euroregion is markedly higher than the EU average. In 2022, the average life expectancy at birth in the EU-27 was 80.6 years, compared to 82.5 years in Northern Portugal and 83.4 years in Galicia (20th highest among EU-27 regions). Given the high average life expectancy, there is a clear need for policies and measures that address the challenges associated with the ageing of the population, such as the provision of adequate health care, the promotion of inclusive social services and the encouragement of the active participation of the elderly in society.

Figure 12 Average life expectancy at birth, 2012-2022

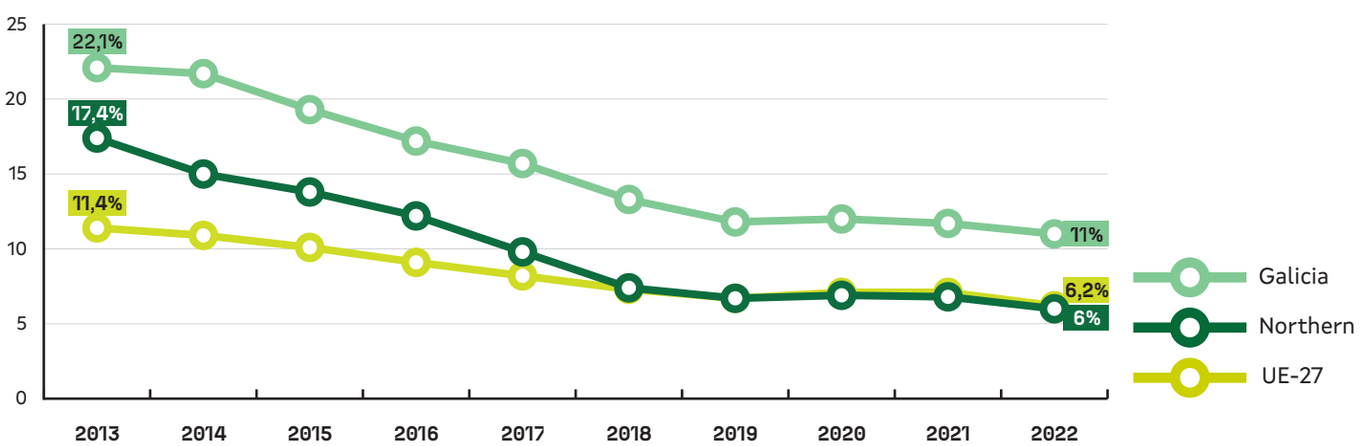


Source: Eurostat (demo_r_mlifexp)

Employment and Qualifications

In recent years, the gradual improvement of unemployment rates in both regions is remarkable. Northern Portugal has a consistent decline in unemployment, with rates falling from 17.4% in 2013 to 6% in 2022, below the EU-27 average. In Galicia, the unemployment rate fell from 22.1% in 2013 to 11% in 2022, still significantly above the European Union average.

Figure 13. Unemployment rate, 2013-2022

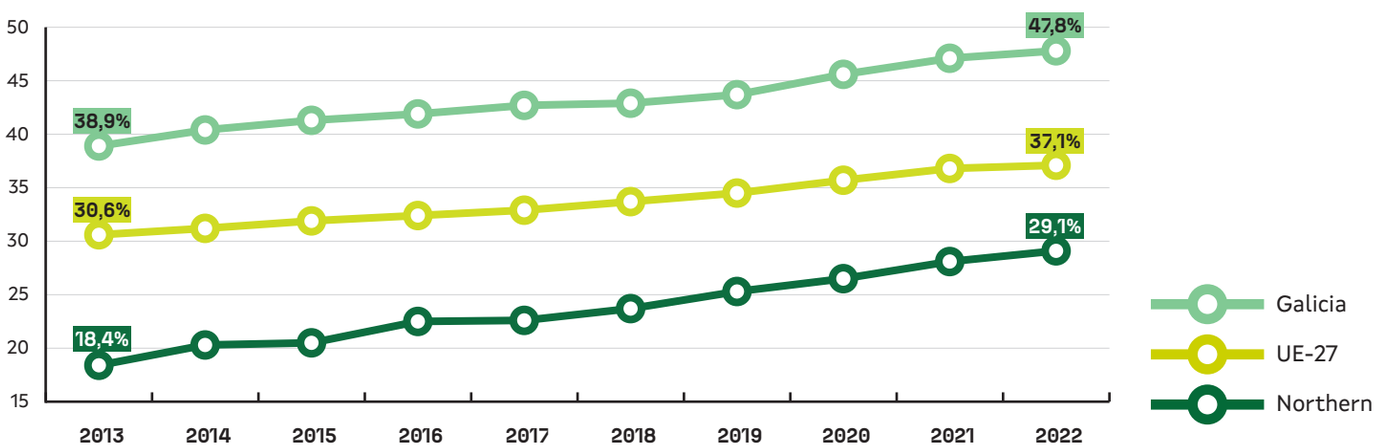


Source: Eurostat (lfst_r_lfu3rt)

Although significant improvements have been made, particularly in Northern Portugal, youth unemployment rates remain persistently high compared to the European average. In 2022, the youth unemployment rate was 12.2% in Northern Portugal and 22.7% in Galicia (Eurostat). Integrating young people into the labour market remains a crucial challenge for the Euroregion ; this is also associated with average wage levels that remain considerably below the EU average in both regions, with repercussions not only on the present, but also the future economic and social situation in the regions. Galicia and Northern Portugal face serious challenges in creating qualified talent, with a history of significant emigration of qualified young people in recent decades, representing a loss of valuable human capital, as well as conditioning the regions' ability to innovate and compete globally.

On the other hand, the increase in the number of people employed with higher education and in fields related to Science and Technology (S&T) is an encouraging trend, reflecting successful investments in education and vocational training, which are essential to boost the Euroregion's competitiveness and innovation capabilities. Galicia has shown constant progress in the proportion of employed people with higher education. For example, in 2013, 38.9% of the employed population had higher education, and in 2022 this figure rose to 47.8%. The Northern Portugal region also registered a remarkable increase in the employed population with higher education, growing from 18.4% in 2013 to 29.1% in 2022. However, it is still considerably below Galicia and the EU-27 average, indicating the need for more investment in education.

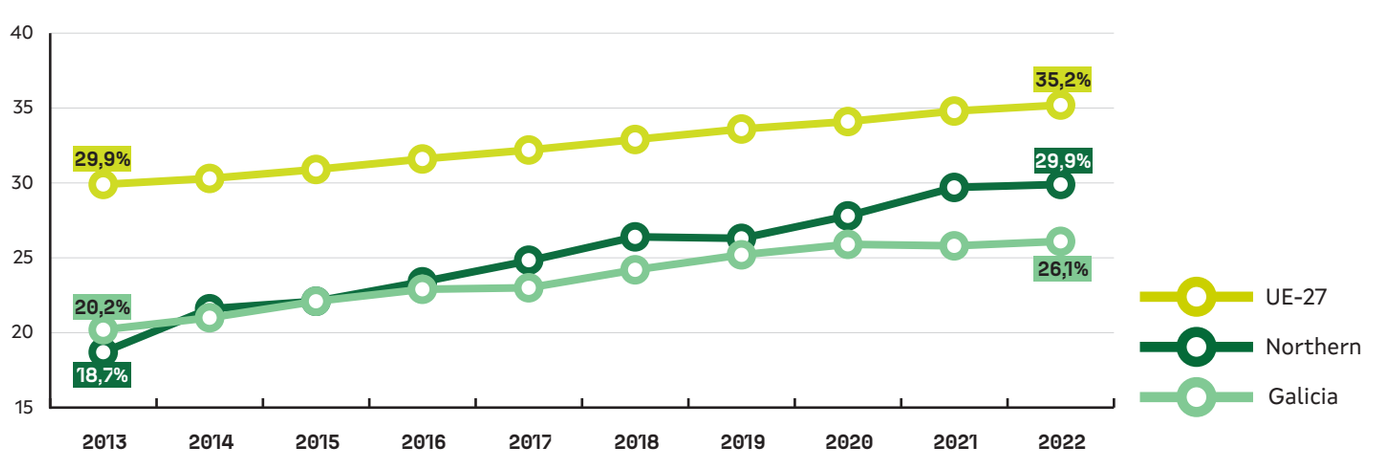
Figure 14. Employed population with higher education, 2013-2022, %



Source: Eurostat (lfst_r_lfe2eedu)

Galicia has gradually increased the proportion of the workforce employed in S&T, rising from 20.2% in 2013 to 26.1% in 2022. Northern Portugal also witnessed a steady increase in the proportion of its workforce employed in S&T, rising from 18.7% in 2013 to 29.9% in 2022. Despite this progress, both regions are still below the EU-27 average.

Figure 15. Workforce employed in Science & Technology, 2013-2022, %



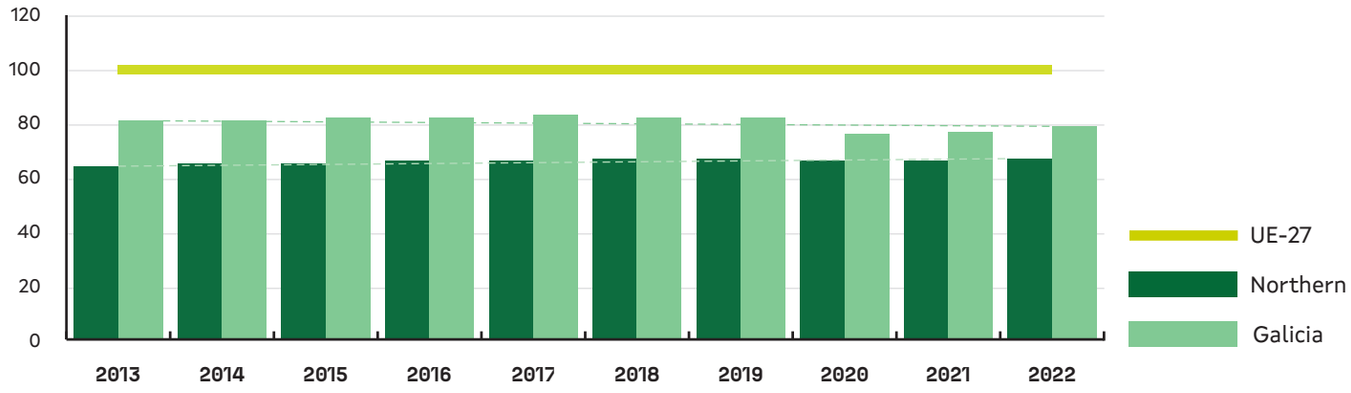
Source: Eurostat (hrst_st_rcat)

Economy and Competitiveness

The Euroregion's economy shows a structural delay against the average of regions in the European Union, with both regions showing lower levels of economic performance than the EU-27 average.

The evolution of GDP at Purchasing Power Parity (PPP) per capita in relation to the EU-27 average over the last decade reveals remarkable differences in economic performance between Northern Portugal, Galicia and the European average. The Northern Portugal region has a GDP per capita level significantly lower than the EU-27 average, reaching 67% in 2022. Nevertheless, GDP per capita PPP in Northern Portugal has shown a steady growth trend over the years, indicating a regional economy that is still developing and in line with the EU-27 average. Galicia, on the other hand, has a slightly more favourable situation, with a GDP per capita PPP higher than that of Northern Portugal. However, there has been a downward trend in recent years, with a reduction from 82% in 2015 to 79% in 2022 compared to the EU-27 average.

Figure 16. GDP per capita PPP (EU-27 = 100 2013-2022)



Source: Eurostat (nama_10r_2gdp)

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

The Euroregion's business structure is dominated by micro-enterprises, which account for about 96% of the total. This feature is particularly pronounced in Northern Portugal, where 68% of companies are sole-owner businesses. Despite the prevalence of micro-enterprises, most of the workforce is employed in small and medium-sized enterprises, indicating a dynamic business fabric, but with challenges related to scale and business growth.

In recent decades there has been a trend toward the tertiarisation of the Euroregion's economy. Both Northern Portugal and Galicia have similar sectoral structures, although with some distinctive features. Galicia has a specialisation profile that combines a strong service sector focused on tourism and commerce, with a significant presence in the primary sector and public services. Northern Portugal, on the other hand, stands out for its robust industrial base, with a markedly industrial specialisation, with 27.8% of the workers employed in the industrial sector, almost twice the proportion in Galicia. The prominence of industry implies an economy strongly focused on production and manufacturing.

In Galicia, there is a strong presence in the trade, transport, accommodation and catering industries, which employs 26.3% of the workforce. This indicates that Galicia's economy is largely focused on services related to tourism, commerce and transport. The Public Administration, defence, education and health sectors are also significant, accounting for 23% of employment.

The Public Administration, defence, education and health sectors are significant employers in both regions, with the figure for Northern Portugal being slightly lower (21.3% versus 23.0% in Galicia), which still demonstrates the public sector's strong presence. The construction sector in both regions also have significant weight (Galicia 7.0%, North 7.3%).

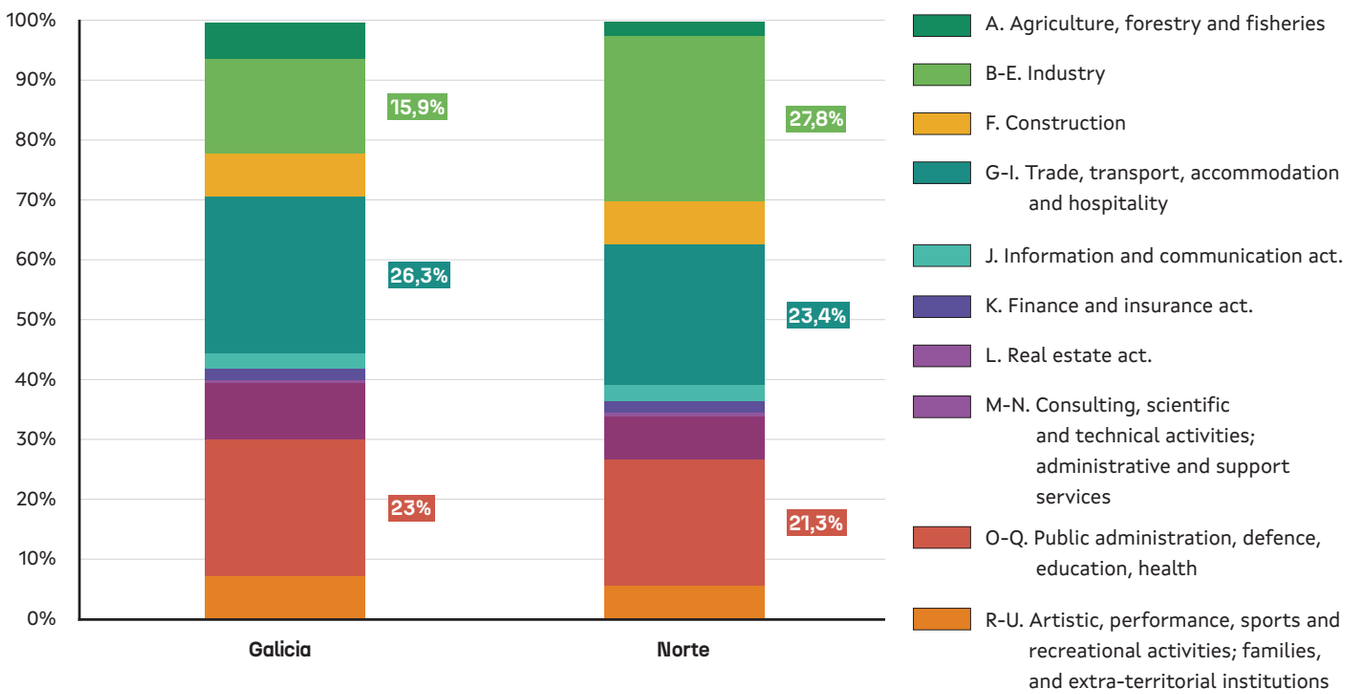
Agriculture, forestry and fishing is more important in Galicia (6.2%) compared to Northern Portugal (2.2%), reflecting a greater dependence on primary activities in Galicia. In sectors such as consulting, scientific and technical, administrative and support services activities, Galicia also has greater participation (9.5%) compared to Northern Portugal (7.1%), indicating a stronger focus on specialised services and business support activities.

A more detailed analysis of manufacturing industries in each region reveals distinct patterns of expertise between the two regions. Galicia has greater diversification, with a strong presence in the food, metalworking and transport equipment sectors, while Northern Portugal is highly specialised in the textile and clothing, footwear, automobile, metallurgical and metalworking industries.

In Galicia, the food and beverage industry concentrates the largest number of workers, representing 29.87% of the workforce serving the processing industries, especially the processing of fishery products. Metalworking industries also have a strong presence in the region, representing 17.7% of employment, mainly concentrated in the manufacture of metal products. The transport material sector represents 16.88% of industrial employment in the region, with a strong emphasis on the production of motor vehicles and ancillary components. Other important sectors include the fashion industries (7.96%), in particular the clothing sector; the wood and cork sector (7.09%), and the repair and maintenance of machinery and equipment.

In Northern Portugal, fashion industries are the most prominent sector, accounting for 39.92% of total employment in the manufacturing industry. This strong focus on the textile, clothing and footwear industries characterises the region's industrial specialisation.

Figure 17. Distribution of employment by economic activity (NACE Rev. 2), 2021



Source: Eurostat (lfst_r_lfe2en2)

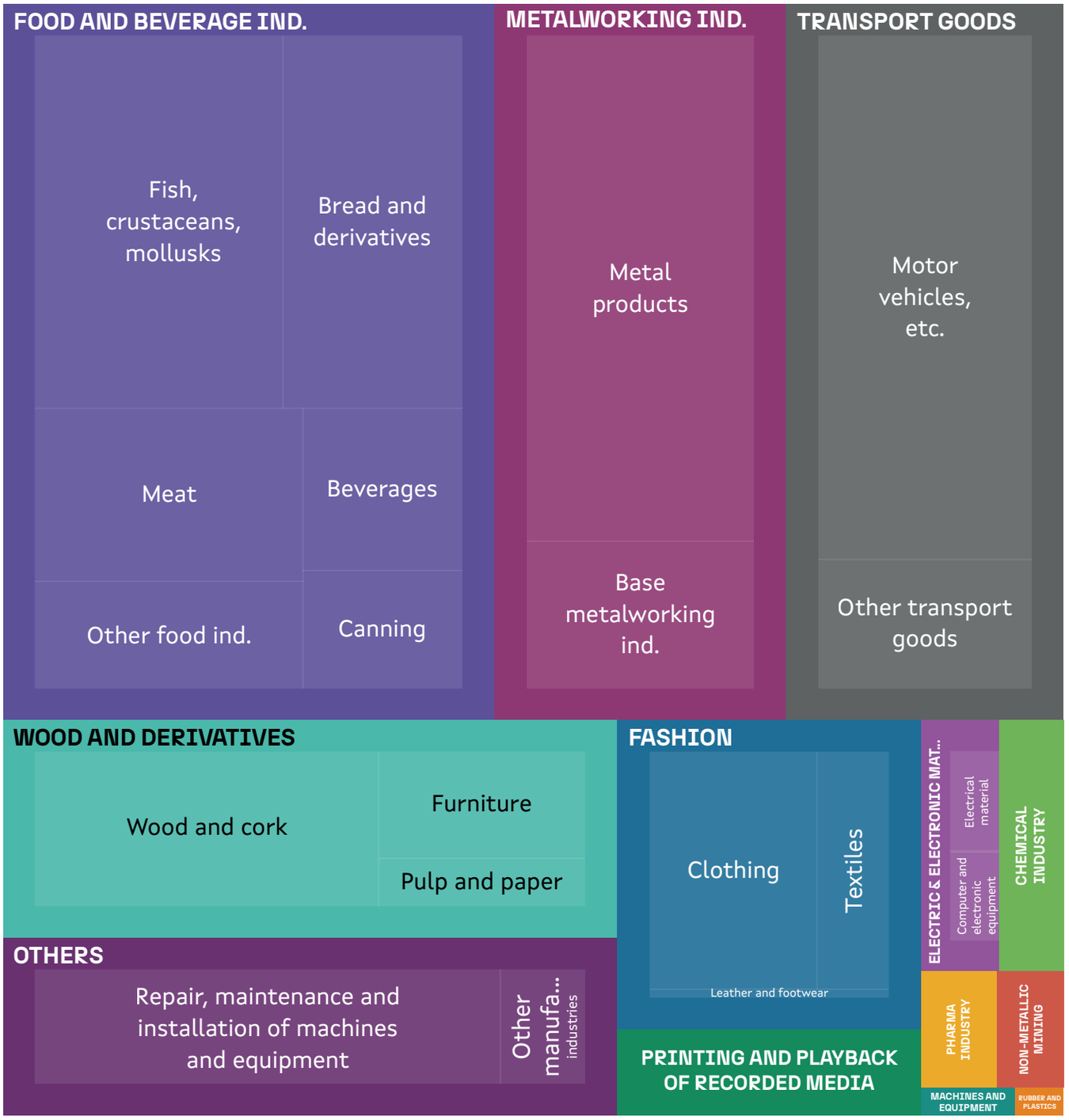
Another important sector is wood and derivatives, which represents 12.08% of the manufacturing industry workforce, especially in the manufacture of furniture and wood and cork products. Metalworking industries also have a strong presence in the region, representing 13.29% of employment, with a strong focus on the manufacture of metal products.

The food and beverage industry represents 8.38% of total manufacturing industry employment, with an even spread across several sub-sectors, including baking and derivatives, meat and beverages (wine production).

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

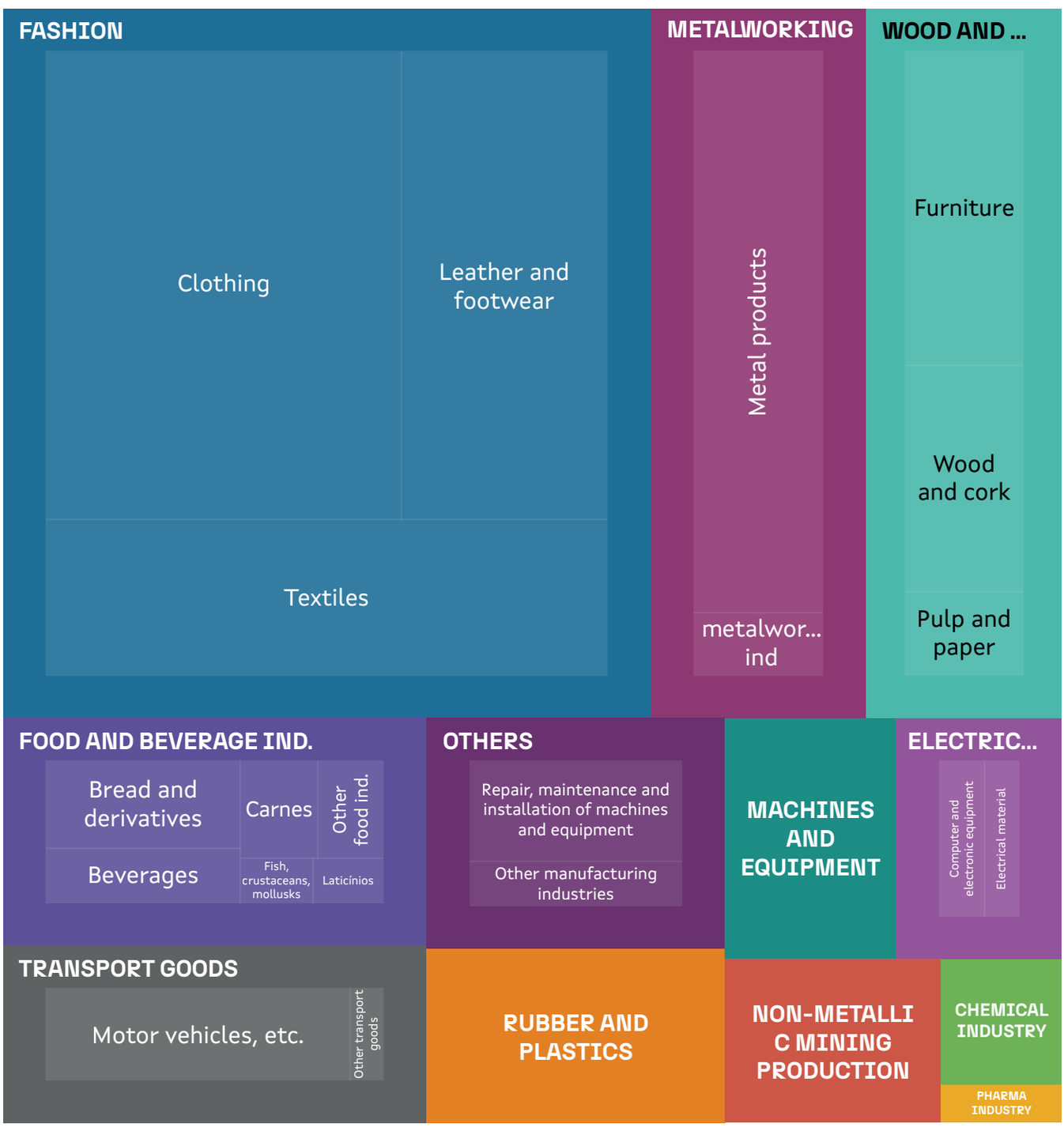
Figure 18. Distribution of the manufacturing industries workforce by sector, 2021

GALICIA



Galicia and Northern Portugal are two regions that have a positive trade balance, and in both cases, contribute significantly to mitigate the trade imbalance of their respective countries. The strong focus on exports is a strength of the Euroregion, driven by a highly industrialised productive and business structure on both sides of the border.

NORTHERN PORTUGAL



Source: INE - National Institute of Statistics and IGE - Galician Institute of Statistics

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

Table 1. Main indicators of international trade, 2022

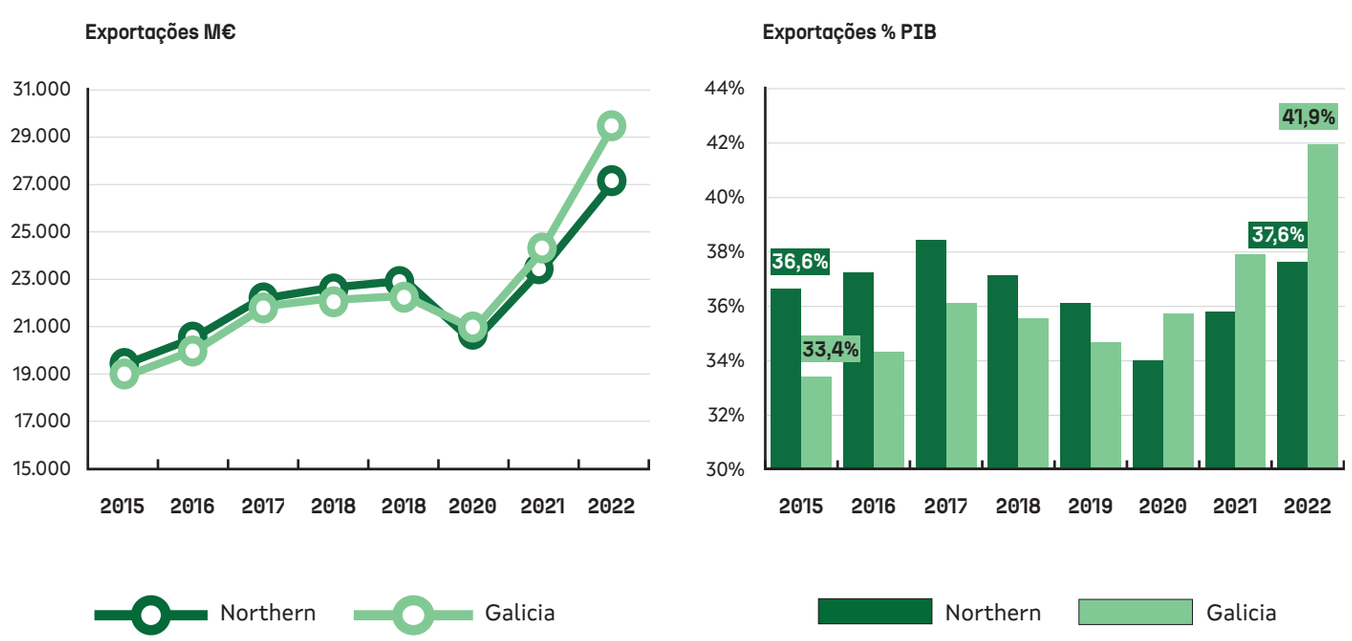
	Exports (M€)	Imports (M€)	Trade Balance (M€)	Coverage Rate	Exports as % of GDP
NORTHERN PORTUGAL	27 040	24 641	2 400	1,10	37,6%
GALICIA	29 293	26 978	2 315	1,09	41,9%

Source: INE - National Institute of Statistics and IGE - Galician Institute of Statistics

The evolution of exports of goods in the regions of Northern Portugal and Galicia reveals a consistent growth over the years, reflecting a strong dynamic in the international trade of both regions. The exception to this trend was the year 2020, affected by the Covid-19 pandemic, however, there was a rapid recovery in the years immediately after.

In the case of Northern Portugal, exports of goods reached a value of 27,040 million euros in 2022, representing 37.6% of regional GDP. In Galicia, the value of exports reached 29,293 million euros in 2022, representing 41.9% of regional GDP.

Figure 19. Evolution of exports, 2015-2022



Source: INE - National Institute of Statistics and IGE - Galician Institute of Statistics

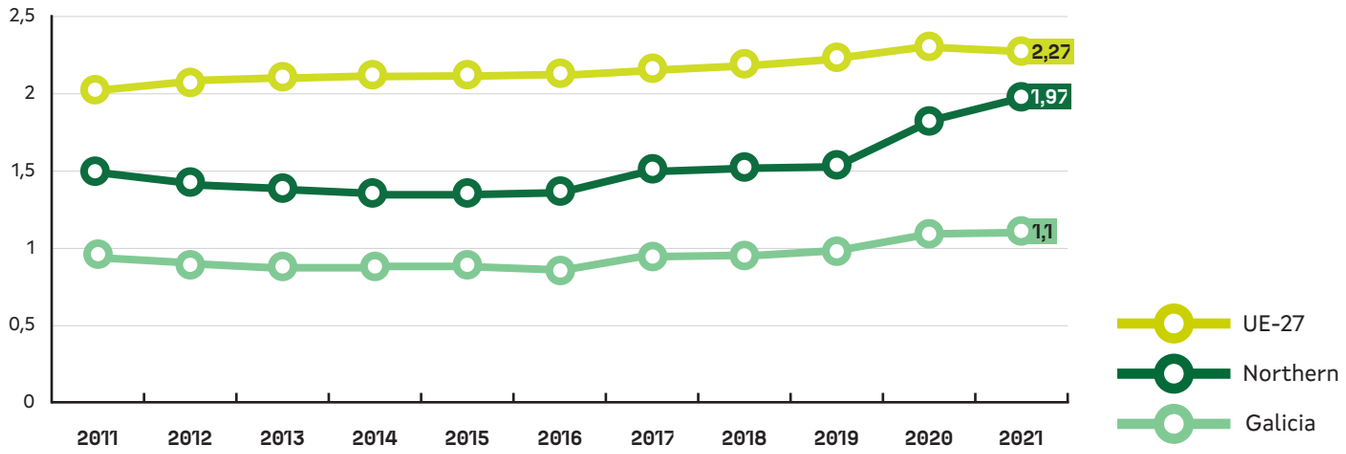
In Galicia, the main exports of goods include transport materials - automobile and naval sectors (24%) - and textile materials and articles thereof (23%). In Northern Portugal, textile materials and articles thereof are the class of goods with the highest export value (16%), followed by machinery and appliances (14%). There is also a greater diversification of the range of exported goods in Northern Portugal and a predominance of processed goods over unprocessed ones.

Innovation

Over the last decade, the Euroregion has seen an increase in its own technological endeavours, with a rise in the weight of R&D investment in GDP that is particularly noticeable in Northern Portugal.

In 2021, R&D expenditure in Northern Portugal was 1.97% of regional GDP, compared to the national average of 1.67% (Portugal). Despite positive developments, that performance is still below the European average and far from the established target of 3% R&D expenditure as a percentage of GDP. In Galicia, the evolution of this indicator in the last decade was more moderate and significantly lower than in Northern Portugal. In 2021, gross R&D expenditure represented 1.1% of Galicia's GDP, compared with the national average of 1.41% (Spain).

Figure 20. Gross R&D expenditure (% GDP), 2011-2021



Source: Eurostat (rd_e_gerdtot; tgs00042)

The Regional Innovation Scoreboard is an instrument developed by the European Commission to evaluate and compare the performance of European regions in innovation, using a composite indicator that synthesizes the innovative performance of a region based on 21 indicators that reflect the following four dimensions: (1) Structural Conditions, (2) Investments, (3) Innovation Activities and (4) Impacts.

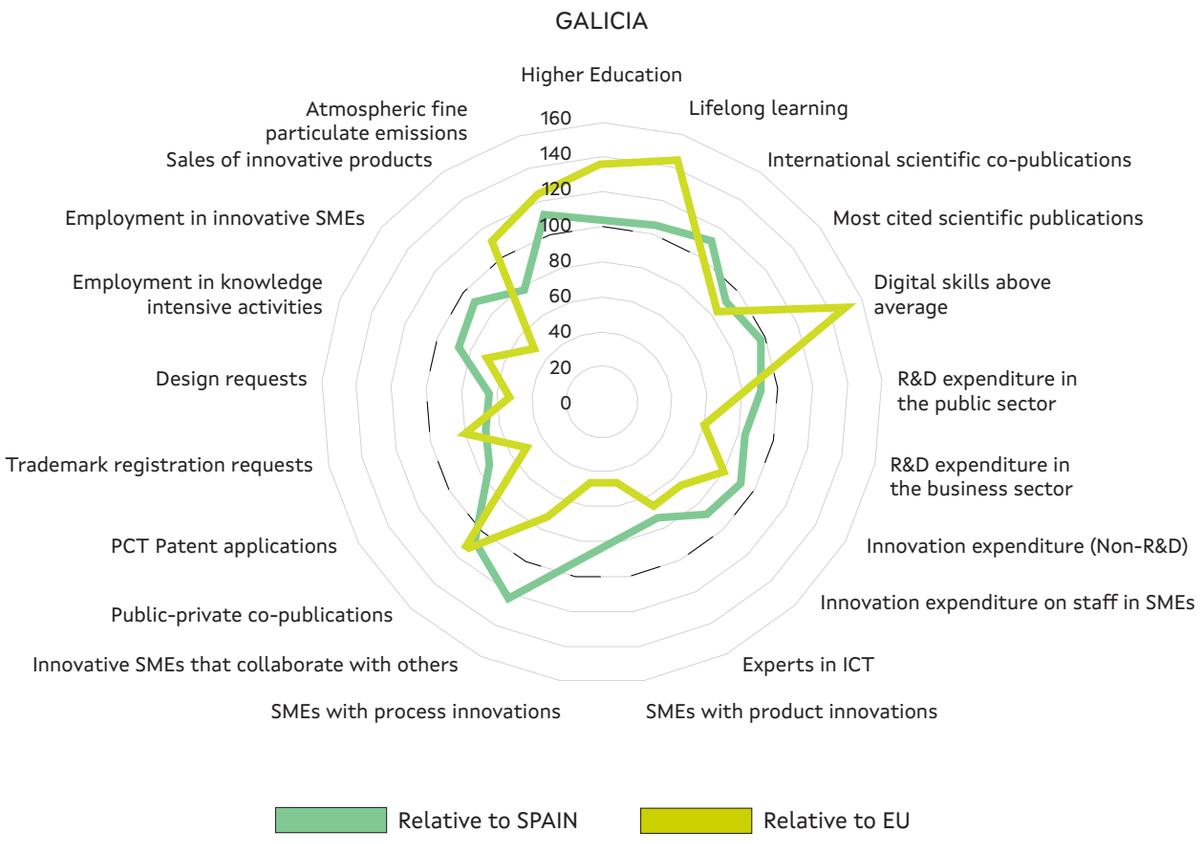
The Regional Innovation Scoreboard 2023 classified Galicia as a "Moderate Innovator", ranking 154th out of the 239 regions analysed. Northern Portugal is classified as a "Moderate Innovator", in 143rd place.

The performance of Galicia and Northern Portugal in the innovation index is below the EU average, with relative performances of 80.7 and 85.9 respectively (EU 2023=100).

A more detailed analysis of the indicators that make up the composite index of the Regional Innovation Scoreboard 2023 makes it possible to highlight the strengths and weaknesses of the functioning of the regional innovation system in the two regions.

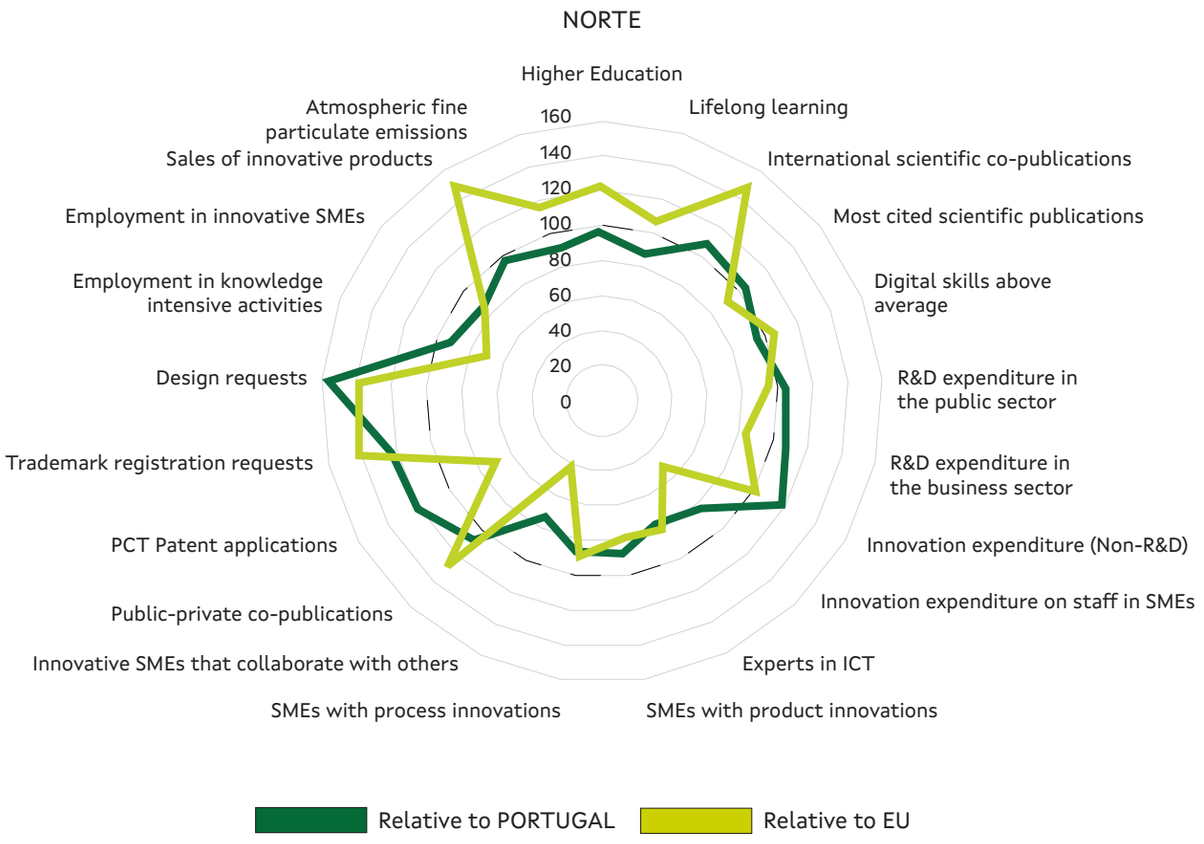
CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

Figure 21. Performance of Galicia and Northern Portugal in the Regional Innovation Scoreboard 2023



Galicia presents key strengths in education and digital skills. The higher education rate represents 104% of the Spanish average and 136% of the EU average. In terms of lifelong learning, the region also stands out, with 106% of the Spanish average and 145% of the EU average. In addition, it has an above-average digital skills indicator, at 151% of the EU average. Galicia also demonstrates good performance in public-private scientific co-publications, as well as maintaining low atmospheric emissions of fine particles.

However, Galicia faces significant weaknesses in innovation and R&D. R&D expenditure in the public sector and in the business sector is lower than both the national and EU averages. Furthermore, SME indicators with product and process innovations are also below average at 77% and 91% of the Spanish average and only 46% of the EU one. Indicators for patent applications, trademarks and designs also perform below the national and European average, as does employment in knowledge-intensive activities.



Source: Regional Innovation Scoreboard 2023

Northern Portugal has a higher performance than the European Union average in some areas, particularly the intellectual property indicators related to trademark registration and design, associated with product differentiation and increased value. Other strengths of the region, in which it stands above the European average, include the authorship of international scientific co-publications; public-private co-publications and sales of innovative products.

In terms of R&D investment and innovation, the region performs better than Portugal, but lower than the EU in two indicators (public sector R&D expenditure and corporate sector R&D expenditure), as well as in the industrial property registration indicator (PCT patent applications).

The main weaknesses in Northern Portugal's performance are in the indicators of innovative performance of small and medium-sized enterprises (innovative SMEs that collaborate with others, SMEs with product innovations, SMEs with process innovations), as well as in employment in innovative companies and knowledge-intensive activities.

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

MAPPING AND CHARACTERISATION OF THE EUROREGION'S INNOVATION SYSTEM

Mapping and characterisation of the cross-border innovation network is essential to identify the entities that make up the Euroregion's innovation system. Understanding the relational dynamics of the ecosystem is crucial for the broad involvement of stakeholders in the entrepreneurial discovery process, as well as for the success of the cross-border strategy. In order to characterise the cooperation dynamics in the Euroregion, this stage was structured in two phases:

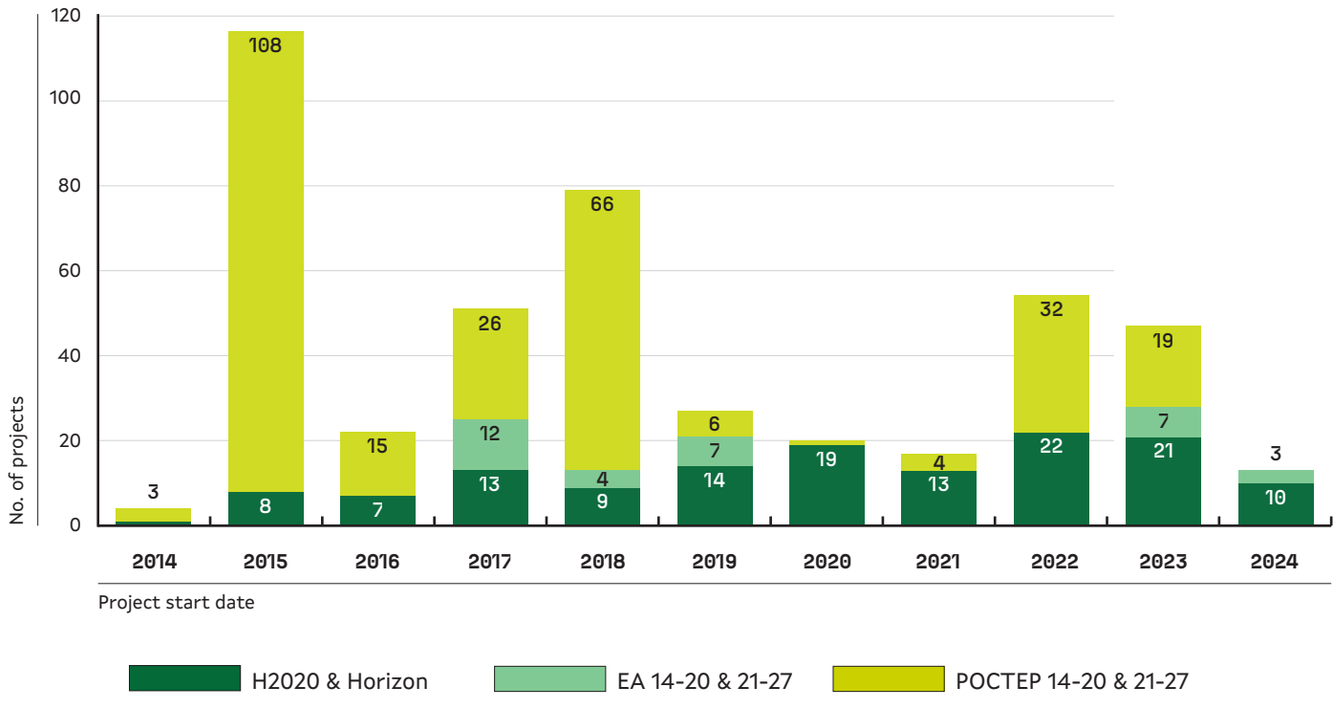
1. Joint mapping of the institutions in the Euroregion's innovation system, based on mapping exercises carried out by the two regions;
2. Analysis of networks applied to international cooperation projects involving entities from Northern Portugal and Galicia under programmes such as Horizon 2020 and Horizon Europe, POCTEP and the Atlantic Area Programme, among others that the Monitoring Group understood as relevant.

This mapping process was developed via the analysis of social networks of projects in co-promotion with the participation of at least one entity based in Galicia and one based in Northern Portugal under the H2020, Horizon Europe, POCTEP and Interreg Atlantic Area programmes. The analysis of Social Networks of collaborative projects allowed us to establish deep insights into the interactions between the organisations that make up the Euroregion's innovation ecosystem, namely:

1. Examining communities of POCTEP, Interreg Atlantic Area and H2020 and Horizon Europe with significant participation by organisations from Galicia and Northern Portugal.
2. Identifying the main organisations in the research network of the Galicia - Northern Portugal Euroregion.
3. Highlighting organisations that establish direct intermediation in the Euroregion's ecosystem.

In addition, the figure below demonstrates the evolution dynamics of joint participation of Galicia and Northern Portugal in international projects, in the H2020, Horizon Europe, Atlantic Area and POCTEP programmes between 2014 and 2024. Participation in the H2020 & Horizon Europe programme began modestly in 2014, with only one project, growing significantly in 2015 and 2017, reaching a peak in 2022 with 22 projects. After 2022, there is a slight drop, but a high level of participation continues. In the EA programme, participation began in 2017, indicating a late entry compared to other programmes, and showed a general growth trend with a peak in 2019, followed by a decrease, suggesting fluctuations in participation over the years. The POCTEP programme shows a sharp initial increase in 2015, with 108 projects, followed by a decline over the following years, with a recovery in 2018 with 66 projects. From 2020 onwards, participation is irregular, with significant variations from year to year. The results show a positive evolution in the joint participation of Galicia and Northern Portugal in international programmes, with annual fluctuations that tend to reflect gaps in framework programme changes and the periods when projects start.

Figure 22. Evolution of participation



Source: H2020, Horizon Europe. POCTEP and EA.

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

POCTEP

The analysis of the Interreg Spain-Portugal Cross-Border Cooperation Programme focused on a set of data available for the periods 2014-2020 and 2021-2027 (current period). The first framework programme analysed revealed 89 different projects, each with the participation of at least one entity from Northern Portugal and Galicia, totalling 272 entities: 68.3% from the Euroregion, 21 from Northern Portugal and 86 from Galicia. The data set for the period 2021-2027 presents, at the date of analysis, 27 different projects with the same criterion of participation Northern Portugal-Galicia, totalling 130 entities.

In the case of POCTEP 2014-2020, the description of the projects made it possible to carry out a content analysis (represented as a *wordcloud* in Figure 23), constructed from 1418 words which reveal the main themes and areas of focus. Terms such as "cooperation", "cross-border", "companies", "sector", "resources", "territory", and "euroregion" reflect a focus on cross-border cooperation, technological innovation, social development and environmental sustainability, with an emphasis on efficient resource management and promotion of regional development.

Figure 23. Wordcloud: Project Descriptions POCTEP 2014-2020

Source: POCTEP 2014-2020

The POCTEP 2014-2020 network analysis shows 1904 interconnections. Each entity is connected on average to 14 others, suggesting a well-connected and intensive network (average weighted degree = 32.559). The largest number of steps required to connect any two entities is five (diameter). Nevertheless, there are well connected nodes that can reach any other node in three steps or less (radius). The average length of the path is 2.615, showing that on average it takes only two and a half steps to connect any two entities, which demonstrates good efficiency in network communication.

Network modularity is 0.557, suggesting a significant presence of 9 communities, with cohesion reinforced by the high average clustering coefficient (0.822). In observation of clusters, areas of expertise distinct from the analysed projects associated with the entities are demonstrated. Starting with the key facilitators (table 2), the central entities in the network, measured by the centrality of intermediation (betweenness centrality), include the Universidade de Vigo (0.256), the Universidade de Santiago de Compostela (0.133), and the CIM Alto Minho (0.126). The Universidade de Vigo participates in several projects, reflecting a central position in the

network and specialisations in technology and innovation. Examples include the "Storage and Management of Renewables (AGE)" project, focused on the development of advanced technologies for storage and management of renewable energy. The Universidade de Santiago de Compostela has projects focused on biotechnology and health sciences. The *Inter-Municipal Community of Alto Minho* (CIM Alto Minho) and the *Diputación de Huelva* (Huelva Provincial Council) are shown to be important regional facilitators, promoting regional development projects and inter-municipal cooperation. CIM Alto Minho participates in projects including "Regional Development and Intermunicipal Cooperation (DRCI)", which aims to improve infrastructure and cooperation between municipalities to promote sustainable development. The Diputación de Huelva is involved in projects including "Integrated Management of Natural Resources (GIRN)", focused on sustainable management of natural resources and environmental preservation. And the Universidade do Minho, participates in projects such as "Advanced Materials Technologies (TAM)", dedicated to the development of new technologies and advanced materials.

Regarding the analysis of the POCTEP 2021-2027 network, it consists of 726 interconnections, with each entity being connected to about 11 others, suggesting a well-connected and intensive network. The greatest number of steps required to connect any two entities is six, although well-connected nodes can reach any other node in a single step. Average path length is 2.664, showing that on average it takes about 2.66 steps to connect any two entities. Network density is 0.087, indicating that although the network is well connected, there is still room for new connections, as would be expected in large and complex networks. Additionally, the network contains two weakly connected components, meaning that there are two large subgroups on the network that are not directly connected to each other.

The modularity of the network is strong (0.619), with 8 well-defined communities reinforced by *a* high average clustering coefficient (0.880), suggesting the robustness of the cohesion of consortia among themselves (2183 triangles). In the observation of the clusters, distinct areas of specialisation are seen, based on the projects associated with the entities, similar to the period 2014-2020. Similarly, the central entities in the network, measured by the centrality of intermediation, include the Universidade de Vigo, the Foundation for the Promotion of Innovation in the Galician Industry (CTAG) and the Universidade do Minho.

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

Table 2. Ranking of Intermediaries in POCTEP 2014-2020

	ENTITY	Betweenness
1	Universidade de Vigo	0.256
2	Universidade de Santiago de Compostela	0.133
3	Comunidade Intermunicipal do Alto Minho (CIM Alto Minho)	0.126
4	Diputación de Huelva	0.085
5	Universidade do Minho	0.082
6	Instituto Politécnico de Viana do Castelo	0.051
7	Universidade do Porto	0.050
8	Diputación de Pontevedra	0.047
9	Agencia Gallega de Innovacion	0.040
10	Diputación de Avila	0.038
11	Instituto Politécnico de Bragança	0.035
12	Diputación de Ourense Instituto Ourensano de Desarrollo Económico	0.035
13	Dirección General de Defensa del Monte	0.034
14	Laboratorio Iberico Internacional de Nanotecnologia	0.032
15	Instituto Gallego de Promocion Economica	0.032

Source: POCTEP 2014-2020

Table 3. Ranking of Intermediaries in POCTEP 2021-2027

	ENTITY	Betweenness
1	Universidade de Vigo	0.247
2	CTAG	0.190
3	Universidade do Minho	0.097
4	Centro Tecnologico de Eficiencia y Sostenibilidad Energetica	0.095
5	Faculdade de Engenharia da Universidade do Porto	0.085
6	Universidade de Santiago de Compostela	0.082
7	Camara Municipal de Viana do Castelo	0.064
8	Universidade da Coruña	0.060
9	Agencia Gallega de Innovacion	0.059
10	Agrupacion Europea de Cooperacion Territorial Galicia-Norte de Portugal	0.048
11	Instituto Energetico de Galicia	0.043
12	Comunidade Intermunicipal do Alto Minho (CIM Alto Minho)	0.041
13	Agencia Gallega de Desarrollo Rural (AGADER)	0.040
14	Ayuntamiento de Monterrei	0.040
15	Diputacion de Ourense	0.037

Source: POCTEP 2021-2027

INTERREG ATLANTIC AREA

In the analysis of the Interreg Atlantic Area 2014-2020, 23 different projects were considered with the participation of at least one entity from Northern Portugal and Galicia, a total of 204 participating entities, of which 28.9% come from the Euroregion (21 from Northern Portugal and 38 from Galicia). In the current period (2021-2027), the analysis focused on 10 different projects, with the participation of 90 entities, of which 33.3% come from the Euroregion: 20 from Galicia and 10 from Northern Portugal. Considering the reduced number of projects and total participating entities to build a network analysis with robust results, both periods were aggregated.

In a first analysis of the descriptions of the projects, composed of 3033 different words present and after tokenising, 923 relevant words were identified for the construction of the wordcloud via frequency counting, resulting in the visual representation in Figure 24. Terms such as "Atlantic", "innovation", "energy", "new", "resources", "marine", "sector", and "transnational" indicate a strong focus on innovation, energy and resources in the Atlantic Area. The emphasis on "marine", "blue", and "coastal" highlights the importance of maritime and coastal issues, while "resources" and "energy" suggest a focus on sustainable exploitation of natural resources and renewable energies, reflecting projects with a thematic focus on innovation, sustainability and transnational cooperation, with an emphasis on the exploitation and protection of Atlantic marine and coastal resources.

Figure 24. Wordcloud: Project Descriptions Interreg Atlantic Area

Source: Interreg Espaço Atlântico

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

The aggregate analysis of the Interreg Atlantic Area Network 2014-2020 and 2021-2027 consists of a total of 1877 connections. When we consider the intensity of the connections, i.e. the number of shared projects, we observed that the connections are even more significant, reflecting an intense collaboration between the entities (evidenced by the average weighted degree of 28.205).

The network has a diameter of 5, which means that the longest distance between any two entities is only five steps and a radius of 1 suggests at least one extremely central entity that connects other entities. On average, it takes almost three steps (2.77) to travel from one entity to another, reinforcing the idea of a well-connected network. The modularity analysis suggests a strong community structure (0.716), of 12 distinct communities, suggesting a diversity in the way entities collaborate. At the same time, the extremely high average clustering coefficient (0.915) indicates that entities often form triangles of collaboration, a sign of robustness and resilience in the network.

We highlight entities that play crucial roles in facilitating the network such as the Universidade do Porto (0.2728), Brest Métropole (0.1595) and the National University of Ireland Galway (0.1012), which have high centralities of intermediation. The Universidade do Porto is involved in projects covering biology, science, engineering, architecture and letters. Brest Métropole, focusing on economic and international development and urban planning, specialises in urban development and sustainability. The National University of Ireland Galway is involved in social innovation, medical devices, chemistry, geography and science and engineering. The AD ELO - Bairrada and Mondego Local Development Association - is focused on local development and rural entrepreneurship, as indicated by its projects. The Universidad de Las Palmas de Gran Canaria, with projects in maritime studies, environmental sciences, sustainable tourism and food security, demonstrates specialisation in these areas. Entities such as the International Iberian Nanotechnology Laboratory (INL), Universidade de Vigo and the Interdisciplinary Centre of Marine and Environmental Research (CIIMAR) also play significant roles, although with slightly smaller intermediation centralities (Table 4). Other entities, such as the Universidade de Santiago de Compostela, Universidade da Coruña and University College Cork, also stand out in the network, each with its areas of specialisation and influence.

Table 4.
Ranking of intermediaries in Interreg Atlantic Area

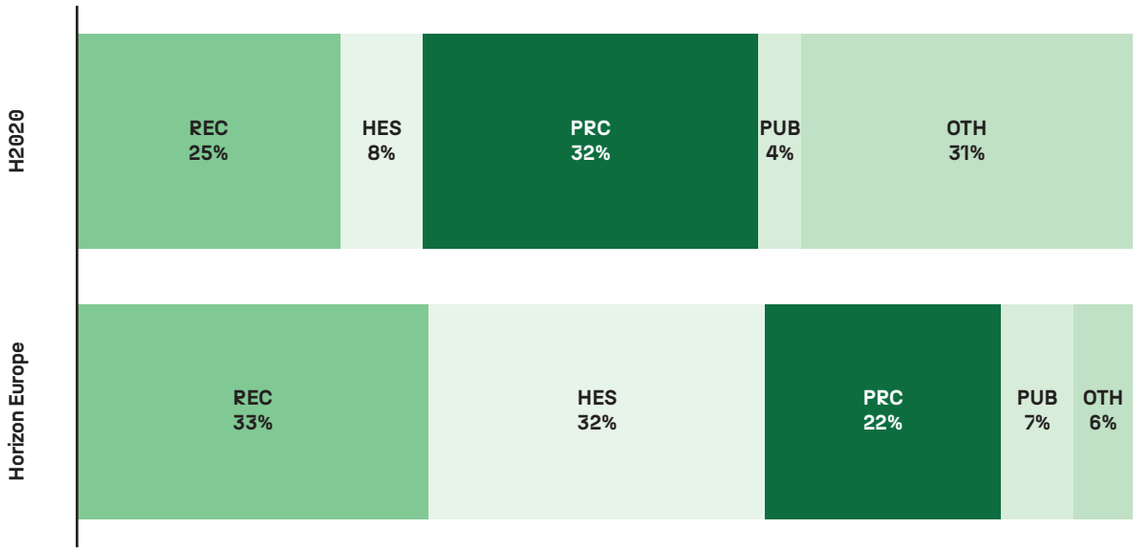
	ENTITY	Betweenness
1	Universidade do Porto	0.2728
2	Brest Métropole	0.1595
3	National University of Ireland Galway	0.1012
4	AD ELO - Associação de Desenvolvimento Local da Bairrada e Mondego	0.0908
5	Universidad de Las Palmas de Gran Canaria	0.0896
6	Fórum Oceano – Associação da Economia do Mar	0.0787
7	International Iberian Nanotechnology Laboratory (INL)	0.0588
8	Universidade de Vigo	0.0492
9	Centro Interdisciplinar de Investigação Marinha e Ambiental	0.0482
10	Universidade de Santiago de Compostela	0.0475
11	Universidade da Coruña	0.0469
12	University College Cork, National University of Ireland, Cork	0.0428
13	TEAGASC – Agriculture and Food Development Authority	0.0337
14	University College Dublin	0.0313
15	Centro Tecnológico del Mar – Fundación CETMAR	0.0167

Source: Interreg Atlantic Area

H2020 & HORIZON EUROPE

The analysis of H2020 focused on 83 different projects, with the participation of at least one entity from Northern Portugal (a total of 131) and Galicia (85 entities), from a total of 2865 participating entities, of which 7.5% are from the Euroregion. In the case of Horizon Europe, 53 different projects were considered, with the participation of 1349 entities, of which 144 are from the Euroregion (76 from Northern Portugal and 68 from Galicia, respectively). The data sets for both framework programmes show a harmonised organisational typology that allows us to assess a significant change that reflects an increase in the participation of research and higher education institutions, and a reduction in the participation of companies and other private organisations (Figure 25).

Figure 25. Type of organisations in the Euroregion in H2020 and Horizon Europe (%)



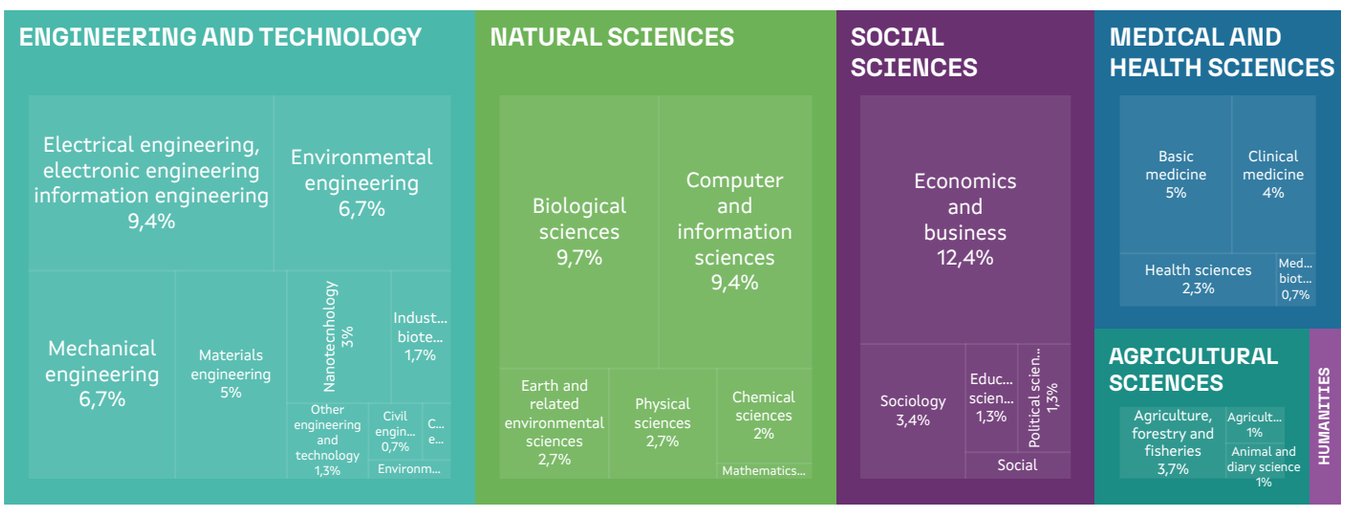
Source: H2020 & Horizon Europe

When analysing the thematic focus of projects in accordance with the European Scientific Vocabulary (EuroSciVoc) – a multilingual taxonomy representing all the main fields and sub-fields of science in CORDIS – we see a substantial variation in the predominant scientific fields associated with projects approved between H2020 and Horizon Europe. In H2020 (Figure 26), the main sub-fields are: electrical and electronic engineering (9.4%), biological sciences (9.4%), and economics and business (12.4%); others include computer and information sciences (9.4%), mechanical engineering (6.7%), environmental engineering (6.7%), and health sciences, specifically basic medicine (5%). With the transition to Horizon Europe (Figure 27), there is a change in the thematic priorities associated with the projects. there is a higher concentration in biological sciences (16%), followed by earth and environmental sciences (9%), and economy and business (8%). Environmental engineering maintains a notable presence (5%), along with health sciences and basic medicine (5%). Other important fields include computer and information sciences (5%), sociology (6%), and electrical and electronic engineering (3%).

In short, Horizon Europe accentuates the thematic frequency of biological and environmental sciences, possibly reflecting a response to emerging needs and societal challenges such as climate change and public health. This is in contrast with H2020, which showed a more balanced distribution across various disciplines.

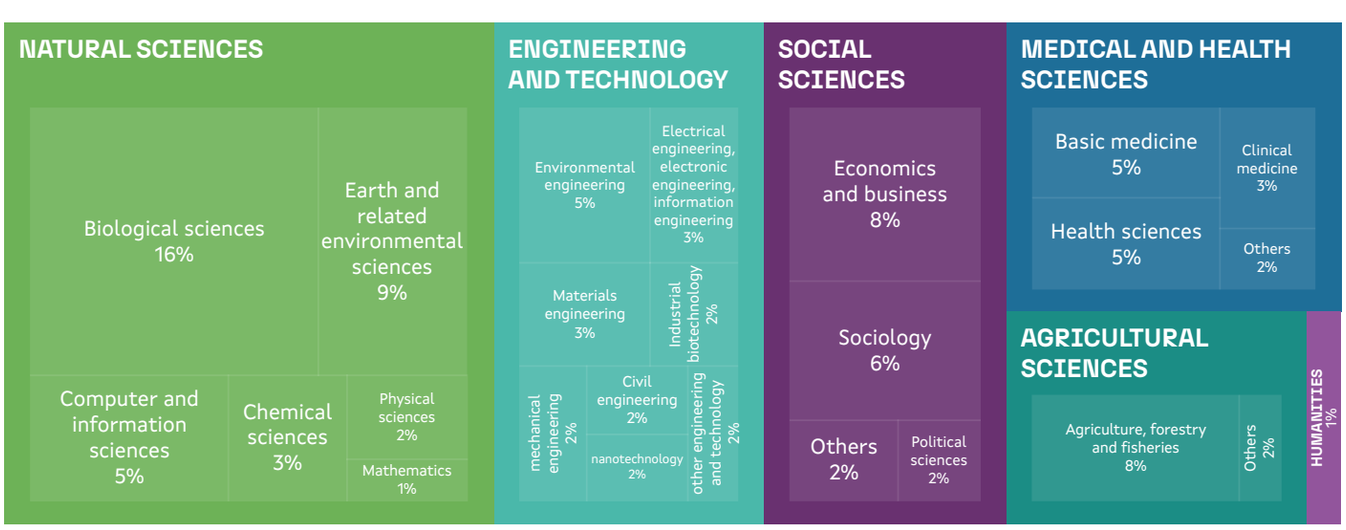
CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

Figure 26. H2020 projects by EuroSciVoc fields and sub-fields (%)



Source: H2020

Figure 27. Horizon Europe projects by EuroSciVoc fields and sub-fields (%)



Source: Horizon Europe.

The inter-entity collaboration network in the H2020 programme reveals a complex and highly connected structure. The graph, composed of 68,985 relations between each other (edges), in which each entity is directly connected to about 80 others on average (average grade of 80.308), highlighting the intensity of its collaborative character. When we consider the number of projects shared between entities, the weighted average degree is even more impressive (282.934), showing robust connections often involving multiple projects.

The average distance between all entities on the network is relatively short (average path length of 2.408), suggesting efficient network communication. The network diameter indicates that the largest number of steps required to connect two entities is only four. The radius – the smallest maximum distance between one central node and all others – is only 1, indicating an extremely strong centrality of some of the main entities in the network. The network has only three poorly connected components, demonstrating that most entities are interconnected, but there are small subnets which are disconnected.

The modularity of the network is 0.435, with 10 main communities, indicating the presence of well-defined subgroups with denser internal connections than with the rest of the network. The clusters formed reflect distinct areas of expertise. In transversal terms, the facilitators of innovation and technology are identified, predominantly composed of major research institutes and technological universities, such as Fraunhofer Gesellschaft, Teknologian Tutkimuskeskus VTT Oy and Danmarks Tekniske Universitet. These hubs stand out in projects covering additive manufacturing, nanotechnology, the circular economy and renewable energy.

Other clusters emerge with areas related to life sciences and health, with entities such as Aarhus Universitet and the Universidade de Santiago de Compostela. These institutions are involved in projects in biotechnology, public health and biomedical research. In environmental sciences and sustainability, institutions such as the Universidade do Porto and the Centre National de la Recherche Scientifique (CNRS) stand out. This group predominantly focuses on research on climate change, environmental conservation and green technologies, exemplified by projects such as Atlanteco and ASSEMBLE Plus that clearly illustrate these areas of activity. The social sciences and economics cluster, which includes the Universidade de Vigo and the Consiglio Nazionale delle Ricerche (CNR), is dedicated to projects focused on ICT, renewable energy and environmental sustainability, reinforcing this thematic focus. Finally, the engineering and industry cluster, with entities such as the Universidade do Minho and Asociacion de Investigacion Metalurgica del Noroeste, specialises in applied engineering and technological innovation in sectors related to production industries, such as mechanical engineering, metalworking and logistics, participating in projects that promote the digital transformation of renewable energy plants and solutions.

Table 5 reflects the ranking entities with the greatest centrality of intermediation, of which the Fraunhofer Gesellschaft (0,181) and the Universidade do Porto (0,049) stand out, acting as central points in the network.

The analysis of relations in Horizon Europe has 37355 connections. On average, each node is connected to 73 others, suggesting a dense and intensive connected network (corroborated by the high weighted average grade of 153.088). Similar to H2020, the diameter of the network is 4, indicating that the largest number of steps needed to connect two entities, as well as the radius of 1, suggesting that there are extremely well-connected nodes that can reach any other node directly. The average length of the path is 2.455, showing that on average it takes only two and a half steps to connect any two entities, which demonstrates high efficiency in network communication. Additionally, there is evidence that entities tend to form cohesive groups together, forming a robust and strongly interconnected network (Average Clustering Coefficient of 0.933).

The modularity of the network is 0.506, which indicates a significant presence of communities, with the clear identification of 10 major communities. The observation of clusters reveals distinct areas of expertise based on the projects associated with entities that act as their main facilitators. The Universidade do Minho is involved in projects such as HERMES, CBDHIGHBIO, IMAGINE and ADAPTATION, reflecting specialisations in technology, innovation and biotechnology. The Universidade de Vigo participates in projects such as HERMES, CBDHIGHBIO, IMAGINE, MemCat and 3DSecret, indicating a focus on engineering, technology and sustainability. AIMEN, with projects such as OPENZDM and EuReComp, specialises in materials engineering, metalworking and advanced manufacturing. The Universidade do Porto participates in the OPENZDM project and is especially prominent in engineering and technology. CIIMAR is represented by the BlueShellfish project, aimed at marine sciences and environmental sustainability. The University of Ghent participates in the TClock4AD and IMAGINE

CHARACTERISATION OF THE EUREGION'S INNOVATION SYSTEM

Table 5. Ranking of intermediaries in H2020

	ENTITY	Betweenness
1	Centre National de la Recherche Scientifique	0.035
2	Aarhus Universitet	0.025
3	Instituto Tecnologico del Embalaje, Transporte y Logistica	0.021
4	Fraunhofer Gesellschaft	0.181
5	Agencia Estatal Consejo Superior de Investigaciones Cientificas	0.064
6	Universidade do Porto	0.049
7	Universidade do Minho	0.044
8	Commissariat a L Energie Atomique Et Aux Energies Alternatives	0.035
9	Teknologian Tutkimuskeskus VTTt OY	0.033
10	Danmarks Tekniske Universitet	0.033
11	Universidade de Vigo	0.021
12	Asociacion de Investigacion Metalurgica del Noroeste	0.021
13	INESC TEC	0.020
14	Universidade de Santiago de Compostela	0.019
15	Instytut Chemii Bioorganicznej Polskiej Akademii Nauk	0.018

Source: H2020

Table 6. Ranking of intermediaries in Horizon Europe

	ENTITY	Betweenness
1	Fraunhofer Gesellschaft	0.060
2	Universidade de Santiago de Compostela	0.059
3	Ethnicon Metsovion Polytechnion	0.056
4	Aarhus Universitet	0.053
5	Consiglio Nazionale delle Ricerche	0.052
6	Agencia Estatal Consejo Superior de Investigaciones Cientificas	0.051
7	Universidade de Vigo	0.046
8	Institut National de Recherche pour L'agriculture, L'alimentation et L'environnement	0.043
9	Centro Interdisciplinar de Investigacao Marinha E Ambiental	0.037
10	INESC TEC	0.034
11	Region Hovedstaden	0.034
12	Institut Jozef Stefan	0.034
13	Universidade do Minho	0.034
14	Tartu Ulikool	0.029
15	Universiteit Gent	0.029

Source: Horizon Europe

projects, reflecting a specialisation in technology and biotechnology. The Universidade de Santiago de Compostela, with projects such as TClock4AD and CAR T-REX, focuses on biomedical sciences and innovation. Finally, the Jožef Stefan Institute, involved in the AI REDGIO 5.0 project, stands out in artificial intelligence and technology.

Additionally, Table 6 shows betweenness centrality of the main entities in the network, which potentially facilitate the transfer of knowledge between different groups more frequently. For example, Fraunhofer Gesellschaft, with the greatest centrality of intermediation, stands out as a central node, facilitating collaboration and innovation through multiple projects and partners.

FINAL CONSIDERATIONS

The results show that the programmes involving cross-border collaboration in the Galicia – Northern Portugal Euroregion consolidate well-structured and efficient networks, promoting innovation and sustainable development in the ecosystem. The conclusions on the results are presented in three summary points:

1. All networks have a high average clustering coefficient, indicating a general tendency for persistent collaboration to form between the same organisations.

2. The average path lengths in all networks are relatively low, revealing the proximity with which organisations have to go to reach another, i.e., the potential facilitator in the dynamisation of the ecosystem.

3. Each network has a variety of communities with strong modularity, especially in H2020 and the Interreg Atlantic Area, resulting in the thematic specialisation of the projects developed.

In addition, the network analysis performed highlights the importance of the central entities in it and the formation of cohesive communities that facilitate the identification of thematic specialisation and efficient collaboration in the Euroregion.

In terms of contributions from the social media analysis to the strategic convergence between the RIS3 priorities of Galicia and Northern Portugal, a basis of empirical evidence was established to support and validate areas where cross-border cooperation is already robust, summarised in the following points:

4. The analysis of the POCTEP and H2020 networks indicates a strong clustering in biotechnology, having the Universidade de Vigo as an intermediary entity for projects in biotechnology and preservation of natural resources.

5. The presence of clusters whose main focus is on advanced production technologies and circular economy in the networks of Horizon Europe and H2020 suggests a strong specialisation in these areas.

6. The Interreg Atlantic Area analysis highlights the importance of terms such as ”marine“ and ”blue“, indicating a thematic focus of projects in the programmatic scope of marine resources and sustainability.

VISION AND OBJECTIVES

SWOT ANALYSIS OF THE EUROREGION INNOVATION SYSTEM

The process of co-creation of SWOT is carried out following the diagnosis and mapping of the Euroregion and the exercise of strategic convergence of the common points between RIS3 Northern Portugal and RIS3 Galicia through the content analysis of the documents. So, a preliminary version of the Euroregion SWOT was drawn up for discussion by stakeholders during the first workshop.

The workshop session used a multitude of tools to gather evidence that underpins the co-creation of the RIS3T SWOT. The first of these exercises was a questionnaire survey, individually completed by 54 of the participants in the session. The results demonstrate a high level of relevance of the preliminary points, with more than 70% of the answers being "Agree" or "Agree totally" and less than 10% of the answers being "Disagree" or "Disagree totally". Nevertheless, in an open session, the respondents had the possibility of presenting their specific suggestions point by point, which were considered in the consolidation phase.

The next phase distributed participants into 8 *focus group* work groups, facilitated by a moderator and working *on canvas*. The first phase of the *canvas* allowed the participants to reflect together on at least 3 points that could be added, changed or removed in the preliminary SWOT. The results of this session and the contributions of the questionnaire survey allowed the technical team to build a preliminary SWOT review with evidence of the stakeholders' tacit knowledge and with the sensitivity necessary to avoid duplication and facilitate the reading of a final version.

Next, we present the consolidated analysis of the Euroregion SWOT (source: Own elaboration).

VISION AND OBJECTIVES

S STRENGTHS

1. Robust R&D&I ecosystem with strong orientation toward innovation and technological development.
2. Excellence in research and technological development, with a solid industrial base and export guidance.
3. Significant progress in integrating research and development with the market and effective international cooperation.
4. Strong alignment with strategic R&D agendas at European level.
5. International recognition in various business sectors, especially industries such as textiles and automobiles.
6. Diversified industrial capacity and complementarity of strategic sectors.
7. Strong use of unique natural and heritage resources as a basis for the development and promotion of tourism.
8. Strategic positioning supported by advanced qualifications and expertise in the international market.
9. Well-established Euroregion cooperation and collaboration.
10. Cultural proximity to Portuguese and Spanish-speaking markets, facilitating internationalisation.

O OPPORTUNITIES

1. Multiplication of value through the dual digital and sustainable transition, integrating new technologies into value chains.
2. Several funding opportunities available to foster innovation and industrialisation, driven by national and European policies.
3. Public-private and international collaboration, creating an environment conducive to strategic partnerships.
4. Adaptation to post-pandemic changes, offering new market opportunities and innovation.
5. Development of collaborative governance models and exploitation of territorial resources.
6. Co-promotion projects and creation of clusters operating across various sectors for greater competitiveness.
7. Awareness of the benefits of digital technologies, accelerating regional digital transformation.
8. Modernisation of accessibility and connectivity between regions, facilitating economic integration.
9. Re-industrialisation of Europe as a strategy to strengthen the regional industrial and technological foundations.
10. Incentives for mobility and talent retention, especially in technological areas.

WEAKNESSES W

Table 7. RIS3T Consolidated SWOT

1. Limited business investment capabilities in R&D, especially in small and medium-sized enterprises.
2. Need for improvement in digital infrastructure and agile administrative processes to support innovation, with appropriate policy-mix.
3. Disconnect between research and development and practical applicability in the market.
4. Complexity and bureaucracy that complicate administrative and business efficiency.
5. A still-incipient culture of innovation and resistance to change in the business fabric.
6. Insufficient training and capability building of the management team, especially in small companies.
7. Institutional fragmentation and lack of articulation between different levels of governance.
8. Chronic problems linking academia and industry, affecting technology transfer.

THREATS T

1. Demographic challenges, including population decline in rural areas and ageing of the population.
2. Challenges in investment and business innovation due to the difficulty of access to credit and funds.
3. Globalisation and international competition, requiring greater integration in R&D&I value chains.
4. Lasting impacts of the COVID-19 pandemic on the economy and dynamics of the labour market.
5. Climate change that threatens the sustainability of economic and social activities.
6. Geopolitical uncertainty that can affect economic stability and international cooperation.
7. Retention of skilled labour, with talent draining to more competitive regions.
8. Social and political polarisation that can hinder the implementation of innovative policies.
9. European economic decline, negatively affecting investment capacity and regional growth.
10. Unequal competence against countries outside the EU, impacting business competitiveness.

SHARED VISION & STRATEGIC OBJECTIVES FOR THE DEVELOPMENT OF RIS3T

The process of designing the updated shared vision of RIS3T was based on stakeholder consultation. The focus group consisted of a first phase of contribution the SWOT and its validation, in which the 8 working groups each built their own shared vision. The overlapping views resulting from the exercise, in strategic convergence with the elements present in the documents of RIS3 Galicia and Northern Portugal, allowed of following shared vision for RIS3T to be designed:

"Consolidate a robust innovation system that strengthens cross-border collaboration in R&D excellence and the development of products, processes and services that meet Euroregion's production and consumption needs, with scalability to the global market, attracting and retaining talent and leveraging external investment to promote sustainable development and improve quality of life".

With regard to the strategic objectives, their mapping followed the same strategy convergence analysis exercise between the two documents of RIS3 for Galicia and Northern Portugal. After listening to the audience at the May 7 workshop, no new standards were identified that would allow us to add other strategic objectives beyond those mapped. With this in mind, the RIS3T Strategic Objectives are presented below.

Having established that a shared vision should be ambitious and inspiring, but should be anchored in the current context, not only in global trends, the second phase of the focus group employed a collaborative backcasting tool, allowing them to be optimised to the size of Euroregion.

Starting from the current state of the selected strategic objective, participants identified and listed the changes needed to attain the desired future vision. This process required step-by-step analysis, from the present situation through to the future vision; the changes required in various areas, from technical components to social aspects, also including changes in trends or market dynamics. Similarly, with the chain of changes and trends established, stakeholders identified the activities and resources needed to carry out these changes. For this, the exercise worked backwards from the last identified change required to achieve the vision.

Table 8. RIS3T Consolidated strategic objectives.

RIS3T SO	CONSOLIDATED
Deepen R&D&I collaboration in the Euroregion	Both strategies reflect the importance of strengthening an integrated and technologically advanced R&D&I ecosystem, facilitating collaboration and technology transfer to streamline the business and industrial framework of both regions. And to achieve a sustainable balance between excellence in research and the development of innovative products and services that meet the applied needs of the global market.
Promote the attraction and retention of talent	The Galician RIS3 highlights support for the development of people's abilities to seize the opportunities of a smart specialisation model and make the region attractive for attracting and retaining talent. Similarly, the Northern Portugal RIS3 includes the increase of qualifications of all segments of the population as a transversal objective. Both recognise the importance of human capital in the process of innovation and regional development. The orientation towards investing in the continuous training of the population is consolidated, raising the educational and technical level to attract and retain talent in both regions, with particular attention to gender equity and inclusion.
Improve Global Positioning of Value Chains	Galicia's strategy aims to boost the Galicia brand as an asset for R&D&I, seeking to position the region on the global stage and attract foreign investment. In addition, one of Northern Portugal's strategic objectives is to improve competitive positioning on a global scale. This goal is shared by both regions, focusing on enhancing their visibility and attraction in the international context. The aim is to strengthen the regions' brand on the global stage, using innovation and an effective governance model to attract investment and improve quality of life, promoting the region as a place of excellence in which to live, work and invest. In addition, it aims to reduce the peripherality of the Euroregion in the European context and increase its attractiveness as an investment destination.
Promote regional cohesion and exploit endogenous resources	This strategic objective focuses on promoting territorial cohesion, with emphasis on border regions, seeking to mitigate regional disparities and strengthen local identity, through the exploitation of endogenous resources, as cultural, natural and heritage elements as a driver of regional competitiveness. This objective aims to promote social and economic inclusion through innovation, resource preservation and institutional cooperation.
Strengthen the institutional capacity and efficiency of the Public Administration in cross-border cooperation for common societal challenges	This remaining objective of RIS3T 2014-2020 aims to facilitate the sharing of best practices, resources and knowledge among governmental and institutional entities in both regions, promoting a more integrated and effective approach to regional governance and the administration of R&D&I funds and projects.

Source: Own elaboration.

PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

THE PRIORITIES OF THE REGIONAL RIS3S FOR 2021-2027

The Smart Specialisation Strategy of Galicia 2021-2027

As part of the Galicia Strategic Plan 2022-2030, the RIS3 Galicia Smart Specialisation Strategy 2021-2027 defines the priorities and objectives on which R&D&I investment in the Galicia region will be focused in this period. At the strategic level, the participatory process made it possible to prioritise for intelligent and sustainable specialisation in Galicia, through the identification of shared challenges. Prioritisation is based on RIS3's 3 major challenges, and the 3 priorities identified by stakeholders for 2021-2027:

Challenge 1
Innovation-based natural and cultural resource management model - Modernise traditional Galician sectors through the introduction of innovations that improve efficiency and yield in the use of endogenous resources and their reorientation to alternative uses of higher added value in energy, agriculture, aquaculture, pharmacy, cosmetics, food and culture.

Challenge 2
Industrial model based on competitiveness and knowledge - Increase the technological intensity of Galicia's industrial structure through essential enabling technologies and the evolution of value chains.

Challenge 3
Healthy living model based on active ageing of the population - Position Galicia as the leading region in southern Europe in providing knowledge-intensive services and products related to healthy living models and active ageing.

The Smart Specialisation Strategy in Galicia defines 3 priorities, implemented in different areas of prioritisation:

Priority 1: Sustainability

Develop and apply the numerous scientific-technological and innovation solutions to advance the decarbonisation of value chains, the sustainability of natural resources (land and sea) and the heritage of Galicia, whilst also creating opportunities for diversification for sustainable and internationally competitive products that improve the well-being of the region's people.

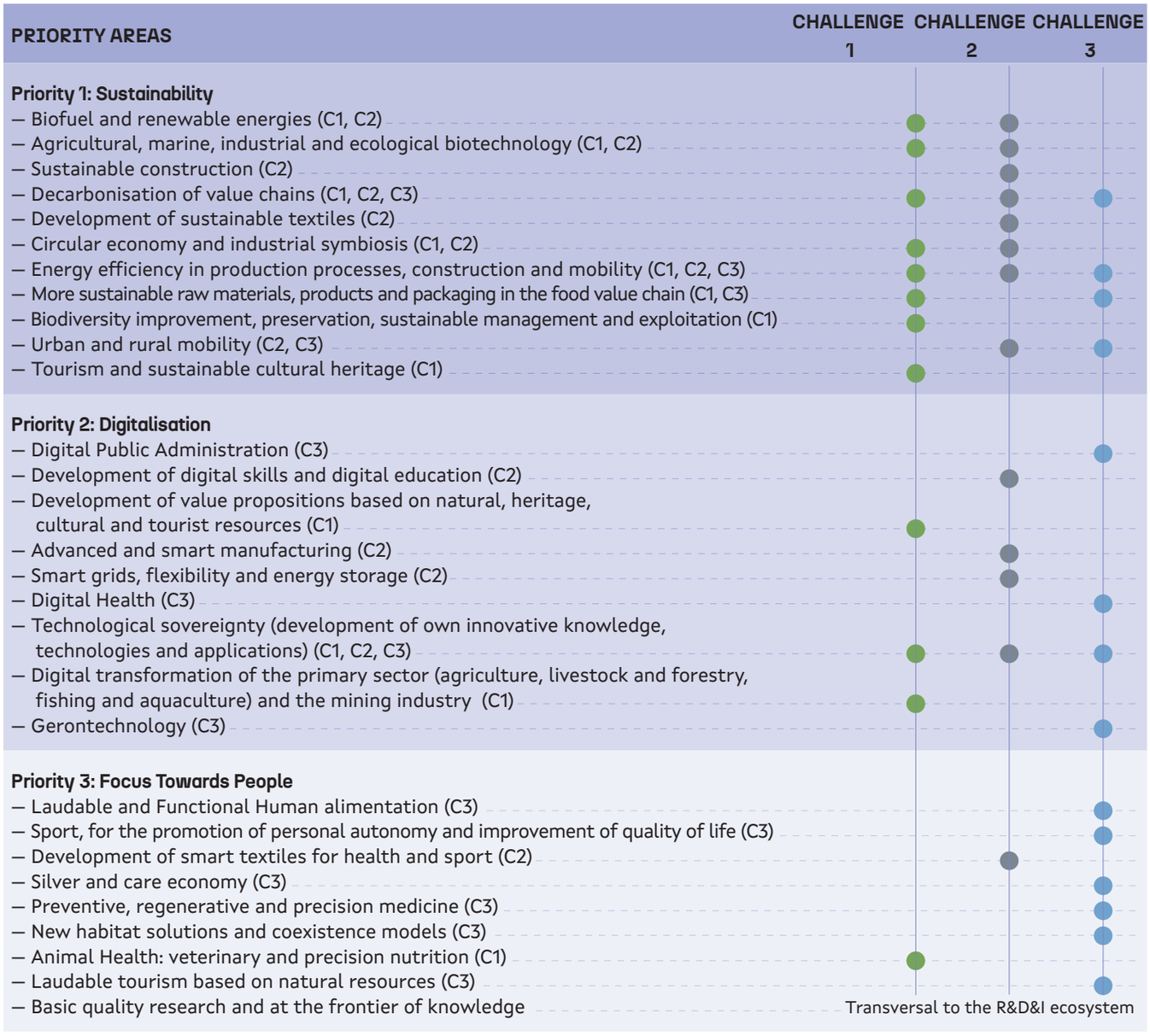
Priority 2: Digital transformation

Support the digital transformation (development and/or incorporation of technologies) to promote the Galician industrial model, the management and provision of quality health and social services, as well as the management of natural and cultural resources, as a basis for Galicia's resilient transformation.

Priority 3: Focus on people

Focus R&D&I efforts on people's needs and well-being, and consolidate Galicia as a world leader in the development and testing of new opportunities and innovative solutions aimed at them.

Figure 28. Priority areas and challenges of RIS3 Galicia 2021-2027



Source: RIS3 Galicia

The Smart Specialisation Strategy of the Northern Portugal Region 2021-2027

Approved on December 30, 2020 by the Regional Council of CCDR NORTE, the Smart Specialisation Strategy of Northern Portugal 2021-27 (S3 NORTE 2027) defines eight priority areas of regional commitment where there is critical mass in the region, identifying the main international demand trends in the medium-term and characterising the respective public policy rational for the programming period 2021-27.

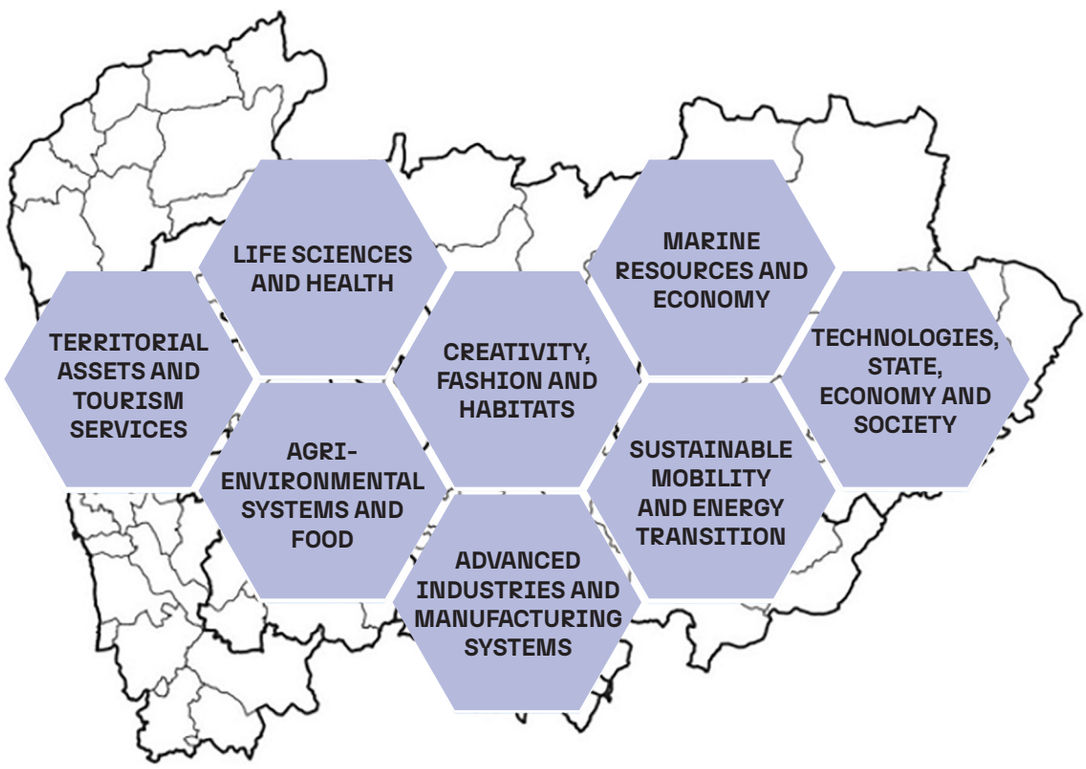
The vision established for S3 NORTE 2027 is

> "Development of Northern Portugal and its international standing by investing in the knowledge and competitiveness of the economy, supporting a new path for strong economic growth, job creation and territorial cohesion"

PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

The implementation of this regional strategy involves three strategic objectives: (i) technological intensification of the productive base; (ii) territorially intensive assets and resources; (iii) improvement of competitive positioning on a global scale. In addition to these strategic objectives, there are three transversal objectives: increasing the qualifications of all segments of the population; vertical and horizontal equity in access to quality public goods and services; and the effectiveness and efficiency of the regional governance model.

Figure 29. Priority areas of the Northern Portugal smart specialisation strategy for 2021-27



Source: S3 NORTE 2027

Creativity, Fashion and Habitats
Explore the potential of creative industries (design, architecture, informatics, etc.), new materials and innovative technologies to create new competitive advantages in sectors with a strong component of symbolic capital (culture and creativity), namely fashion (textiles and clothing, footwear, jewellery, etc.), habitat (furniture, home textiles, construction materials and solutions, built heritage, etc.) and other symbolically related activities, in the context of the global adaptation of supply chains, as well as increasing digitalisation, environmental and social responsibility and energy transition.

Industrialisation and advanced manufacturing systems
Development of lines linked to enabling technologies (namely materials engineering, nanotechnologies, biotechnology and biotransformation, artificial intelligence, nano- and microelectronics, photonics, mechatronics, systems engineering, etc.), combining the existence of scientific and technological capacities and infrastructures, consolidated business bases (mechanical and equipment engineering, industrial engineering and consultancy, industrial informatics, etc.) and relevant user sectors (manufacturing, extractive industries, construction, water, energy, primary sector, etc.), in the context of digital and energy-environmental transformation processes and new production, management, business and work models.

Agri-environmental systems and food
Linking the region's agricultural potential, particularly in high value-added products (wine, olive oil, chestnuts, Protected Designations of Origin (PDOs) and Protected Geographical Indications (PGIs), etc.), with scientific and technological skills (oenology, engineering, biology, biotechnology, ICT, robotics, etc.) and business skills (food industries, agriculture and animal production, forestry, forest-based industries, etc.), capable of promoting an agri-food and forestry sector with greater added value in a way that is compatible with the preservation and management of resources such as water, forests and ecosystems, and contributes to a greater appreciation of endogenous resources as an opportunity to increase territorial competitiveness.

Sustainable Mobility and Energy Transition
Taking advantage of installed scientific and technological skills (in the areas of production technologies, materials, digital technologies, biotechnology, etc.) to upgrade the automotive components and systems industries (from the production of moulds and tools to the assembly of complex systems) in the context of global value chains, as well as to provide greater added value in other mobility industries and their infrastructures (aeronautics, rail, maritime transport, urban mobility, logistics, energy, space, etc.), ensuring a more competitive and sustainable mobility system in a context of decarbonising the economy, energy transition, digital transformation and new mobility concepts.

Life and Health Sciences
Consolidating the dynamics of articulation between research at regional level (particularly in the fields of tissue engineering and regenerative medicine, cancer, neurosciences, development of surgical techniques, etc.) and companies in the health industries and services in the broadest sense (pharmaceuticals, medical devices, ICT, provision of health services, personal protective equipment, health and wellness tourism, social support and physical activity, cosmetics, etc.), driving the development of new products and services capable of responding to current challenges (ageing populations, chronic diseases, pandemics or digital transformation) and contributing to the sustainability and resilience of the health system.

Territorial Assets and Tourism Services
Exploiting land-intensive resources, namely cultural resources (UNESCO world heritage, networks and routes of classified cultural heritage, intangible heritage, etc.), natural resources (national parks, natural parks, protected landscapes of national and local interest, sites of community interest, special protection areas integrated into the Natura 2000 network, UNESCO world geoparks, etc.), creative resources (relevant and symbolic infrastructures, cultural agendas, events, etc.) and endogenous resources (gastronomy, marketing, arts, authenticity, etc.) and endogenous resources (gastronomy, wines, tradition, etc.), taking advantage of scientific and technological capacities, particularly in the areas of management, marketing, the arts, digital technologies, etc.) and the relevant tourism offer (accommodation, catering, tourist entertainment, etc.), with the aim of boosting tourism services and better integrating tourism into different cultural, modern and traditional contexts, as a way of broadening the territorial framework and promoting regional competitiveness.

Resources and the Marine Economy
Establishing links between applied engineering (civil, mechanical, naval, robotics, biotechnology, energy, IT, materials), marine resources (living marine resources, non-living marine resources and marine and coastal ecosystem services) and economic activities that enhance them (renewable marine energies, coastal, nautical and cruise tourism, naval industry, biotechnology, aquaculture, maritime equipment, infrastructures, etc.), favouring the creation of a set of synergies and job creation activities related to the marine economy, preserving and promoting the use of marine resources.

Technologies, State, Economics and Society
Promoting accumulated competences in science, technology, engineering and mathematics with a view to the digital transformation of the economy and society as a process based on a set of digital technologies (internet of things, next generation wireless networks [5G], cloud computing, data analysis, artificial intelligence, cybersecurity and high performance computing) that ensure the integration of digital technologies in companies, the use of internet services, the promotion of digital competences, the provision of connectivity infrastructures and mobile services and the development of digital public services and open and networked administration.

PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

Identifying priority areas for cross-border cooperation in the context of smart specialisation involves selecting a limited number of strategic areas in which collaboration can generate mutual benefits to promote cooperation and innovation in cross-border areas.

The proposed exercise for identifying the priority areas of RIS3T 2021-2027 is the result of applying a methodology based on three essential premises:

1. Ensure overall strategic alignment with regional specialisation strategies 2021-2027 in Galicia and Northern Portugal, aiming to achieve strategic convergence on points common to the Euroregion;
2. Promote the use of lessons learnt during the implementation of the RIS3 cross-border strategy 2014-2020, in a process of continuity and revision of the 2014-2020 strategic priorities;
3. Involve Euroregion stakeholders in the process of entrepreneurial discovery at the Euroregion level, promoting the active participation of economic, social and institutional agents in (re)definition of priority areas through co-creation exercises within the thematic Focus Groups.

The degree of alignment of each "Northern Portugal Priority Area/Galicia Priority" pair was evaluated, taking several components into account, namely: the respective rationales and descriptions defined in each regional RIS3; the prioritisation scopes by priority and challenge in the case of RIS3 Galicia 2021-2027; and the characterisation of the priority areas of the regional strategy of smart specialisation[2], in the case of Northern Portugal. Thus, the degree of alignment was classified as follows:

No alignment: There is no clear correspondence or synergy between the 'priority areas' of the Northern Portugal Smart Specialisation Strategy 2021-27 and the 'priorities' of the Smart Specialisation Strategy for Galicia 2021-27, or whatever alignment there is minimal. The areas, as defined by their specialisation rationales, do not share common objectives, technologies, sectors or major challenges.

Moderate alignment: There is some correspondence or synergies between the two. However, these are limited or partial, focusing on the partial or secondary aspects of their respective specialisation rational, and there may be differences in specific objectives, technologies used, or application sectors.

2 CCDR NORTE. 2023 North Region Smart Specialisation Strategy 2021-27: Characterisation of the priority areas of the regional smart specialisation. www.ccdr-n.pt/storage/app/media/Publish_WEB.pdf

In addition, the conclusions of the diagnostic exercises and characterisation of the Euroregion's innovation system were naturally taken into account in order to identify sectors or areas of common interest for the regions of Galicia and Northern Portugal, in particular, the trends observed in the thematic specialisation of cooperation dynamics as identified by the analysis of social networks.

So, in a first phase, the analysis of the overall strategic alignment with the Regional Specialisation Strategies of Galicia and Northern Portugal 2021-2027 resulted in the following framework of strategic convergence (Figure 30). This chart makes it possible to identify the areas of alignment between the priorities of the two regional RIS3 for the 2021-2027 period, considering the alignment between the 'Priority areas' of the Northern Portugal Smart Specialisation Strategy 2021-27 (rows) and the 'Priorities' of the Smart Specialisation Strategy of Galicia 2021-27 (columns).

Strong alignment: There is a significant correlation between the 'priority areas' of Northern Portugal and the 'priorities' of Galicia. The areas share several common objectives and present clear synergies in terms of technologies, sectors or challenges addressed. The regional strategies show a high potential for cooperation, although there may still be some differences in rational, priority or specific focus areas.

Very strong alignment: There is a very strong correspondence between the two datasets. The priority areas have the same main objectives, technologies, sectors and challenges. This typology indicates a very high synergy, potential for collaboration and deep strategic integration between the two regions.

In addition, in order to facilitate the reading of the chart, the main areas of alignment between each "priority domain" of Northern Portugal and the "priority" of Galicia were indicated in the respective cells (whenever there is at least moderate alignment), corresponding to those areas that are mentioned in both rationales and the documents that characterise the respective priorities, thus identifying the areas in which alignment between the two regional RIS3s occurs.

PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

Figure 30. Framework of strategic convergence between the priorities of the Galicia and Northern Portugal RIS3s 2021-2027

RIS3 NORTE 2021-2027	RIS3 GALICIA 2021-2027			
	REGIONAL PRIORITIES	**SUSTAINABILITY**	**DIGITAL TRANSFORMATION**	**FOCUS ON PEOPLE**
	Creativity, Fashion and Habitats	— Sustainable construction — Development of sustainable textiles — Circular economy and industrial symbiosis	— Digital transformation and digital market	
	Industrialisation and advanced manufacturing systems	— Circular economy and industrial symbiosis — Decarbonisation of value chains — Energy efficiency in production processes	— Advanced and intelligent production	
	Agro-environmental systems and food	— Decarbonisation of value chains — Circular economy and industrial symbiosis — Biotechnology — Preservation of biodiversity		— Healthy eating
	Sustainable Mobility and Energy Transition	— Biofuel and renewable energy — Decarbonisation — Energy efficiency in mobility	— Smart networks	
	Life Sciences and Health		— Digital health technologies and active ageing	— Preventative, regenerative and precision medicine — Active and healthy ageing
	Territorial Assets and Tourism Services	— Decarbonisation — Tourism and sustainable cultural heritage	— Digital transformation and tourism	— Tourism based on natural resources
	Marine Resources and Economy	— Blue biotechnology		— Turismo baseado nos recursos naturais
	Technologies, State, Economics and Society		— Digital transformation in Public Administration — Digital skills and digital education	

very strong alignment strong alignment moderate alignment

Thus, from this first stage, it can be concluded that the main areas of strategic alignment of the two regional RIS3s focus on the areas of advanced and intelligent production, mobility, tourism, health and agri-food industries. There is also a moderate alignment regarding the main strategic plans for the Sea in the two regional RIS3s.

Table 9. Criteria that underpin the selection of the proposed priority areas

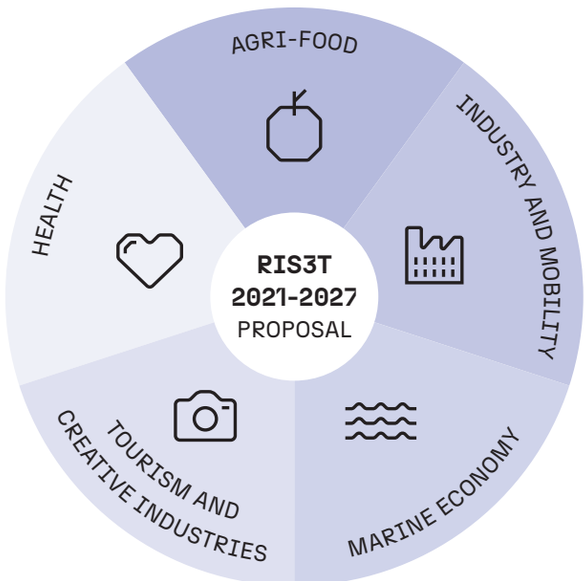
	CRITERION			
PRIORITY AREA	Degree of alignment with regional RIS3	Continuity of RIS3T 2014-20	Evidence of thematic communities of cross-border cooperation (social media analysis)	SWOT insights and preliminary participatory exercises (Entrepreneur Discovery Workshop)
Agri-food	•••	••	•••	•••
Industry and Mobility	•••	•••	•••	•••
Marine Economy	••	••	•••	•••
Health	•••	•••	••	•••
Tourism and Creative Industries	•••	••	•	••

- • Low degree of alignment/continuity/evidence
- •• Medium degree of alignment/continuity/evidence
- ••• High degree of alignment/continuity/evidence

There is also alignment between some of these convergence areas and the main thematic communities identified in the social media analysis, in particular with regard to agri-food and biotechnology, the sea and the areas of advanced production technologies and, in a transversal way, in several sectors, the circular economy.

Bearing in mind the proposed methodology, it should be noted that this was a preliminary and necessarily deficient exercise, as a mere starting point for involving stakeholders in the process of entrepreneurial discovery in thematic Focus groups, which were held in July 2024. Prior to the extended stakeholder consultation process, the review of the progress report by the Study Monitoring Group presented some considerations on the thematic areas that were incorporated in this report.

Figure 31. Priority Areas RIS3T 2021-2027 (Preliminary Proposal)



PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

STAKEHOLDER CONSULTATION PROCESS

The consultation process with the interested parties took place at the Agricultural School of Ponte de Lima, on July 3, 2024. The event established two moments of critical importance for the development of the planned methodology: (i) the presentation of the preliminary results of the 1st workshop and the preliminary areas of collaboration; (ii) the establishment of thematic working groups for the co-definition of priority areas and cross-border cooperation actions. The first part allowed those who did not participate in the first workshop to get up to speed and to present the latest developments of the study seeking to establish a basis for informed discussion. In the second part, the 113 participants were distributed into 8 working groups in accordance with the 5 thematic areas marked on the registration form, which coincide with those identified in the previous exercise:

— **Agri-food (2 groups)**

— **Industry and mobility (2 groups)**

— **Marine economy (1 group)**

— **Health (2 groups)**

— **Tourism and creative industries (1 group)**

The agenda of the working groups was divided into two parts. The first was devoted to the co-creation of the thematic areas initially identified in the content analysis, particularly in the identification of challenges and obstacles, the design of the scope of the rationale for specialisation and the deliberation on the designation of the thematic area of collaboration. The second, cumulative to the work already done, sought to design a roadmap for the co-created collaboration area, taking into account actions, funding instruments and monitoring metrics, underpinning Stages 6 and 8 in a bottom-up logic.

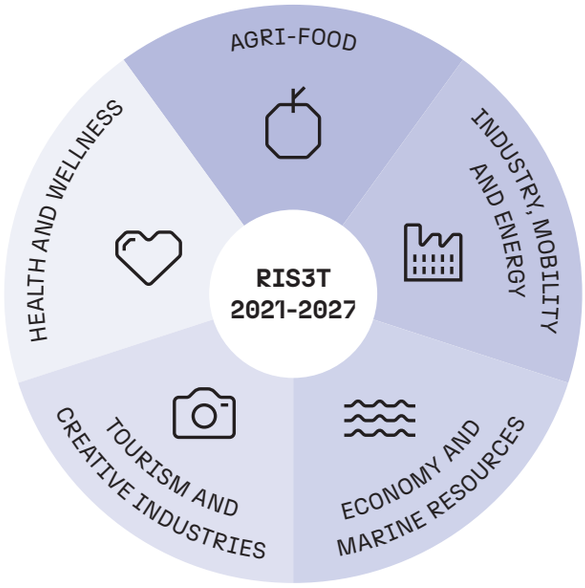
In summary, the participants submitted 431 responses in the fields of their *canvas*, 3 of which had illegible handwriting on the *post-its*. In addition, the discussion presented three alternative proposals for the following thematic areas, which were incorporated in this report:

— **"Marine Economy" for "Marine Resources and Economy"**
— **"Industry and Mobility" for "Industry, Mobility and Energy"**
— **"Health" for "Health and Wellness"**

In addition, 69 participants at the event were asked individually and anonymously to give their views on the thematic areas by means of a questionnaire. The results show that the majority of respondents consider all proposed areas relevant (Figure C-IV).

Thus, based on the previous exercises, the following priority areas for RIS3T 2021-2027 are proposed in the following pages, based on content analysis and stakeholder consultation. For each priority area identified, the respective rationale for specialisation is also proposed, in order to better describe the strategic focus resulting from the previous convergence analysis, the diagnostic exercises and the characterisation of the thematic cooperation networks in the Euroregion, as well as the insights shared by the stakeholders in the Entrepreneurial Discovery Workshop on the main challenges and opportunities.

Figure 32. Priority areas RIS3T 2021-2027



AREA OF COLLABORATION: AGRI-FOOD

Rationale for Specialisation

Development of sustainable management solutions for natural resources (e.g.: water) and development of sustainable and digital technology solutions for agriculture and food production, focusing on regional cooperation aiming at excellence in production and sustainability, facing the challenges of climate change and resource scarcity, while promoting sustainable and digital transformation of agricultural practices. Encourage cooperation between SMEs and the formation of efficient networks to maximise existing initiatives, with an emphasis on attracting and retaining young talent to revitalise the agri-food sector.

Challenges

- Adaptation to climate change to ensure the sustainability of the agri-food sector.
- Water scarcity and the need for efficient reuse and utilisation strategies.
- Integration and cooperation of SMEs and self-employed producers to strengthen competitiveness.
- Promoting healthy and sustainable food, reducing waste and improving health and well-being.
- Rural ageing and lack of skilled labour, along with the low attractiveness of the sector for young people.
- Efficient management of agricultural and agro-industrial waste, in addition to the need to optimise communication between stakeholders.

Opportunities

- Optimisation of production and forecasting processes through the development of digital transformation technologies such as artificial intelligence.
- Simplified support for new farmers and efficient water use practices.
- Technological training and skill-building for young producers, encouraging innovation and the adoption of advanced technologies.
- Potential application of biotechnology in the development of biomaterials, sustainable bio-consumption processes and biofuels.
- Creation of innovative products with high added value, promoting associativism and cooperation between entities.
- Attraction and retention of specialised talent, driving the development of new technologies and agricultural practices.
- Investment in precision technologies, sensors and drones for monitoring and improving agricultural quality.
- Promote projects in the circular economy, encouraging the reuse of by-products and economic and environmental sustainability.
- Linking the agri-food sector with tourism, in particular to expand the territorial competitiveness base in sparsely populated territories.

PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

AREA OF COLLABORATION: INDUSTRY, MOBILITY AND ENERGY

Rationale for Specialisation

Development of sustainable and decarbonised industrial value chains, supported by advanced technologies (e.g. nanotechnologies and artificial intelligence), embracing the green and digital transition as a central element in the transformation of industrial processes. Increase international competitiveness by ensuring responsible and sustainable industrial production. Promote productivity and innovation to combat depopulation and ageing, contributing significantly to GDP and creating qualified jobs. Accordingly, the Euroregion seeks to attract and retain talent, promote technological and productive sovereignty, and establish advanced technological infrastructures and a sustainable mobility network, positioning itself as a brand of excellence.

Challenges

- Increase the effectiveness of production processes in a sustainable way and ensure the digital transition of value chains.
- Deepen knowledge sharing between Northern Portugal and Galicia and create effective partnerships between the various players.
- Overcome the low intensity of digital transformation and innovation in critical sectors and increase the number of startups.
- Empower qualified human resources and address the skilled labour shortages.
- Improve mobility infrastructures, especially rail, and develop sustainable logistics alternatives.
- Address external competition, ensure environmental and social sustainability, and adapt to new environmental and electrification regulations.

Opportunities

- Application of sustainability techniques (LCA, LCC, sLCA) to qualify the impact of production processes and promote the circular economy.
- Strengthening EU industrial autonomy, development of well-established clusters and industrial complementarity in the Euroregion.
- Increase the availability of highly qualified human resources and ensure adequate funding for innovation and infrastructure projects.
- Use of natural resources for the production of renewable energy and promotion of electrification of industry.
- Development of cross-border intermodality and multimodality support systems through the implementation of a large multilevel cross-border mobility infrastructure (coordination between different levels of government), multipolar (several interconnected transport centres) and flexible (multipurpose, intermodal and multimodal) to connect cross-border territories and facilitate the movement of people and goods more quickly, efficiently and sustainably.
- Focus on decarbonisation and environmental sustainability through the development of dual-use technologies and products and strong industrial policies.
- Attraction and retention of talent in Science and Technology, and promotion of knowledge and innovation sharing in the Euroregion.
- Providing greater added value in other mobility industries and their infrastructure (aeronautics, railway, transport, maritime, urban mobility, logistics, energy and space).

AREA OF COLLABORATION: MARINE RESOURCES AND ECONOMY

Rationale for Specialisation

Promotion of knowledge and sustainable exploitation of marine resources, integrating blue biotechnology and other applied engineering, with the aim of preserving marine ecosystems and promoting an innovative and sustainable marine economy. The approach includes (bio)remediation of polluted areas, development of sustainable aquaculture and use of offshore renewable energies. The aim is to maximise the value of fishing by-products and marine biotechnology, promoting a circular economy and strengthening digital transformation and offshore technology. Focusing on human resource training and collaboration between academia and industry, it is intended to create an ecosystem that values marine biodiversity and optimises the use of available resources.

Challenges

- Leverage the innovative capacity of the region and link-up the different actors to capitalise on the opportunities of the marine economy.
- Overcoming the lack of qualified human resources and increasing the Euroregion's wealth through sustainable strategies.
- Implement good practices in the exploration of marine resources and the offshore industry.
- Manage industry by-products correctly and create new business lines, reducing costs and technological dependence.
- Digital transformation of maritime industries and development of technological infrastructures for pilot and industrial scale projects.
- Transfer of knowledge from academia to industry and optimisation of marine and land resources.

Opportunities

- Investment in blue biotechnology and capitalising on human resources and regional talent.
- Use of industry waste to create high added value products and new products from the Euroregion.
- Potential for biotechnological exploitation of marine resources to respond to global challenges and promote innovation in aquaculture.
- Development of renewable energies and promotion of synergies between sectors to optimise resource exploration.
- Development of advanced materials, digital technologies and clean technologies aimed at the shipping and transport industry.
- Application of digital technologies for ocean monitoring.
- Strengthening existing infrastructure networks and promoting collaboration between academia and industry.
- Exploration of large and high-diversity marine areas, taking advantage of the vast expanse of the Atlantic coast for access to new markets.

PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

AREA OF COLLABORATION: HEALTH AND WELLNESS

Rationale for Specialisation

Promotion of research and development in the area of health, as well as cooperation between academia and industry to create innovative solutions that improve the well-being of people and respond to challenges such as population ageing and prevention of chronic diseases. Focusing on the development of digital technologies for health, as well as preventative, regenerative and precision medicine, the region intends to create a robust ecosystem in the health sector. The use of artificial intelligence and other advanced technologies is central to transforming healthcare and ensuring an integral and personalised approach to the patient, promoting equal access and quality of services in all regions.

Challenges

- Improve access to geospatial health data and ensure prevention and care in all regions.
- Combat the centralisation of health services in large cities by promoting equal access.
- Address population ageing and the lack of social support for the elderly.
- Promote the integration of mental health with traditional medicine for a holistic approach to the patient.
- Reduce bureaucracy in clinical trials and encourage the participation of clinicians in innovative processes.
- Avoid the *brain drain* and ensure that health researchers are not forced to leave the Euroregion.
- Aggregate resources and infrastructures to optimise the provision of health services.

Opportunities

- Focus on early monitoring and early diagnosis using advanced technologies such as genomics.
- Integrate artificial intelligence into health technology to improve efficiency and care customisation.
- Expand tele-medicine and tele-assistance to increase the reach and accessibility of health services.
- Act more in the prevention of diseases and raise awareness of the importance of health and wellness.
- Promote integration between public and private institutions to modernise health services.
- Develop continuous training programmes and the mentoring structure for health professionals, integrating IT and R&D knowledge.
- Promote sport as a driver to increase life expectancy through good health and encourage research on the impacts of sport on health.
- Explore the potential of balneotherapy and adopt the *One Health* approach to promote health in a holistic and sustainable way.
- Promote the cooperation of the medical device and pharmaceutical industries, from existing experiences, such as in the vaccine production sector.

AREA OF COLLABORATION: TURISM AND CREATIVE INDUSTRIES

Rationale for Specialisation

Promotion of new tourism products based on the protection and exploitation of cultural and natural resources, and promotion of sustainable tourist practices. Improving the management and promotion of cultural and natural resources through digital technologies and integration of tourism in local communities, improving quality of life and creating economic opportunities. Digital transformation, internationalisation and mobility, supported by common strategies, are crucial to boost the sector and increase regional competitiveness, ensuring a differentiated and sustainable tourism offer.

Challenges

- Overcome the provision of tourism by local authorities that discourages private initiatives and to foster cooperation between stakeholders.
- Improve data aggregation of sub-sectors and develop analytical platforms for decision-making informed by policy-makers and regional actors.
- Retain qualified human resources in low-density territories.
- Diversify the range of tourism offered in the region, which is currently highly focused on religious tourism.
- Improve mobility in the territory with a decarbonised and sustainable transport network.
- Expand the diversity of cooperation programmes beyond INTERREG.
- Decentralise tourism currently concentrated in large urban centres.

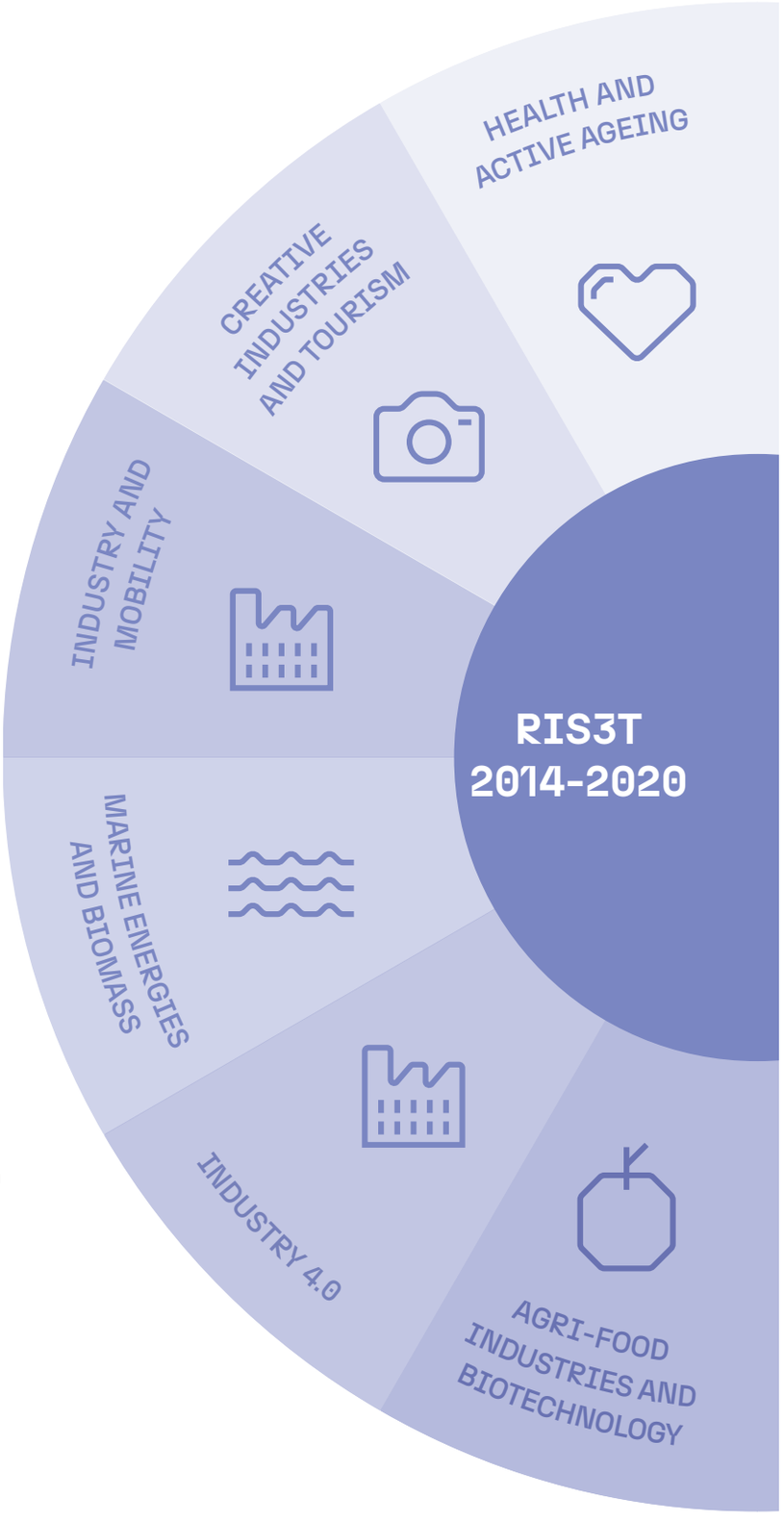
Opportunities

- Adapt tourism courses to the needs of the market and create programmes and tools to empower human resources.
- Strengthen tourism in sparsely populated territories, boosting the sector and encouraging investments.
- Develop differentiated and sustainable tourism package programmes for different target audiences.
- Organise the online tourism offer, using dissemination platforms and promoting actions at the Intermunicipal Communities (CIMs) level.
- To position the Euroregion as a destination for religious, nature, cultural, sports (e.g. golf), gastronomy and wine tourism.
- Implement programmes to support the integration of young graduates in sparsely populated areas.
- Leverage the networks of R&D entities in the region to contribute with innovative knowledge and technology in supporting tourism activities.
- Leverage the political will to implement these strategies effectively.
- Improve the management and promotion of cultural and natural resources through digital technologies to increase efficiency and attractiveness.
- Integrate tourism into local communities, improving quality of life and creating sustainable economic opportunities.

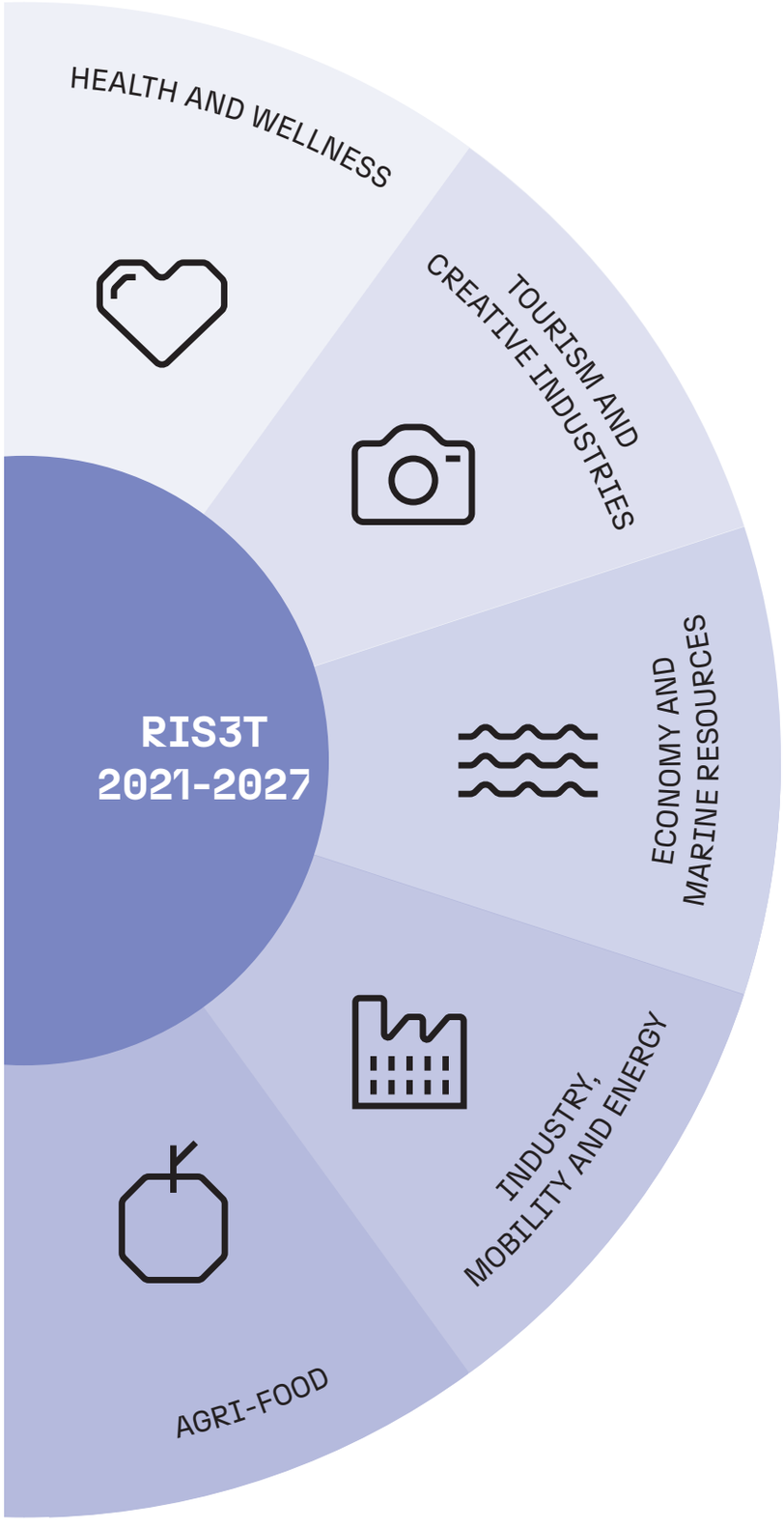
PRIORITY AREAS OF COOPERATION IN THE FIELD OF SMART SPECIALISATION

Figure 33. Alignment between the priority areas of RIS3T 2014-2020 and those proposed for RIS3T 2021-2017

The exercise resulted in the identification of priorities that reflect a natural continuity with the priority areas identified for the RIS3T in the period 2014-2020, with an evolution that mainly relates to the updating of the specialisation rationale (Figure 33).



The evolution of the priority areas from the previous RIS3 strategy to their updated version reflects a continuity in strategic ambitions, adjusted to new dynamics and emerging challenges. The transition from 2014-2020 to 2021-2027 demonstrates a reinforcement in the integration of advanced technologies, such as digital transformation and artificial intelligence, in traditionally priority sectors such as industry, mobility, health, agri-food and the marine economy. In addition, an increased focus is observed on sustainability and decarbonisation of value chains, reflecting the growing importance of triple transition issues. The proposed RIS3T incorporates a more holistic and integrated vision, where cross-border cooperation and adaptation to climate change take a leading role, leveraging regional synergies to promote more robust global competitiveness.


HEALTH AND WELLNESS
TOURISM AND CREATIVE INDUSTRIES
ECONOMY AND MARINE RESOURCES
INDUSTRY, MOBILITY AND ENERGY
AGRI-FOOD
RIS3T 2021-2027

IMPLEMENTATION ACTIONS AND INSTRUMENTS

IMPLEMENTATION ACTIONS AND INSTRUMENTS

The co-creation of priority areas by stakeholders, carried out in the previous stage and consolidated from the mapping of challenges, obstacles and opportunities, is later detailed in the co-definition of roadmaps for each of the thematic areas. This process focuses specifically on a preliminary approach to potential implementation actions to be carried out by the working groups during the life of the strategy, as well as mapping the resources that make these initiatives possible.

This proposal does not replace the continuous need to carry out discovery processes in the life cycle of the smart specialisation strategy. Nor does it guarantee granular identification of projects for experimentation, replication and/or scalability through a customised portfolio of instruments. This exercise would necessarily include holding multiple workshops to accompany the implementation of initiatives in each priority area (e.g., ensuring that all stakeholders can come together to create dedicated calls).

This stage includes a preliminary exercise to provide an evidence base – a process of transforming the SWOT and the strategy vision into a programme of actions and possible instruments for each proposed area – that will allow these exercises to launch in a consolidated way, in accordance with the directionality of the present study and other factors under consideration.

The aggregate views of the results in each thematic area reveal recurring patterns, in both actions and instruments. The actions proposed below have been consolidated in order to be transversally applicable to various areas of collaboration, facilitating an integrated and strategic approach. The implementation of these actions should consider the particularities of each sector, making adjusting as necessary to maximise the impact and collective efficiency of the initiatives implemented:

1. **Promotion of network collaboration**
   Organise periodic meetings between key actors and stakeholders to facilitate cooperation, knowledge transfer and development of strategic partnerships. Establish dynamic B2B and B2C events and formalised partnerships that allow cross-border synergies to develop. Promote the broad involvement of stakeholders in the RIS3T's process of monitoring, continuous evaluation and learning by codifying knowledge of the region in recursive feedback. One example of thematic dynamisation put forward by the stakeholders consulted in the Agri-Food sector is the importance that periodic meetings can have for efficiency in the cross-border agricultural and food value chain.

2. **Training and Qualification of Human Resources**
   Develop training and skill-building programmes for the qualification of manpower in strategically defined areas, aiming to strengthen the skills necessary for the transfer of knowledge and support innovation. And in establishing partnerships between higher education institutions, R&D&I centres, R&D&I intermediaries and companies. This activity is illustrated in the Marine Resources and Economy, where participants argued the importance of constructing dual degree doctorates. And in Industry, Mobility and Energy through collaborative talent retention programmes among training centres and clusters/companies, with specific instruments for joint Galicia - Northern Portugal projects and European projects with cascading funds.

3. **Support for Innovation and Technological Modernisation**
   Implement initiatives that encourage the adoption of advanced technologies and sustainable production practices that directionally respond to societal challenges identified in the Euroregion. In Health and Wellness, this support could address the creation of an open platform with epidemiological data.

4. **Infrastructure Development**
   Invest in infrastructures that support R&D&I and the diffusion of innovation, such as intermediate bodies, technology transfer centres, *living labs*, and digital hubs. In the area of collaboration related to Tourism and Creative Industries, the importance of developing an infrastructure to study the return of tourism activity is established. In parallel, for Health and Wellness, the search is for infrastructures that enable solutions in updating the computer systems and the data transfer and diagnostics network.

5. **Promotion of Collective Efficiency**
   Establish programmes to accelerate and support innovative projects that have the potential to create synergies between different thematic areas, facilitating access to funding and resources. In this context, the importance of the diagnosis and mapping of assets in the Euroregion is highlighted, with importance reinforced by the collaborative areas of agri-food; Industry, Mobility and Energy; Health and Wellness; and Tourism and Creative Industries.

6. **Optimisation of Administrative Processes**
   Reduce bureaucracy associated with access to financing instruments, facilitating an innovation- favourable environment, by articulating the scheduling of calls, creating joint calls and sharing good administrative practices.

To sum up, the first clear evidence is the participants' appreciation of instruments that go beyond the funding dimension. The transversal emphasis of all the groups on boosting spaces to promote collaboration between the ecosystem, B2B events, developing and modernising infrastructures, improving literacy, empowering actors to leverage competitive applications and qualifying human resources in the thematic area, highlights the importance attributed to soft instruments. This is also demonstrated in regulatory instruments, which aim to create a favourable environment for sustainable and innovative development. In addition, the funding instruments available to support these actions have been identified, namely: Horizon Europe, POCTEP, INTERREG, Eureka, IACOBUS and Vanguard Initiative. To these we add the relevance of SO 1.4. when dedicated to activities related to the development of the ecosystem's capacity.

All thematic areas value the close collaboration of the Euroregion in the creation of calls, applications and joint instruments with the participation of stakeholders as a decisive factor for the success of mapped activities. The co-creation and active involvement of all stakeholders ensures that the developed instruments are truly aligned with regional needs and priorities. This participatory approach promotes a sense of co-ownership and commitment among stakeholders, strengthening collaboration networks and facilitating the implementation and scalability of initiatives. The significant weight that stakeholders are afforded in this process is, therefore, a central element for building a robust and sustainable smart specialisation strategy that really responds to the challenges and opportunities identified, fully aligned with the consolidated literature and reinforced by the emerging literature (Gianelle et al., 2016; Reid et al., 2023; Foray, 2023). In this context, the Interregional Innovation Investments (I3) Instrument can enable the fulfilment of this stakeholder engagement.

IMPLEMENTATION ACTIONS AND INSTRUMENTS

Table 10. Action feasibility grid by financing instrument

ACTIONS	INSTRUMENTS			
	POCTEP	INTERREG	HORIZON EUROPE	OTHER FUNDS & STATE AID
Promotion of Online Collaboration	•••	•••	•••	•••
Training and Qualifications of Human Resources	•	••	•••	•
Support for Innovation and Technological Modernisation	•••	•	•••	•••
Infrastructure Development	•••	•	•••	•
Promotion of Collective Efficiency	••	•••	•••	•
Optimisation of Administrative Processes	•••	•••	•	•

• Low degree of feasibility
•• Medium degree of feasibility
••• High degree of feasibility

Finally, there is the emerging literature on the importance of S3 in the expansion of synergies between different instruments, with the aim of making funding more effective and complying with good governance. Synergies between funds such as ERDF, Horizon Europe, Next Generation and national, regional and local funds have the opportunity to be capitalised on by S3 thematic platforms established for capacity building and evidence-based decision-making. In this sense, its alignment with S3 objectives can facilitate a more effective use of synergies among instruments (Tsipouri, 2023; Jokalainen & Guerrero, 2023). However, this is only possible with strategic thinking and the establishment of concertation and common direction among all actors. Furthermore, stakeholders need to be empowered for different ways of combining instruments. On this last point, the Capacity Building Strand 2b of the Interregional Innovation Investments (I3) Instruments of particular importance.

Table 11. Action Alignment Grid by Criteria relative to the enabling condition

ENABLING CONDITION	↓ ACTIONS	DIFFUSION OF INNOVATION	GOVERNANCE	M&A SYSTEMS	ENTREPRENEURIAL DISCOVERY PROCESS	STRENGTHENING INNOVATION SYSTEMS	INDUSTRIAL TRANSITIONS	INTERNATIONAL COLLABORATION
Promotion of Online Collaboration		•••	•••	•••	•••	••	•	•••
Training and Qualifications of Human Resources		•	••	•	•	•••	••	•••
Support for Innovation and Technological Modernisation		•••	•	•	•••	•••	•••	•••
Infrastructure Development		•••	•	•	•	•••	•••	•••
Promotion of Collective Efficiency		••	•••	•••	•••	••	•	•••
Optimisation of Administrative Processes		•	•••	•••	•••	••	•	•••

• Moderate alignment
•• Strong alignment
••• Very strong alignment

GOVERNANCE MODEL

GOVERNANCE MODEL

It is essential to ensure good governance in any strategic planning approach to smart specialisation. Therefore, those initiatives that ensure their efficient operation should be promptly consolidated, in a model of recursive feedback on their governance structures. At this stage, the governance model of the cross-border RIS3T will be revised in comparison with the model in force in the period 2014-2020. So, semi-directive interviews were conducted with those responsible for monitoring the strategy and extended responses were collected from interested parties in the form of a questionnaire survey. Processing this information allows us to understand the challenges, opportunities and priorities identified by the different levels of governance in implementing the strategy, enabling a comparative analysis with examples of other government models that effectively capitalise on and mitigate the considerations raised by stakeholders. This process will culminate in the creation of a proposal for a governance model for RIS3T 2021-2027.

The RIS3T 2014-2020 governance process was structured in three main levels. The Steering Committee, composed of political representatives from CCDR NORTE and the Xunta de Galica (through GAIN), is responsible for strategic coordination. At the technical level, the Management Team is made up of personnel designated by GAIN and CCDR NORTE, ensuring the execution of the activities. The working groups, coordinated by the Management Team, bring together the main stakeholders in the Regional Innovation Systems to integrate tacit knowledge and promote R&D&I throughout the value chain. To ensure broad participation and continuous involvement, the RIS3T Forums were set up, allowing the dissemination of the Strategy and facilitation of networking among Euroregion agents[3].

In order to understand which mechanisms the stakeholders consider essential for good cross-border governance, 69 of the 113 participants at the 2nd Workshop were surveyed. Processing this data shows that these results underline the need for a coordinated and integrated inter-institutional approach transcending geographical boundaries, without unnecessary duplication of borders, in order to ensure the effective and sustainable implementation of cross-border governance strategies.

The sorting of the results based on the weighted averages of the relevance assigned to each mechanism allows the top four considerations to be ranked. The relevance of cross-border, inter-regional, transnational and/or macro-regional "joint strategies" appear as the highest priority (4.55). This result underlines the importance attached to coordination and cooperation by transcending geographical boundaries. The implementation of joint measures involving different ministries/departments/ agencies for defined collaboration areas (4.38) highlights the need for administrative coordination between different public sector institutions tailored to the needs of the Euroregion's ecosystem to achieve common objectives effectively and efficiently. This mechanism is reinforced by the importance given to joint actions/projects in specific priority areas (4.36), reflecting the importance of smart specialisation to stakeholders. And finally, the thematic working groups (4.29) highlight the importance of bringing together stakeholders to support the codification of tacit knowledge, map the ecosystem and develop specific solutions to the challenges identified in conjunction with the instruments.

The open responses collected reinforce the importance of the frequent involvement of the Euroregion's innovation ecosystem beyond the design of the strategy, both in the justification of "*co-creation or consultation actions, (...) in intermediate periods of implementation, to evaluate the defined strategy*" and even the duration of the periods of the work sessions advocating "*more time available, moving to a full day of work*". In addition, 90% of respondents indicated that they were interested in participating in the RIS3T 2021-2027 Working Groups.

3 Ris3t-Galicianortept.eu

As for the results of the interviews, the challenges identified were in line with the responses to the questionnaire survey of interested parties, namely:

1. Political commitment to the activities and allocation of resources to the results of the strategy;
2. Institutional alignment between the two regions;
3. Prevention of duplication of structures, maximising collaborative efficiency among existing bodies;
4. Articulation of instruments in the Euroregion;
5. Autonomy of the working groups' activities.

In view of these challenges, the following international good practices in good governance of RIS3 are describe, which underpin risk mitigation mechanisms, potentially helping to influence the revision of the current governance model:

Kvarken Council

The Kvarken Council[4] is a Nordic cross-border cooperation body composed of representatives of the sub-national governments of Finland and Sweden. Its mission is to promote growth, innovation and international competitiveness in the Kvarken region through cooperation, involving even the smallest municipalities, to ensure inclusive and sustainable development. The Council faces challenges related to accessibility and infrastructure, improving connectivity and attractiveness of the region for investors and tourists. As a key player in one of the largest Nordic energy clusters, it promotes green industrial growth and effective cross-border governance. Based on its extensive network, experience and political support, the Council facilitates and manages cross-border projects, providing strategic support and resources to partners of all sizes. This approach reduces administrative barriers, promotes socio-economic development and ensures that regional projects are implemented efficiently, fostering trust and cross-border cooperation to meet the needs of the region's citizens and businesses. The success of the Council also depends significantly on regional political commitment, and it is crucial to understand the needs of *stakeholders* to build strong relationships across borders, find common ground and promote synergies in order to better serve the citizens and businesses of the region (OECD, 2021).

RIS3CAT 2030

Over the past decade, the EU-wide focus on establishing synergies between European funds has grown, with the aim of ensuring more effective public spending. In the context of Catalonia's Smart Specialisation Strategy (RIS3CAT 2030[5]), these synergies arise through Shared Agendas, which provide a framework for stakeholders to address common challenges in a manner that is aligned with the Sustainable Development Goals. These agendas are supported by a participatory governance model that facilitates the identification and implementation of transformative initiatives. The governance model of RIS3CAT 2030 is coordinated by the Secretariat General for Economy and Finance, which involves several interdepartmental committees and opportunities discovery mechanisms. The aim of this model is to maximise the use of European funds and participation in international networks. It also promotes intersectoral collaboration and the involvement of all social actors, with the aim of developing sustainable and scalable solutions. An example of this is the circular bioeconomy in the Shared Agenda of Lleida, Pyrenees and Aran (Generalitat de Catalunya, 2023).

Baltic Sea Region S3 Directors' Network

A Baltic Sea Region S3 Directors' Network (BSR S3 Directors' Network), includes 10 regions, promoting S3-based collaboration. The project "BSR S3 Ecosystem" (Interreg Baltic Sea Region, 2018-2022), in line with several EUSBSR S3 initiatives, aims to improve investments in the Baltic Sea region by building on previous project experiences and providing tools for the effective use of EU 2021-2027 opportunities (e.g.: tools to map and act on interregional value chains). The platform encouraged inclusion, green transition, and the importance of political leadership to drive inter-regional investments in innovation. The BSR S3 Directors' Network has resulted in direct contributions to the macro-region and significantly to the EU Strategy for the Baltic Sea Region.

4 kvarken.org
5 fonseuropeus.gencat.cat/ca/ris3cat

GOVERNANCE MODEL

Wallonia's S3 2021-2027

The evolution of the Walloon government's model highlights the transition from an incremental approach, based on pre-existing policies (2014-2020), to a more integrated and collaborative model (2021-2027). The new governance focuses on the participation of several actors through continuous entrepreneurial discovery processes, in a process that revisited the entire strategy and defined 5 roadmaps for strategic innovation areas that incorporate 19 strategic innovation initiatives or coherent sets of activities and projects with sufficient critical mass that brings together Wallonia's disparate forces and relevant actors in response to one or more ambitions in the roadmaps.

RIS3 Extremadura Thematic Working Groups:

At the operational level of S3 governance, it is crucial to engage stakeholders to continually redefine the adjusted priorities. In Extremadura, thematic working groups emphasise the importance of motivating these stakeholders to participate, empowering them to co-create actions and policies. One of the main challenges identified was to ensure a close relationship and motivate stakeholder engagement in a sustainable way. The creation of 5 Thematic Working Groups (TWGs) sought to encourage, involve and empower the main regional actors in each area of specialisation, promoting transparency, regular interaction and identification of cooperation opportunities.

We could also supplement the analysis with the multiple Interreg Europe projects that have dealt with innovation governance in territorial terms, namely BRIDGES, COHES3ION, ECORIS3, ERUDITE, IMPROVE, INNOHEIS, MARIE, OSIRIS, RELOS3 and TRACS3. However, these examples show crucial differences due to the unique character of RIS3T Galicia and Northern Portugal. The best practices we describe are therefore limited to displaying specific mitigation mechanisms for one or more of the mapped challenges.

Nevertheless, as argued by Guzzo and Gianelle (2021), territories must find out which governance mechanisms work best in their context, enabling experimentation with new governance structures and processes, instead of blindly adopting ideal models and good practices that are often formally introduced without promoting effective change.

PROPOSAL FOR A RIS3T 2021-2027 GOVERNANCE MODEL

Cross-border collaboration is a challenge throughout the lifecycle. It involves actors operating in different jurisdictions who may have little or no experience of working together. A joint governance body can facilitate the construction of a common understanding of the needs and context concerned and can help lead or coordinate the creation and implementation of a comprehensive vision. Nevertheless, it is in the establishment of bridges, through the provision of platforms for continuous dialogue, that a common institutional language is established, building comparability in approaches and developing international political instruments.

However, it must be borne in mind that cross-border collaboration also has inherent costs. Leveraging projects with European funding enables actors to mitigate the risk of these costs. These are especially important when regional actors are not able to dynamise the ecosystem (e.g., regional clusters).

At the European level, Thematic Smart Specialisation Partnerships have been established since 2015 to create European ecosystems for transnational and interregional collaboration with similar S3 priorities. Additionally, after successful pilot action, the I3 will support similar RIS3s to build pan-European clusters in priority sectors. The trend in strategic planning is towards the establishment of cross-border, transnational and macro-regional cooperation, going beyond the traditional execution of siloed projects.

RIS3T Galicia and Northern Portugal 2014-2020 strengthened the proximity between the two regions in economic, social and environmental challenges. The pilot made it possible to fulfil the objectives of the original strategic document, promoting synergies in value chains, in the efficiency of funding instruments, in the development of coordinated actions to leverage competitive funding for excellence (e.g. H2020) and intensified network relations in the Euroregion. In a short time, RIS3T has become internationally recognised for good practice in multiple sources of literature. Many other regional strategies, especially in cross-border regions, have disregarded this option and the accompanying economies of scale, coordination and transfer of good practices. However, the enabling conditions of the new framework programme establish the promotion of inter-regional cooperation as a basis for the good governance of RIS3 (Woolford et al., 2021).

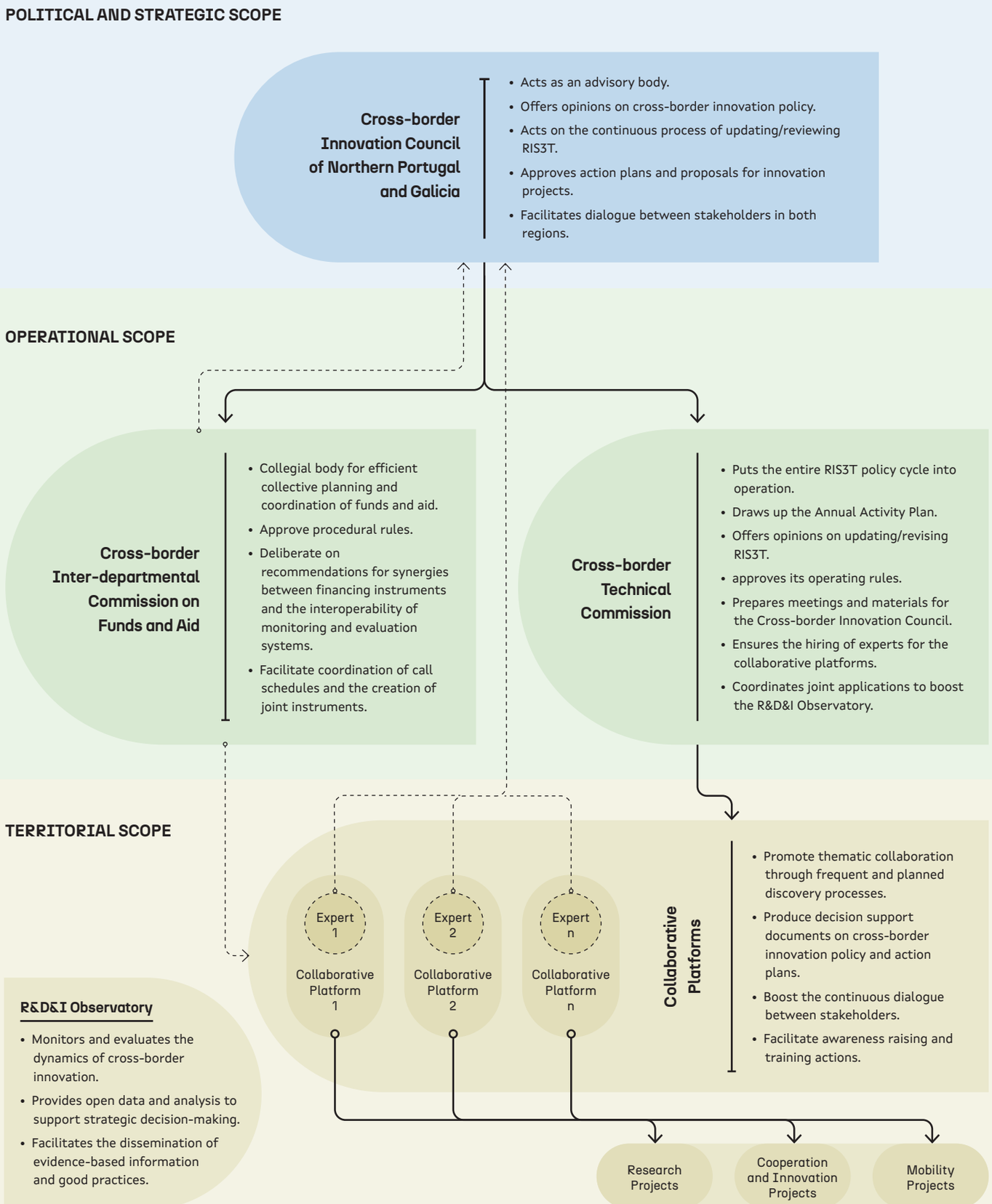
Mariussen et al. (2016) lists 6 steps in the evolution of transnational collaboration:

1. "Shared/mutual information, good practice sharing
2. Experimentation with policy learning and transfer of good practice from other regions
3. Opening the programmes for external partners
4. Alignment of policies in specific areas and joint actions
5. Forming strategic platforms for a continuous pipeline of joint actions and projects
6. Joint strategies (cross-border, inter-regional, transnational, macro-regional)"

However, the RIS3T example shows that these steps do not have the initially assumed linearity. Not all steps were followed sequentially or with sufficient articulation. Nevertheless, in the course of this study and as a result of the collection of information by triangulation, all these elements were argued by those consulted as being important in the future of RIS3T. In order to ensure good governance of RIS3T on these elements by experimentation, the following organisational structure model is proposed for the 2021-2027 period.

GOVERNANCE MODEL

Figure 34. Proposal for an organisational structure for RIS3T Galicia and Northern Portugal 2021-2027



Cross-border Innovation Council of Galicia and Northern Portugal

The establishment of a Cross-border Innovation Council aims to mitigate the risks of a lack of political commitment, ensuring the coordination of innovation policy between geographic areas in the long-term with the broad participation of stakeholders. In short,

"*Innovation (or research and innovation) councils are widespread institutions with plurality in their composition and a certain degree of independence and detachment from the electoral cycle. Innovation councils can provide advice, coordinate, allocate funding, monitor, evaluate and do foresight. Therefore, an innovation council needs political endorsement and support to have a meaningful role; resources to keep the momentum (secretariat), prepare and have the strategic intelligence (data, studies) to provide evidence-based guidance; have a sense of urgency, a common purpose and ambition. Such councils can help align different levels of government for long-term commitments and ensure reflexivity and the resilience of collective efforts towards long-term societal wellbeing*" (Pontikakis, 2024 adaptaed from Serger et al., 2015).

Northern Portugal and Galicia have structures with different morphology, but with similarities in their relationship with RIS3 (the Conselho Regional de Inovação do Norte [Northern Portugal Innovation Council] and the Governing Board of the RIS3 - whose functions are undertaken by the Board of GAIN) that can be appointed to establish this comprehensive advisory structure. The purpose of this structure is to institutionalise the space for dialogue, consolidate the direction, avoid the duplication of structures and ensure the coordination of innovation policies on the basis of the findings of the other structures, in particular the contributions of the Observatory and the direct presence of experts from the Collaborative Platforms, being supported by the Cross-border Technical Commission acting with the powers of the secretariat. In addition, the presidency of the structure can rotate annually between the Portuguese and Spanish territories.

Function

- Advisory body.
- Offer opinions on cross-border innovation policy.
- Deliberate on the ongoing process of updating/ reviewing RIS3T.
- Approve opinions on action plans, proposals for instruments and innovation projects.
- Facilitate continuous dialogue between stakeholders in both regions.

Duties and Competencies

- Approve procedural rules.
- Produce recommendations on cross-border innovation policies.
- Assess and approve the annual activity plan of the Cross-border Technical Commission.
- Assess and deliberate on decision support documents delivered by the R&D&I Observatory and Collaboration Platform Experts.
- Communicate opinions on instrument synergies to the Cross-border Inter-departmental Commission on Funds and Aid, supported by the evidence resulting from the R&D&I Observatory and Collaboration Platform Experts.
- Deliberate on proposals for RIS3T revisions.
- Annual rotation of the presidency between the two territories.

Constituent bodies:

— CCDR NORTE.

— Axencia Galega de Innovación (GAIN).

— GNP-AECT.

— Members appointed by the RIS3 Governing Board.

— Members appointed by the Northern Portugal Innovation Council.

— Collaborative Platform Experts.

— Observer status assigned to representatives of instrument management bodies (public and private), management authorities of national operational programmes for funds and other state aid.

Cross-border Inter-departmental Commission on Funds and Aid

This chapter has already stressed the importance of establishing synergies between instruments to maximise the effectiveness of public spending of funds and state aid. Practical cases exist throughout Europe. In this context, we highlight RIS3CAT 2030. MEanwhile, RIS3 Galicia also has its foundation in a similar body, the Comisión Interdepartamental de I+D+i (Interdepartmental R&D&I Commission). The purpose of the proposed body is to address the insights from the multiple stakeholders consulted, both in strengthening the Euroregion's articulation in the timing of the opening of calls, and in designing tailor-made instruments for the challenges mapped out by the collaboration platforms and the solutions identified in the roadmap. In addition, it can also be a space for establishing interoperability between monitoring and evaluation systems, for example, allowing the R&D&I Observatory to exploit the data economy, allowing platforms to work on more up-to-date and automated diagnoses of the reality of the ecosystem, enabling learning and reflexivity in the demand and supply of tools in the Euroregion. The presidency of this body will rotate annually between the Portuguese and Spanish territory, between CCDR NORTE and GAIN.

Function:

— Approve procedural rules.

— Collegial body for efficient collective planning and coordination of funds and state aid.

— Deliberate on recommendations for synergies between cross-border financing instruments on opinions.

— Deliberate on recommendations for the interoperability of monitoring and evaluation systems in the Euroregion through evidence to support decision-making.

— Deliberate on the recommendations to facilitate coordination of call schedules and the creation of joint instruments through evidence to support decision-making.

Duties and Competencies:

— The Cross-border Technical Commission acts as the secreteriat of the Inter-departmental Cross-Border Commission on Funds and Aid, and the Presidency is assumed by the entity that is chairing the "Cross-border Innovation Council of Galicia and Northern Portugal".

— Assess the opinions of the Cross-Border Innovation Council of Galicia and Northern Portugal for the design and implementation of integrated financing policies and/or synergies between multiple instruments in view of the needs discovered.

— Promote interoperability of monitoring and information systems.

Constituent bodies:

— Representatives of instrument management bodies (public and private), management authorities of national operational programmes for funds and other state aid.

— CCDR NORTE and GAIN.

Cross-border Technical Commission

The Cross-border Technical Commission is modelled on the original Management Team. The proposal maintains same composition. However, its importance beyond the secretariat of the Cross-Border Innovation Council is emphasised. Like so many other operational executive units, this body is crucial for the start-up and operationalisation of the entire RIS3. Leveraging competitive finance was crucial for boosting the strategy in the previous framework programme. These templates should be continued. The duties of the Cross-Border Technical Commission should include preparing meetings for the CIC, ensuring the hiring/appointment of experts to boost collaborative platforms (e.g., capitalising on SO 1.4.) And ensure joint applications for programmes relevant to capacity-building the Euroregion's ecosystem. This last point particularly reflects participation in initiatives that enable the activation of their governance structures in awareness, training and networking activities. As well as projects aimed at consolidating the Euroregional monitoring and evaluation system, integrating key local actors into the consortia (e.g. universities and polytechnics to build specific indicators for the collaborative platforms defined in RIS3T 2021-2027). In short, this balance of duties and competencies allows the Cross-border Technical Commission to maximise the collective efficiency of meetings and gatherings provided for in the government model through forums that communicate and disseminate the good governance of RIS3T 2021-2027 internationally.

Function:

— Joint technical unit responsible for the operationalising the entire policy cycle of RIS3T.

— Prepare the Annual Activity Plan.

— Offer opinions on the ongoing RIS3T update/review process.

— Approve procedural rules.

— Operationalise RIS3T through the execution of specific projects.

— Prepare meetings and materials for the Cross-border Innovation Council.

— Ensure the hiring and appointment of experts to boost collaborative platforms.

— Coordinate joint applications to boost the R&D&I Observatory.

GOVERNANCE MODEL

Duties and Competencies:

— Project management and fundraising for the sustainability of RIS3T.

— Ensure the good operationalising of the organisational structure.

— Ensure effective coordination and communication between different bodies and stakeholders.

Constituent bodies:

— Technical personnel designated by GAIN.

— Technical personnel designated by CCDR NORTE.

R&D&I Observatory

The R&D&I Observatory's mission is *"(...) to create an information system for the analysis, comparison and monitoring of the dynamics of cross-border innovation. As a result, the goal is to increase the capacity to raise resources and achieve greater efficiency in the use of European funds."* Although it was not formally included as a body in the previous governance model, the Observatory stood out as a reference point for finding information on the Euroregion's Innovation System. Its contribution to monitoring is noteworthy, which is why it is now proposed to include it in the organisational structure for this purpose and for its value in boosting the territory through stakeholder involvement. As mentioned above, the Observatory's activities are initiated by the Cross-Border Technical Commission in the form of competitive funding, consortium involvement with local actors and project (co-)management. Reversing the logic of the instruments available to solve problems in terms of capacity building, foresight and monitoring must be a priority. At the same time, the work of the experts to boost collaborative platforms must also be ensured in this framework, ensuring their independence, even if their administrative reporting structure is the Cross-Border Technical Commission. The execution and results of this work must be ensured through transparent publication on an open platform built for this purpose, prioritising automation and up-to-date results whenever possible, namely in mapping, monitoring, disseminating activities to boost the ecosystem and adding value to the data economy.

Function:

— Observatory for monitoring and evaluating the dynamics of cross-border innovation.

— Provide open data and analytics to support strategic decision-making.

— Facilitate the dissemination of evidence-based information and good practices.

Duties and Competencies:

— Provide a platform that systematises the information to compile relevant activities and results arising from RIS3T in a clear and accessible way.

Constituent bodies:

— Operational management of the Cross-border Technical Commission.

— Collaborative Platform Experts.

Collaborative Platforms

Collaborative platforms assume the role of smart specialisation meta-platforms, i.e. systematic and creative meetings between stakeholders. While the Thematic Platforms operate within each RIS3, the Collaborative Platforms cover all those that exist in common as designated areas of collaboration. The Collaborative Platforms are made up of elements from each thematic platform in Galicia or Northern Portugal, not implying the exclusion of other participants, but promoting quintuple helix involvement. The results of boosting the discovery processes on the collaborative platforms can have a multiplicity of objectives:

1. Assuming the original ethos of the RIS3 (cf. Figure 35).
2. Looking for the experimental development of an approach to cross-border Smart Specialisation Strategies for sustainability (S4), Mission-oriented policies (Mazzucato, 2018) , challenge-led policies (Kuhlmann & RIP, 2018) and/or transformative innovation policies (Schot & Steinmueller, 2018).
3. Developing challenges common to all the collaborative platforms —by organising forums at the intersection of all of them— to develop issues related to the good governance of RIS3T, namely the dissemination of innovation, international cooperation, industrial transition and the strengthening of innovation systems.

Irrespective of the choice —between the first and the second option— working on challenges and issues of common interest, designing collaborative projects and identifying solutions relevant to the specialisation theme are the main objectives of the collaborative platforms. These meetings provide a forum for stakeholders to engage in dialogue on the topics covered and to exchange knowledge, ideas, good practices and experiences, including the development of thematic brokerage sessions and specific initiatives that could be candidates for funding from national and regional operational programmes.

Expert support in facilitating collaborative platforms can have a multiplier effect on discovery processes (entrepreneurial or open). Experts can assume the role of a hired consultant/academic, or this role can be assumed institutionally by a *Champion* organisation, with the power to leverage the collaborative area (e.g., organisations present in the established intermediary rankings).

The discovery processes must be undertaken frequently and result in a tangible codification of tacit knowledge of the sessions, which means that the sequential planning of the participating sessions deserves reflection by an actor with assigned skills. The codification of this information should be triangulated with other information related to the monitoring and evaluation of the Euroregion (e.g. by the R&D&I Observatory). And finally, consolidate evidence-based roadmaps —including planned actions, detailed projects and the necessary policy mix— that demonstrate short-, medium- and long-term trajectories to mitigate challenges or increase the economic, social and/or environmental performance of the collaborative areas. These types of co-created documents should be deliverables to be reported to the Cross-Border Innovation Council and the Cross-Border Interdepartmental Commission on Funds and Aid, with specific times scheduled for their discussion both at a political and strategic level, as well as at an operational level.

GOVERNANCE MODEL

Function:

— Thematic collaboration meta-platforms.

— Produce documents supporting decision-making on cross-border innovation policy.

— Produce decision-support documents on the ongoing RIS3T update/review process.

— Produce decision-support documents with recommendations for interoperability of monitoring and evaluation systems in the Euroregion.

— Produce action plans, instrument proposals and innovation projects for each collaboration platform.

— Promote continuous dialogue between stakeholders in both regions through frequent and planned discovery processes.

— Promote the exchange of knowledge, ideas, best practices.

— Facilitate awareness and training actions for instruments.

— Activate thematic brokerage sessions.

Duties and Competencies:

— Promotion of entrepreneurial/open discovery processes.

— Production of decision-support documents based on the boosting of thematic platforms and open data of the R&D&I Observatory.

Constituent bodies:

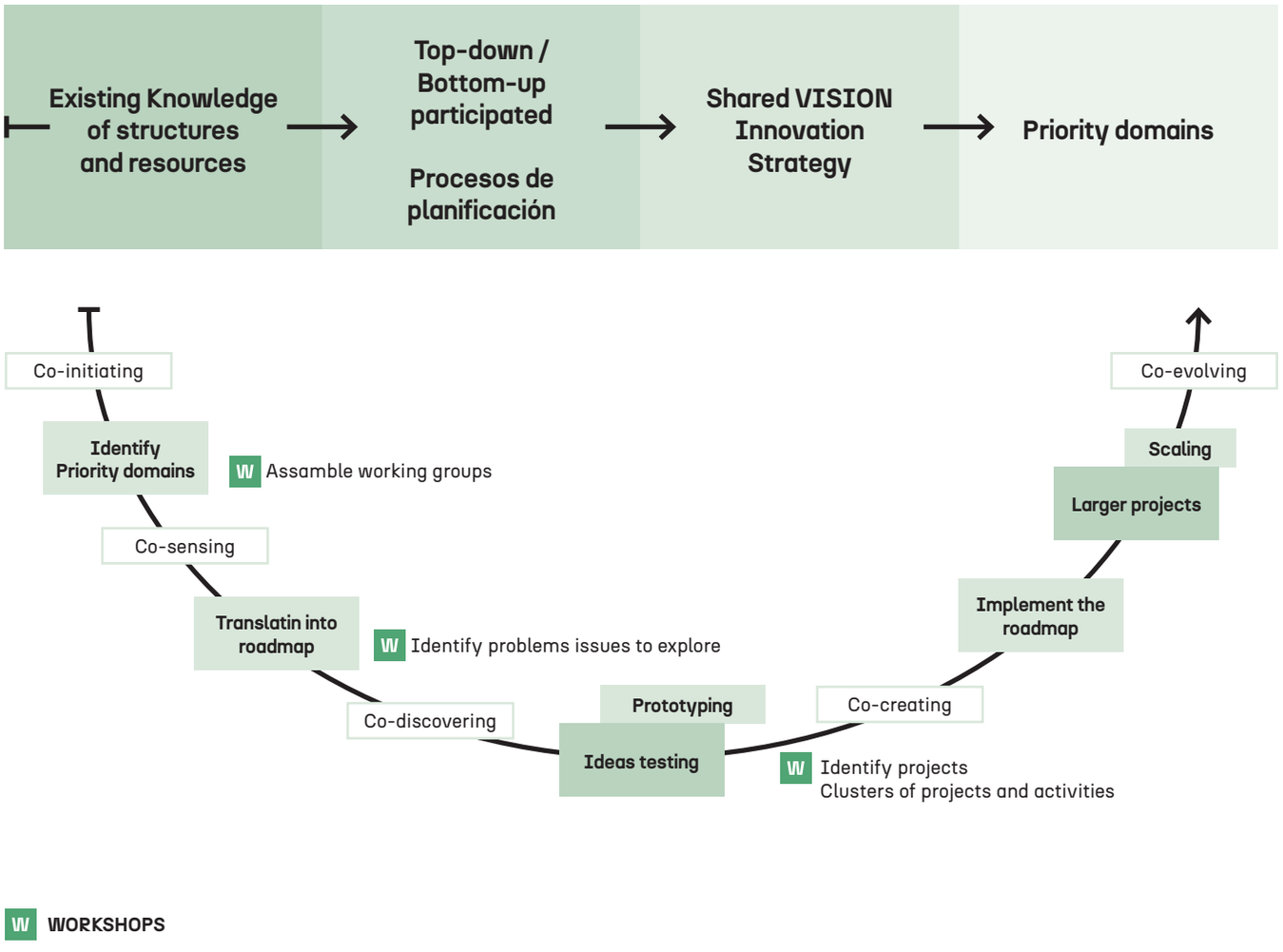
— Stakeholders from the thematic platforms of Galicia and Northern Portugal.

— Collaborative Platform Experts.

This proposal for an organisational structure sought to build a bridge between the theory in the literature, the evidence gathered and the pragmatism needed in Portuguese institutional culture. However, there are still unanswered challenges, which reinforce these final considerations with work to be developed in the implementation of the next governance model.

Firstly, it is crucial to guarantee sustained and flexible regional commitment, involving the right actors (*Champions* and *Hidden Champions*) at different stages and allowing for adaptable commitment. Secondly, defining a specific —but sufficiently broad— scope for cooperation (even starting with a *Coalition of the Willing*) is essential to maintain regional interest and identify synergies. Thirdly, securing various sources of funding at an early stage, in addition to exclusive EU funding (e.g. joint calls with public and private contributions). Finally, it is essential to improve the regions' learning curve and cooperation experience through knowledge transfer (e.g.: good practice). Instruments such as Era-Nets and Interreg are valuable resources to multiply the added value of the regions, creating mutual trust, developing skills (learning by doing), with changing practices due to learning and reflexivity of tacit codified knowledge.

Figure 35. Strategic, balanced and participation diagram of the S3



Source: Bianchi et al., 2024.

MONITORING AND EVALUATION SYSTEM

MONITORING AND EVALUATION SYSTEM

Monitoring systems can serve as an early warning for changes that go against our expectations, allowing us to counter these trends by implementing measures (Gianelle and Kleibrink, 2015).

Monitoring is a direct principle of guaranteeing the effectiveness of implementation, being subordinated to answering whether the strategy is achieving the defined objectives, whether it is still adequate, making it possible to avoid duplication of instruments, as well as identifying opportunities for strategic alignment and promoting coherence between the policies implemented. In summary, "*Monitoring policies and policy strategies refers to an organised set of activities encompassing the iterative collection and elaboration of information on assessing the evolution and direction of socio-economic phenomena and the delivery of policy measures*" (Gianelle et al., 2016).

The S3 monitoring systems enable rapid strategy-based interventions, allowing timely and effective adjustments from an economic point of view based on multiple sources of evidence in an ideally designed system. "*The focus of ongoing S3 monitoring is on whether or not opportunities identified through local EDP processes are viable and if they truly have the potential to induce structural social-economic changes. This involves understanding and reflection around whether spillovers and related variety between and within targeted priority-domains is potentially being generated*" (Laranja et al. 2020). Therefore, monitoring should be viewed as a flexible tool, in close proximity to stakeholders, involving them via pragmatic knowledge related to the territory, which allows for learning, adaptation and appropriate responses as close to reality as possible. It should mirror the strategy's *logos*, relating the socio-economic reality directly to the priority areas defined, closely monitoring their implementation due to change and the specific objectives set.

The results-orientated monitoring system aims to measure the outputs, in other words, the type and volume directly produced by the instruments allocated, by way of non-exhaustive example, training actions, spinoffs, international platforms and intellectual property, for example. And the results, that is, the measuring of achievement in socio-economic objectives and socio-economic structural changes in each S3 priority, defined for direct and indirect beneficiaries (Gianelle et al., 2016).

Hegyi and Prota state that "The monitoring system adopted is generally divided into three levels: "*context indicators*", "*output indicators*", "*result indicators*"" (2021: 19). However, for Gianelle et al. (2016), in addition to output and results indicators the ideal-standard characteristics of a S3 results-oriented monitoring system should measure the implementation of the allocated resources through appropriate accounting tools and funding monitoring mechanisms. With regard to structural change and specialisation, the characteristics of companies, production specialisation and their economic activity in series should be measured. Finally, monitoring should provide a global overview of the competitiveness landscape for research and innovation, through statistical sources or specific qualitative analyses of value chains.

Therefore, the monitoring system serves as a representative instrument of the strategy as a mechanism of anticipation and constructive adaptation, but alone cannot allow for the precise identification of the causal impact that public policies have on the socio-economic environment (Gianelle et al., 2016). In fact, monitoring should not replace the role of impact assessments and their role in accurately analysing the causal effect on socio-economic development of the measures implemented.

There is a clear distinction between monitoring and evaluation, which lies in their main objectives and responsibilities. Monitoring seeks to verify the progress of the instruments against the results indicators and is usually carried out by those responsible for implementation. In contrast, evaluation examines the impact of instruments and the basis of direct or indirect changes, usually carried out by independent experts.

Both processes work in symbiosis: monitoring provides information for evaluation, and evaluation highlights the need for better monitoring indicators. Nevertheless, as Foray et al. reinforce, "*There is no single standardised approach for developing a monitoring and evaluation system for a RIS3*" (2012: 60).

> The same authors establish that the monitoring and evaluation of S3 should be integrated from the outset, based on its own concept of continuous evolution and adaptation to changes and new evidence gathered from the ongoing activities that make it up.

The complexity of building a monitoring system begins with the challenge of defining concretely what we want to monitor and how we will do it. The first condition to fulfil is to successfully establish the actual foundations of the RIS3 strategy, i.e. recognising challenges and needs, formulating strategic objectives and selecting possible solutions to achieve those objectives. The diversification of the RIS3's strategic design alone probably doesn't allow for the definition of two exactly identical monitoring models, so there is no single, transversal solution. However, the essential principle is similar: linking expectations of change to outcome indicators, in other words, mobilising input indicators (measuring the implementation of instruments and resource allocation) and output indicators (observing what is reproduced by the allocated resources) to verify the change in outcome indicators (checking whether expectations materialise) (Gianelle & Kleibrink, 2015).

Now that we understand what we want to monitor, it remains to be seen how we can operationalise it. The monitoring system implemented should take into account the complexity of the real-world conditions to be measured in all its interconnected analysis dimensions. Hegyi and Prota (2021) establish criteria that make up efficient S3 monitoring and evaluation systems. First, the objectives of each S3 priority area should be clearly defined and articulated. Differences between *inputs* and *outputs* must be quantified, with the aim of understanding the effects on socio-economic outcomes. The system should be composed of data management mechanisms that inform evidence-based policy-making, which can be clearly communicated to stakeholders. Finally, the system must presuppose its own fine-tuning, based on evidence and contributing to a continuous learning process that reveals the relationship between results and expectations.

Gianelle and Kleibrink (2015) argue the rationale for implementing monitoring systems on three key aspects. The first relates to gathering information on transformation processes to make available to policymakers. The second is to establish and consolidate the clarity of the strategy's objectives and operating flows in order to strengthen trust and co-operation with stakeholders. And finally, to fulfil accountability mechanisms, reinforcing transparency and even a giving the stakeholders involved a sense of ownership.

This stage is one of the most demanding tasks, especially when it comes to identifying outcome indicators, which are always intrinsic to the priorities defined in the strategy. Added to this challenge is the establishment of base values, milestones and targets consisting of realistic qualitative and quantitative variables. All this has to be combined with the frequency in updating the possible selected variables in relation to socio-economic volatility. In addition, the monitoring system should be consolidated through continuous action plans for the collection of diversified data and should also always ensure the quality of the data to avoid losing legitimacy (Laranja et al., 2020).

In short, in the words of Gianelle and Kleibrink:

> "policy makers should be aware of the inherent limitations of indicators and what they can measure andapproximate" (2015: 14).

MONITORING AND EVALUATION SYSTEM

According to Fuster Marti et al. (2020), the RIS3 monitoring process faces various constraints. Firstly, there is a need for data tailored to specific territories covering several dimensions (aggregated data specific to the priorities defined), making a vision difficult due to data access constraints. Secondly, the ever-changing terminology used to describe the S3 priorities adds complexity to the classification process. Thirdly, the problem of data availability arises due to the fact that the relevant information can be stored in disparate formats across various organisations, leading to difficulties in terms of accessibility, harmonisation and compatibility. Finally, those responsible for monitoring must overcome the challenge of collecting data from multiple sources, without commitment or political authority, funding and/or training.

The granularity and size of the data series available per state and/or region imply other constraints for monitoring systems, which can be mitigated by establishing qualitative exercises, such as questionnaire surveys, expert panels, or the use of other diversified sources of information, such as composite indicators produced by academia. In fact, Hegyi and Prota (2021) state that the lack of adequate and timely data to establish legitimate indicators is one of the main challenges in the construction of a monitoring system, with implications that limit the potential for accountability and the establishment of a relationship between priority areas objectives and indicators.

Gianelle and Kleibrink (2015) present two possible options in the case of the omission of legitimate variables to fulfil the monitoring. The first is to to draw up a data collection process by survey or interview, the costs and time of which depend on the size of the territory. The alternative is to use proxy variables (fulfilled by third parties who may not be primary sources) or ones which represent the closest indicators to those that we intend to monitor. In addition, comparative analyses can facilitate this exercise when regions with similar profiles are identified. Nevertheless, smart specialisation strategies have been embraced by policy makers. However, their pragmatic translation illustrates three complex ambiguities. Firstly, whether the nature of stakeholder involvement is active or passive lacks clarity, i.e. in the passive scenario the principle of mutual monitoring cannot be fulfilled, so participants never develop a sense of ownership over the system. Secondly, although the instruments are channelled into the defined priority areas, no effort is made to develop a tailor-made monitoring system, only one which meets minimum requirements to ease the administrative burden and additional exercises are usually services provided by private individuals. And finally, in the monitoring that is established, the outputs have little consistency with the objectives defined in the results indicators (Kleibrink et al., 2016). These factors may be associated with the weakness of the construction, capacity building and dissemination of the S3 itself by the member states, in the words of Gianelle et al. (2016).

> "There are tangibly signs that regions and countries have put in place mechanisms that can circulate the very rationale of Smart Specialisation. This could be the result of lobbying activities, higher political return from widespread public support measures, risk-averse attitude of policy-makers, and lack of adequate institutional and administrative capacity that can be observed at national and regional levels. However, an additional explanation may lie in the incentive structure established at European Union level which did not fully support the intervention logic of Smart Specialisation" (2020: 1386).

Likewise, **Hegyi and Prota (2021)** highlight the lack of harmonisation between S3 implementation choices across member states as being motivated by the omission of any regulatory compliance, together with the degree of novelty associated with the approach to entrepreneurial discovery processes. This process has been incorporated in most regions as a factor for changing organisational culture, replacing monitoring and evaluation practices based solely on produced guides and benchmarks.

Finally, it is necessary to establish the premise that the degree of experimentation associated with the implementation of the S3 in the European Union implies a need to strengthen the effectiveness of monitoring activities (Hegyi & Prota, 2021). The triple transition involves the analysis of large amounts of data, facilitating the development of custom taxonomies across different regions, data sources and classification systems. These techniques have the potential to improve the effectiveness of monitoring priority areas, particularly if governments establish open science and innovation strategies (Fuster Martí et al., 2020). In line with what Hegyi and Prota suggest,

> **"In view of in the next programming period, to meet this need, it would be necessary to make use of analytical and informative tools (big data, web semantics, etc.) able to provide different kind of data and faster return" (2021: 24).**

Ensuring the effectiveness of monitoring and evaluation is therefore inextricably linked to its relationship with the governance model —envisaged in the previous chapter and detailed in this one— in terms of collecting, organising and managing information through systematic mechanisms and data management, so that up-to-date decision support evidence, close to territorial reality, accompanies adjustments and improvements throughout the RIS3 policy cycle.

The RIS3T 2014-2020 document stated that the implementation of the RIS3T Strategy is based on information collected through an Observatory, "*to analyse and diagnose the impact of innovation policies in the Euroregion and to dynamically monitor the evolution of the system made up of stakeholders on either side of the border, acting as a data repository for the Euroregion*".

The following deliverables are expected:

1. "(...) A general annual report on Innovation Systems in Galicia and Northern Portugal and the RIS3T Strategy.
2. (...) Various sectoral reports, related to advances in each of the fields prioritised in the Strategy. Likewise, regular analyses of the implementation of the Strategy will be made and presented in:
3. (...) An intermediate report (2018), which will analyse the implementation of the Strategy at an intermediate stage, results to date and possible deviations identified.
4. (...) A final report (2021), which will analyse the results and impact of the Strategy once its life has come to an end".

However, despite the evidence included in its design and formulation process, the publicly available information regarding monitoring activities during the life of the strategy was mainly provided by POCTEP. The R&D&I Observatory website features documentation on analysing projects and mapping stakeholders, as well as information on three working groups focusing on different themes. The IMPACT RIS3T project also represents other activities consistent with the development of these activities, such as the dissemination of brokerage events and newsletters for the dissemination of financing opportunities.

Monitoring is carried out by the Management Team, with the results passed on to the Board of Directors so that corrective measures can be proposed in the event of non-compliance or deviations between the targets and expected results being detected. The planned evaluation will be done with the support of external experts who will participate in the mid-term and final evaluation of the implementation of the Strategy and draw up their evaluation reports.

By way of comparison, we can analyse the evaluation results of 69 questionnaire respondents on the relevance of different cross-border monitoring mechanisms.

MONITORING AND EVALUATION SYSTEM

The results, sorted by weighted average, suggest the **stakeholders** consulted had the following priorities for monitoring mechanisms of the Euroregion:

1. Dissemination of financing opportunities (4.42);
2. Detailed analyses of the effects and impacts of initiatives after completion (4.34);
3. Mechanisms that quickly identify deviations or problems in ongoing initiatives (4.15);
4. Online repositories to promote the transfer of good practices, collaborative initiatives and matchmaking among actors (4.12);
5. Comparison of performance with other regions and identification of best practices (4.07);
6. Periodic reports on mapping, diagnosis and evaluation of R&D&I activities in the Euroregion (3.97).

The results highlight the stakeholders' demand for mechanisms for mapping funding opportunities and monitoring implemented initiatives. The ability to quickly identify and correct deviations, promote collaboration and compare performance with other regions is also highly valued. Periodic reports, although important, are seen as a little less critical compared to other mechanisms.

At the same time, the results of the preferences for communicating information about the Euroregion by the same respondents show a high importance attached to newsletters and websites. These results point to the opportunity to develop a hybrid solution of newsletters for regular updates (e.g.: mapping funding opportunities and brokerage events) and an online platform (e.g.: R&D&I Observatory) for comprehensive access to open data that builds broad diagnoses of the Euroregion.

At the same time, the results of the interviews reveal that there is significant under-utilisation of the monitoring systems already in place in each region, resulting in unnecessary duplication of structures and efforts. A more effective approach suggested by the interviewees would be the integration and alignment of these regional systems, leveraging the resources and information available. However, to build robust monitoring solutions, it is essential to involve a wide range of partners, including the public and private sectors and academia. Projects such as MonitorRIS3 were highlighted as promising examples for multiplying the alignment of monitoring and efficiency systems. Finally, the need to develop a battery of crucial indicators, including both quantitative and qualitative metrics, to effectively monitor the progress and impacts of implemented initiatives, allowing for evidence-based adjustments, was emphasised.

To sum up, the challenges aligned between the theoretical framework and the results of the survey and interviews can be systematised into the following points:

- Under-utilisation of the regional systems already in place in each region.
- Leveraging instruments/tools with a degree of methodological novelty to make monitoring processes more efficient (e.g.: in the automated association of approved projects in relation to areas of collaboration).
- Regular and timely production and delivery of scheduled periodic reports to the respective organisational structures.
- Creation of a battery of quantitative and qualitative indicators to properly monitor the progress and impact of initiatives in the Euroregion, allowing evidence-based adjustments.
- Participation in collaborative projects whose objectives include: (i) establish synergies between both regional monitoring systems, establishing synergies between both regional monitoring systems, (ii) producing deliverables for the development of quantitative indicator batteries specific to collaborative platforms, (iii) exploting the data economy, and (iv) establishing information mechanisms centred on the needs of stakeholders (e.g.: information systems with a newsletter informing of funding opportunities).

In view of these challenges, the following international good practices from the literature consulted are described, which serve as monitoring and evaluation mechanisms for at least one of the constraints mapped, potentially contributing to the revision of the current model.

RIS3CAT 2030

RIS3CAT 2030 aims to address specific local challenges and contribute to a triple transition, aligned with the Sustainable Development Goals. To monitor this complexity effectively, simple counting of initiatives is not enough. A contextualised perspective is needed, with indicators adapted to the purpose and location, avoiding the counter-productive effects of simplistic indicators that may reflect the availability of resources rather than relative effort. The RIS3CAT 2030 monitoring system combines various sources of information and types of analysis to better understand how research and innovation in Catalonia are supporting the articulation of sustainable value chains, the emergence of new business models aimed at creating shared value, transforming socio-technical systems, creating digital and technological industries, and transitions to a greener, more digital, more resilient and fairer socio-economic model.

The RIS3CAT indicators are based on the results of the research and innovation projects managed by the Generalitat de Catalunya. However, they extend to other data gathering approaches beyond statistical information, such as surveys, technology foresight reports, indicators and other official data. They mobilise open data from R&D projects managed by other administrations (e.g., the EU, central and local governments) and qualitative and semi-structured data from the discovery process and Shared Agendas (Ecosystem-Based Missions).

Faced with all this complexity, the process of creating an open data platform to monitor RIS3 began in 2017, with a feasibility study related to the availability and quantity of data and analysis of front-end and back-end technology requirements, followed by the development of a proof of concept based on co-creation between public and private stakeholders. The first pilot version included the manual classification of Horizon Europe and S3 projects by RIS3 priorities and the visualisation of collaboration networks. The final version incorporated automatic classification of projects by SDG using Topic Modelling and analytical reports for public policies. After participatory reviews with stakeholders in Catalonia, new features were developed, including international and interregional collaboration networks. The second version was adapted to the new RIS3CAT 2030 framework, automatically reclassifying all projects into the new priorities with *deep learning* classifiers and integrating an emerging classification of topics using Topic Modelling and semantic similarity.

In addition to the open platform (RIS3-MCAT[6]), RIS3CAT has trialled innovative methodologies for qualitative and semi-structured data from the S3 discovery process, such as systems mapping, working with multi-level perspective frameworks (Geels, 2002; 2004; 2010), formative evaluation (Molas-Gallart et al., 2021) and transformative outcomes (Ghosh et al., 2021), involving stakeholders in specific discovery processes of the Shared Agendas. In addition, they explored possibilities of *data lakes* through public procurement of innovation and developing new theoretical and methodological frameworks for collective transformation initiatives.

6 ris3mcat.gencat.cat

MONITORING AND EVALUATION SYSTEM

Emilia-Romagna

Emilia-Romagna's platforms exemplify good practice in using qualitative methods to monitor an innovation ecosystem, balancing a qualitative approach with boosting the ecosystem. Traditionally, the region's S3 monitoring system aims to provide granular data to measure the implementation of the strategy, using indicators specifically built to measure the level of implementation of policies and indicators of specialisation, evaluating structural changes in production systems in relation to the S3 objectives. These indicators include patents, licensing, value of contracts between companies and research centres, number of new startups, and SMEs per area of expertise, among others. This approach is demonstrated in a platform that allows monitored data to be visualised, acting as an essential communication tool to inform stakeholders and general society about the implementation of S3 in the region, providing open data.

Emilia-Romagna's new S3 approach for 2021-2027 adds a process based on inclusive and comprehensive co-creation (Open Discovery Process), focused on the dual green and digital transition. It uses the S3 Forum as a face-to-face platform that promotes open discussions between all actors in the region's innovation system, allowing updates and reviews of the strategy, as well as suggesting policies and intervention tools. In parallel, the EROI digital platform facilitates collaboration between members, promoting a culture of open innovation in the Emilia-Romagna ecosystem. The platform also fosters debate and exchange of ideas on innovation, new technologies and business development, making it a vital resource to align innovation policies with the real needs of companies and promote sustainable development in the region.

This approach represents a comprehensive combination of platforms across all of S3's intervention axes, promoting face-to-face interaction between stakeholders (S3 Forum), the implementation and development of value creation in response to challenges (EROI[7]) and open data monitoring (Monitoraggio S3[8]).

Northern Netherlands Alliance

In 2015, the University of Groningen and the Northern Alliance of the Netherlands (SNN) launched the *Innovation Monitor*, which was later expanded with the cooperation of several strategic partners. This monitor aims to provide detailed insights on innovation trends in the North Netherlands region, focusing both on innovation performance and the skills and needs of small and medium-sized enterprises. The initiative allows an in-depth understanding of emerging activities that have the potential to strengthen the regional economy. In addition, the monitor is fundamental for the formulation of more effective innovation policies and for the efficient use of available subsidies, facilitating the management of programmes such as the ERDF.

The monitor involves the participation of hundreds of SMEs responding to an annual questionnaire, who in return receive individualised benchmark reports comparing their performance with that of other similar companies, as well as a subsidy barometer highlighting the most relevant funding instruments for each company. The annual presentation of the monitor's results is a significant event that promotes the expansion and strengthening of networks between the various players in the innovation ecosystem. Over time, this practice has proved essential for aligning innovation policies with the real needs of companies, promoting an environment favourable to growth and sustainable development in the region.

The successful experience of the Innovation Monitor has opened the door to experimenting with other initiatives with proven performance, such as Open Innovation Calls or taking advantage of the questionnaire survey as an ideal data production tool for matchmaking, whose integrating platform for monitoring, pairing ideal profiles and opening dedicated and integrated calls is currently under construction.

7 emiliaromagnaopeninnovation.art-er.it
8 monitoraggios3.art-er.it
9 snn.nl/innovatiemonitor

Finally, some considerations based on Moujaes (2024) that reflect emerging trends in RIS3 monitoring during a period of transition from economic performance to a focus on sustainability, driven by major societal challenges such as the climate emergency, the COVID19 pandemic and population ageing:

1. Effective monitoring is crucial to ensuring that policies are achieving their goals. However, conventional monitoring focuses on accountability and meeting predefined targets, which can stifle innovative practices aimed at economic, social and environmental sustainability.

2. This new conjuncture implies that indicators must have specialisation granularity in order to capture the directionality of innovation towards sustainability, i.e., indicators must measure the broader impacts and specific objectives of inputs.

3. Notwithstanding the importance of the granularity of these quantitative/qualitative indicators, monitoring must be based on an iterative process with territorial dynamics that evolves on the basis of lessons learnt, both successes and failures.

PROPOSED MONITORING AND EVALUATION SYSTEM

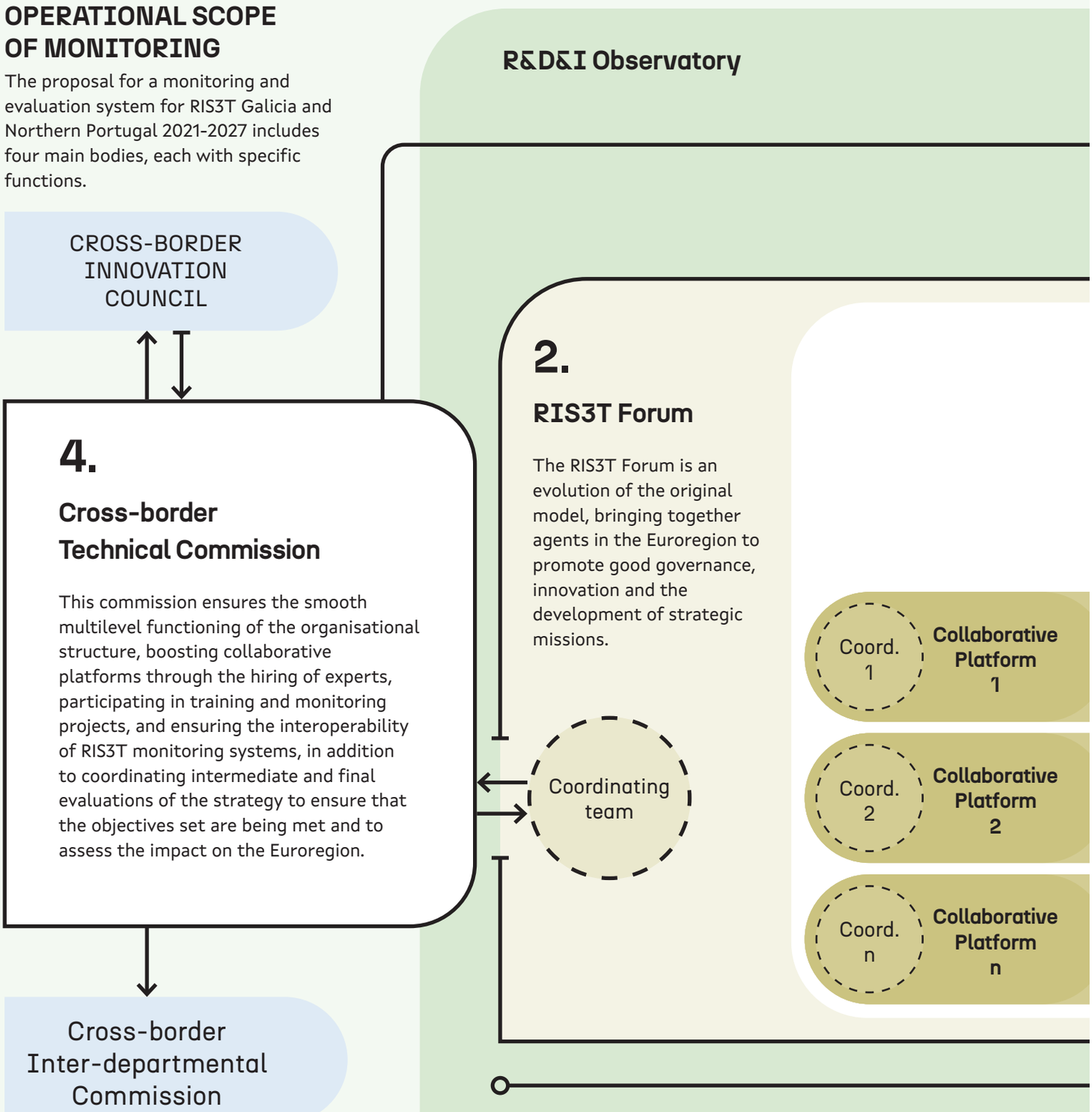
In terms of monitoring, this proposal reflects the idea of an R&D&I 2.0 Observatory, with many of the activities from the previous framework programme being underpinned by this structure, which was not included in the previous governance model. This proposed new framework aims to establish the Observatory as a *Boundary Organisation* (De Wit et al., 2022), integrating various monitoring processes but retaining the possibility of autonomy among its figures and leveraging the RIS3T's capacity building for competitive financing.

MONITORING AND EVALUATION SYSTEM

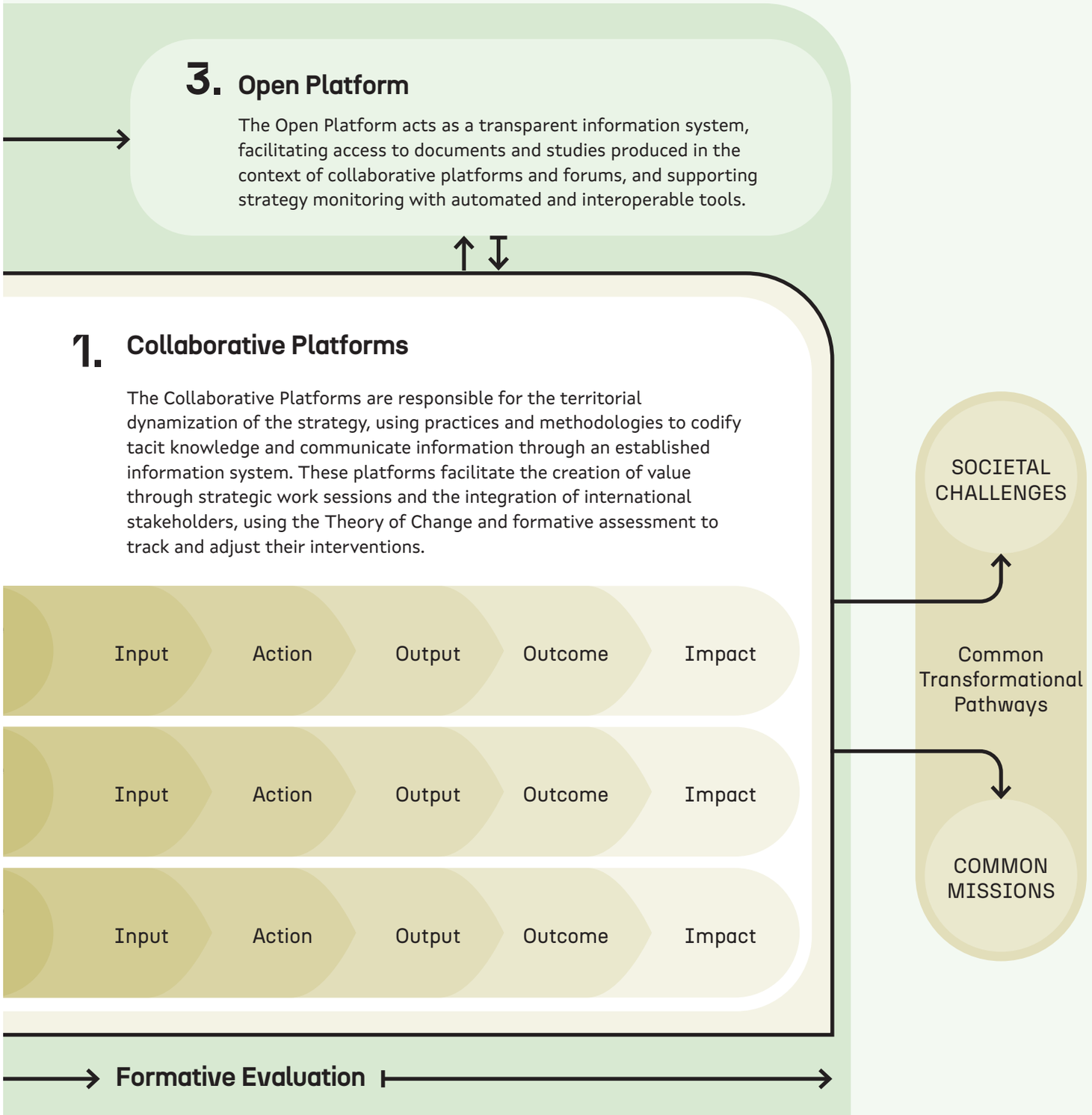
Figure 36. Proposal for a monitoring and evaluation system for RIS3T Galicia and Northern Portugal 2021-2027

OPERATIONAL SCOPE OF MONITORING

The proposal for a monitoring and evaluation system for RIS3T Galicia and Northern Portugal 2021-2027 includes four main bodies, each with specific functions.



EVALUATION SCOPE


3. Open Platform
The Open Platform acts as a transparent information system, facilitating access to documents and studies produced in the context of collaborative platforms and forums, and supporting strategy monitoring with automated and interoperable tools.
1. Collaborative Platforms
The Collaborative Platforms are responsible for the territorial dynamization of the strategy, using practices and methodologies to codify tacit knowledge and communicate information through an established information system. These platforms facilitate the creation of value through strategic work sessions and the integration of international stakeholders, using the Theory of Change and formative assessment to track and adjust their interventions.
Input Action Output Outcome Impact
Input Action Output Outcome Impact
Input Action Output Outcome Impact
SOCIETAL CHALLENGES
Common Transformational Pathways
COMMON MISSIONS
Formative Evaluation
Intermediate Evaluation
Evaluation Ex Post

MONITORING AND EVALUATION SYSTEM

Platforms

The Collaborative Platforms take on the role of the strategy's territorial booster. The success of RIS3T as a whole depends on their activities. Therefore, the proximity to the territory's actors must be leveraged by means of practices and methodologies that make it possible to codify their tacit knowledge. This sequence of information gathering must be processed and communicated through the appropriate channels of the information system established in the strategy, in order to make the necessary adjustments and ensure the effectiveness of its direction and the coordination of stakeholders when it comes to institutionalised dialogue.

This underlines the need for it to be promoted by experts. Each moment of interaction has inherent costs and, as such, must be maximised for value creation. Assigning responsibility for the strategic planning of participatory work sessions can facilitate their productivity, especially if the expert facilitators are properly trained for the complexity they face. In addition, it guarantees the establishment of an accountability-driven information system, the codification of tacit knowledge and its interpretation for the development of evidence-based opinions and recommendations to support decision-making.

Nevertheless, a new level of complexity and novelty is being established within the framework of RIS3T. The international dimension, often neglected in the Entrepreneurial Discovery Process, can be better incorporated through the Open Discovery Process, which connects local forces with global opportunities. To effectively include international stakeholders, it is crucial to integrate them into mapping and strategic discussions based on common interests. To this end, links with global value chains, European partnerships and programmes such as Horizon Europe can be established. This approach not only broadens the participants' viewpoint, but also strengthens the innovation network, ensuring that the RIS3T strategy benefits from a global and collaborative approach, from the discovery phase to implementation (Ramojus, 2024).

In this sense, the central element of the methodological approach proposed for the collaboration platforms will be the Theory of Change, a method commonly used to understand the strategy and approach of an intervention, whether in the course of monitoring projects, programmes or other types of initiative, or in the construction of multiannual roadmaps. A key element is the opportunity to manage collective intelligence processes in order to establish work plans specific to the differentiating areas associated with them and the need to establish a pragmatic procedure from the outset that facilitates measurable monitoring, in which the Theory of Change

> "provides the logic of how the inputs invested in a policy are expected to lead to a set of outputs and relevant outcomes, allows this design to be used for the comparison of different experiments regardless of their underlying theoretical foundations and ToCs" (Molas-Gallart et al., 2021).

In short,

> "ToC is typically defined by policy stakeholders and starts by identifying the main changes that an intervention is aiming to achieve. Policy goals are therefore defined as changes to a baseline situation. Next, participants work backwards from such intended changes to identify the processes that will lead to them, and how these processes will be triggered by the intervention. In this way stakeholders, with the help of evaluation experts, produce an expected process linking the activities triggered by an intervention with its results. Our ToCs will be flexible, implying that they should not be understood as a fixed causal chain; rather, they can be revisited and redefined as a result of the formative evaluation process. The ToCs will be used to foster learning and reflexivity among participants and to help assess if the policy is contributing towards advancing its objectives" (Boni et al., 2023: 579).

A Theory of Change can be applied in various manners but in general consists of six basic elements: (I) inputs, (ii) activities, (iii) outputs, (iv) outcomes, (v) impact and (vi) assumptions. We chose to adopt the Motion Handbook approach (Palavicino et al., 2024) for its extensive application (e.g.: EIT Climate-KIC, EIT Climate-KIC RIS, Circular Economy Beacons and Transformation for Climate).

In a complementary way, adopting formative evaluation as a learning opportunity and method in the Theory of Change process is essential. Systemic transformations are complex, long-term processes in which many elements and actors interact. Any initiative that works toward system change becomes part of the system that it seeks to transform, connecting with other actions and changes that, in the long term, can lead to radical transformations. To maximise the impact of our interventions, it is crucial to understand these processes. Formative evaluation, unlike traditional results evaluation, is a continuous and reflective tool that allows knowledge to be captured and shared during the development of the project. It promotes learning within the organisation by encouraging two forms of learning: one aimed at continuous process improvement and the other at deep reflection on the beliefs and assumptions that shape organisational choices. This type of assessment not only improves the efficiency of processes, but also allows us to reconsider and adapt the systems being transformed. Thus, the Theory of Change, combined with formative assessment, becomes a dynamic model of continuous learning, capable of facing the complex challenges of differentiating domains.

RIS3T Forum

The Forums are an organic evolution of their original model, including a broad representation of Euroregion agents. Their aim here is open and cross-participation in the interaction between different platforms for cross-cutting good governance implications (e.g.: diffusion of innovation, strengthening governance systems, industrial transitions), but also in the institutionalisation of spaces for strategic thinking at the forefront of new innovation policies, enabling the development of missions or other similar theoretical frameworks (cf. Haddad et al., 2022).

Open platform

It is the result of the development of the current website dedicated to the Observatory and it functions as an information system for the Euroregion. It provides transparency, facilitating access to documents produced in the context of collaborative platforms, forums and other opinions and/or recommendations from the organisational structure, as well as studies resulting from the projects implemented. It facilitates the monitoring of the strategy, directly monitoring approved projects, mitigating human involvement in automation and interoperability of systems (e.g.: supported by regularly updated data architectures that allow a panoramic dashboard view of the main indicators of the Euroregion's innovation system).

Cross-border Technical Commission

It ensures the smooth running of the multi-level organisational structure, such as the secretariat of the Cross-Border Innovation Council, namely by holding plenary sessions with the participation of experts. It ensures the dynamism of the collaborative platforms by hiring/appointing experts and participates in projects related to the development of foresight and monitoring capacities, among others in RIS3T (e.g.: in the development of the open platform to guarantee interoperability between current monitoring systems and/or indicators customised for the collaborative areas of RIS3T developed in consortium with higher education institutions in the Euroregion).

As far as evaluation in the conventional sense of RIS3T is concerned, there are no changes to what was planned in the previous strategy. There should be two evaluation points, (i) in the middle of the implementation of RIS3T, ensuring that its developments are fulfilling the intended direction towards the established objectives, and (ii) at the end, considering the impact that the strategy has had on the Euroregion.

REFERENCES

REFERENCES

CCDR Norte e Junta da Galicia. (2021). *Plano de Investimentos Conjuntos da* Eurorregião *Galicia-Norte de Portugal (2021-2027).* https://www.ccdr-n.pt/storage/app/media/Plano_Oficial_21-27.pdf

CCDR Norte. (2023). *Estratégia de Especialização Inteligente da Região do Norte 2021-27: Caraterização dos domínios prioritários da estratégia regional de especialização inteligente*. https://www.ccdr-n.pt/storage/app/media/uploaded-files/S3%20NORTE%202027_Book%202_Publish_WEB.pdf

CCDR Norte. (2023). *Estudo de benchmarking de boas práticas nacionais e internacionais sobre sistemas regionais de inovação e modelos de governação de estratégias regionais de especialização inteligente* (Technopolis Group). https://www.ccdr-n.pt/storage/app/media/uploaded-files/1-Relat%C3%B3rio%20Final%20Estudo%20Benchmarking.pdf

CCDR Norte. (2023). *Estratégia de Especialização Inteligente da Região do Norte 2021-27*. https://www.ccdr-n.pt/storage/app/media/uploaded-files/S3%20NORTE%202027_Book%201_Publish_WEB.pdf

De Vicente, J. (2016). *Visual toolbox for system innovation - A resource book for practitioners to map, analyse and facilitate sustainabiility transitions*. Climate-KIT.

European Commission, Directorate-General for Research and Innovation, Hollanders, H., Es-Sadki, N., *Regional Innovation Scoreboard 2023*, Publications Office of the European Union, 2023. https://data.europa.eu/doi/10.2777/70412

Eurostat. (n.d.). *Urban-rural Europe - introduction*. European Commission. Consultado a 23 de maio, 2024, em https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Urban-rural_Europe_-_introduction#Area_and_%20population

GAIN, & CCDR Norte. (2015). *Estratégia de Especialização Inteligente Transfronteiriça Galicia - Norte de Portugal (RIS3T)*. https://ris3t-Galicianortept.eu/wp-content/uploads/2021/05/RIS3T_PORTUGUES.pdf

GAIN. (2023). *Estratexia de Especialización Intelixente RIS3 2021 - 2027*. https://ris3Galicia.es/wp-content/uploads/RIS32021_2027.pdf

Gianelle, C., D. Kyriakou, C. Cohen and M. Przeor (eds) (2016), *Implementing Smart Specialisation: A Handb*ook, Brussels: European Commission, EUR 28053 EN, doi: https://doi.org/10.2791/53569

Reid, A., Steward, F., & Miedzinski, M. (2023). *Aligning smart specialisation with transformative innovation policy – Lessons for implementing challenge-led missions in smart specialisation*. Publications Office of the European Union. https://data.europa.eu/doi/10.2760/359295

Foray, D. (2023). *Smart specialization strategy and the policy instruments* (Final Draft). Publications Office of the European Union. https://ec.europa.eu/regional_policy/sources/policy/communities-and-networks/s3-community-of-practice/Smart_specialisation_strategy_and_policy_instruments.pdf

Jokelainen, K., & Guerrero, A. (2023). *Implementation of the Smart Specialisation Strategies into the practice with the support of the Synergic Funding* (1). Publications Office of the European Union. https://ec.europa.eu/regional_policy/sources/policy/communities-and-networks/s3-community-of-practice/Synergy_paper.pdf

OCDE. (2021). *Governing Crossborder Challenges*. OPSI. https://cross-border.oecd-opsi.org/wp-content/uploads/2021/10/2021-08-09-OECD-Report1-Print-Final.pdf

Generalitat de Catalunya. (2023). RIS3CAT Shared Agendas as platforms for synergies (RIS3CAT 2030 in knowledge pill; 1). Barcelona: Generalitat de Catalunya. Secretaria d'Afers Econòmics i Fons Europeus.

Woolford, J., Amanatidou, E., Gerussi, E., & Boden, J. M. (2021). *Interregional Cooperation and Smart Specialisation: a Lagging Regions Perspective*. Publications Office of the European Union. https://doi.org/10.2760/25586

Mariussen, A., Rakhmatullin, R., & Stanionyte, L. (2016). *Smart Specialisation: Creating Growth through Trans-national cooperation and Value Chains Thematic Work on the Understanding of Transnational cooperation and Value Chains in the context of Smart Specialisation*. Publications Office of the European Union. https://doi.org/10.2791/658931

Guzzo, F., & Gianelle, C. (2021). *Assessing Smart Specialisation: governance*. Publications Office of the European Union. https://doi.org/10.2760/48092

Pontikakis, D. (2024). Innovation Councils. In G. Bianchi & Et al. (Eds.), *Innovation for place-based transformations*. Publications Office of the European Union. https://doi.org/10.2760/234679

Serger, S. S., Wise, E., & Arnold, E. (2015). *National Research & Innovation Councils as an Instrument of Innovation Governance*. VINNOVA. https://www.vinnova.se/contentassets/4da13cc174a448d1a3f0b816c6b74366/va_15_07t.pdf

Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy*, *47*(9), 1554-1567. https://doi.org/10.1016/j.respol.2018.08.011

Mazzucato, M. (2021). *Mission economy: A moonshot guide to changing capitalism*. Penguin UK.

Kuhlmann, S., Rip, A. (2018). Next-generation innovation policy and grand challenges. *Science and Public Policy*, *45*(4), 448-454. https://doi.org/10.1093/scipol/scy011

Gianelle, C., & Kleibrink, A. (2015). *Monitoring Mechanismsfor Smart Specialisation Strategies* (No. 13/2015). S3 Policy Series. https://s3platform.jrc.ec.europa.eu/en/w/monitoring-mechanisms-for-smartspecialisationstrategie

Gianelle, C., Kyriakou, D., Cohen, C., & Przeor, M. (2016). *Implementing Smart Specialisation: A Handbook*. European Commission. https://doi.org/10.2791/53569

Laranja, M., Edwards, J. H., Pinto, H., & Foray, D. (2020). *Implementation of Smart Specialisation Strategies in Portugal: An assessment* (JRC121189). Publications Office of the European Union. https://publications.jrc.ec.europa.eu/repository/handle/JRC121189

Hegyi, F. B., & Prota, F. (2021*). Assessing Smart Specialisation: Monitoring and Evaluation Systems* (JRC123734). Publications Union. https://doi.org/10.2760/443642

Foray, D., Goddard, J., Beldarrain, X. G., Landabaso, M., McCann, P., Morgan, K., Nauwelaers, C., & Ortega-Argilés, R. (2012). *Guide on Research and Innovation Strategies for Smart Specialisation*. Smart Specialisation Platform. https://s3platform.jrc.ec.europa.eu/en/w/guide-on-research-and-innovation-strategies-for-smartspecialisation-ris3-guide

Gianelle, C., & Kleibrink, A. (2015). *Monitoring Mechanisms for Smart Specialisation Strategies* (No. 13/2015). S3 Policy Series. https://s3platform.jrc.ec.europa.eu/en/w/monitoring-mechanisms-for-smartspecialisationstrategie

Martí, E. F., Marinelli, E., Plaud, S., Quinquilla, A., & Massucci, F. (2020). *Open Data, Open Science and Open Innovation for Smart Specialisation monitoring* (JRC119687). Publications Office of the European Union. https://doi.org/10.2760/55098

Molas-Gallart, J., Boni, A., Giachi, S., & Schot, J. (2021). A formative approach to the evaluation of transformative innovation policies. *Research Evaluation*. https://doi.org/10.1093/reseval/rvab016

Ghosh, B., Kivimaa, P., Ramirez, M., Schot, J., & Torrens, J. (2021). Transformative outcomes: Assessing and reorienting experimentation with transformative innovation policy. *Science and Public Policy*, *48*(5), 739-756. https://doi.org/10.1093/scipol/scab045

Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. *Research Policy*, *31*(8-9), 1257-1274. https://doi.org/10.1016/s0048-7333(02)00062-8

Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems. *Research Policy*, *33*(6-7), 897-920. https://doi.org/10.1016/j.respol.2004.01.015

Geels, F. W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, *39*(4), 495-510. https://doi.org/10.1016/j.respol.2010.01.022

Moujaes, G. (2024). Moving to smart specialization for sustainability: The implications on the design of monitoring indicators. *Science and Public Policy*, *51*(1), 127-143. https://doi.org/10.1093/scipol/scad056

REFERENCES

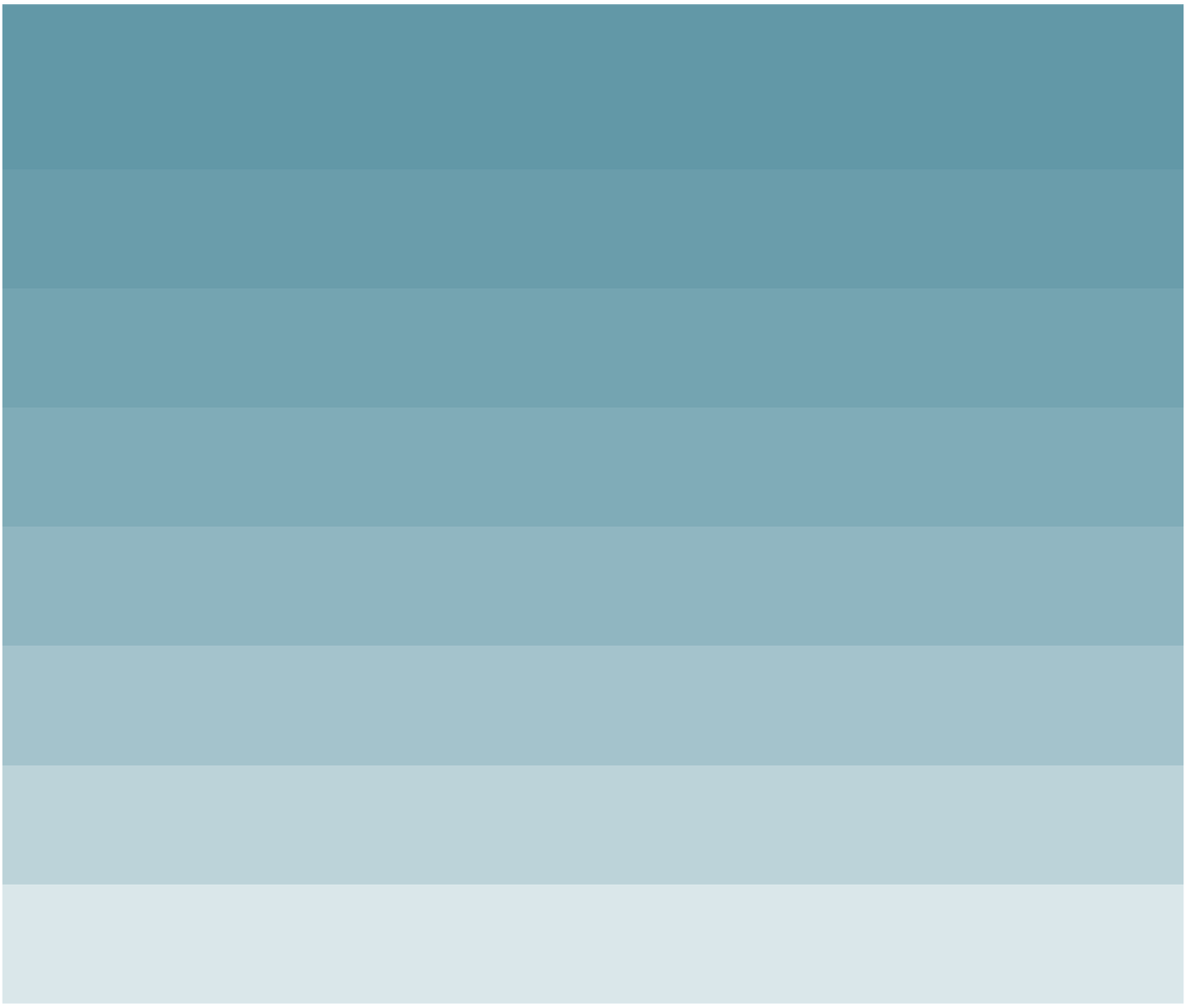
Palavicino, C. A., Matti, C., & Witte, J. (2024). *Motion Handbook - Developing a Transformative Theory of Change*. Transformative Innovation Policy Consortium (TIPC).

Ramojus, R. (2024). ODP: an International Dimension. In G. Bianchi & Et al. (Eds.), *Innovation for place-based transformations*. Publications Office of the European Union. https://doi.org/10.2760/234679

Boni, A., Velasco, D., Molas-Gallart, J., & Schot, J. (2023). Evaluating transformative innovation policy in a formative way: Insights from Vinnova's food mission experiment. *Research Evaluation*, *32*(3), 577-590. https://doi.org/10.1093/reseval/rvad029

Haddad, C. R., Nakić, V., Bergek, A., & Hellsmark, H. (2022). Transformative innovation policy: A systematic review. *Environmental Innovation and Societal Transitions*, *43*, 14-40. https://doi.org/10.1016/j.eist.2022.03.002

De Wit, F., Lourenço, A., Moreira, H., & Vala, F. (2022). Towards knowledge governance in public administration. *European Conference on Knowledge Management*, 23(1), 307-314. https://doi.org/10.34190/eckm.23.1.800



Interreg
Cofinanciado por la Unión Europea
Cofinanciado pela União Europeia
España – Portugal

XUNTA DE GALICIA

CCDR NORTE
Comissão de Coordenação e Desenvolvimento Regional do Norte, I.P.

AGRUPACIÓN EUROPEA DE COOPERACIÓN TERRITORIAL
GALICIA NORTE DE PORTUGAL
AGRUPAMENTO EUROPEU DE COOPERAÇÃO TERRITORIAL