



I4-GREEN

I4-GREEN
Mirroring Strategy
D6.1
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Description of the related task and the deliverable. Extract from DoA	<p>T6.1 EU Mirroring Strategy toward an EU-wide Demonstrator (M20-M30) Lead Beneficiary: ICA, Contributors: ISMC, ACPMR, JdA</p> <p>Our consortium has a proven experience of setting up “mirroring strategies” – such as in MSP-REFRAM, SCRREEN and MIREU projects. Within I4-GREEN, we will set up a Mirroring Strategy between the EU regions that are deemed highly similar RIS3 profiles – be it economic or challenge-wise – and strategies (Mirror Regions). The baseline for such mirroring will be ‘raw material-rich’ regions such as Andalusia, Extremadura, Castile and Leon – Spain – and Alentejo – Portugal –. This effort will build upon our direct liaison with the S3/TSSP Partnerships “Mining Industry” and “Advanced Materials for Batteries” which back I4-GREEN. This liaison will support the further integration of a wider scope of actors and the synchronisation with their respective roadmaps and pilots. This subtask will be integrated with the working events described in task 7.6.</p>			
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Glossary

Acronym	Meaning
ICE	Institute for Business Competitiveness of Castile and Leon
R&D+i	Research and Development + innovation
R&TD	Research and Technological Development
RIS3	Smart Specialisation Strategy
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
TSSP	Thematic Smart Specialisation Partnership

1. Executive summary

This report analyses the capacities of Alentejo, Andalusia, Extremadura and Castile and Leon to promote mining projects, especially those related to the replication of the I4-GREEN pilots. This analysis is carried out using the mirroring strategy and focuses on the following aspects: replication sites for the pilots, inclusion of mining in the RIS3 strategies and membership of the regions in the TSSP Mining. In addition, the lines of support that can favour the development of mining projects and the network of regional stakeholders are analysed.

As a result of this analysis, the role of Andalusia as the best reference in the management of mining issues and with the greatest potential to develop projects is highlighted. Alentejo, not being member of the TSSP Mining and with a shorter list of stakeholders, ranks in the second position as a reference region.

Far from these regions, Castile and Leon and Extremadura do not pay specific attention to the mining sector in their respective RIS3. Furthermore, Extremadura is not member of the TSSP Mining and Castile and Leon barely has replication sites for the I4-GREEN pilots.

According to these results, the recommendations pointed out in the last chapter highlight the convenience that the four regions include mining issues as in specific actions in their RIS3 and become members of the TSSP Mining, allowing and encouraging the development of mining projects in general, and I4-GREEN pilot replication projects in particular, and taking advantage of the calls for grants and the enabler ecosystems studied in this project.

2. Introduction

The Mirroring Strategy concept is basically a benchmarking analysis between regions that share common interests, which aims to fill possible gaps by imitating good practices. In this case, there are four regions rich in raw materials, with sites for I4-GREEN pilot replication and with a common interest in promoting the mining sector: Alentejo in Portugal and Andalucía, Extremadura and Castile and Leon in Spain.

The objective of the Mirroring Strategy is to compare these four regions attending to the following aspects:

- The presence of replication sites for the mineral ores studied in the I4-GREEN pilots
- The inclusion of mining in the RIS3 policies
- The inclusion of the regions in the Thematic Smart Specialisation Partnership of Mining

Additionally, it is worth to consider two other aspects related with the promotion of projects related to mining, especially to replicate the I4-GREEN pilots:

- Calls for grants
- Enabler ecosystems

All these aspects are tackled in the following chapters, and, from the benchmarking analysis, a series of recommendations will be drawn to complete the approach of these regions regarding the promotion of the mining sector in general and the replication of the I4-GREEN pilots in particular, thus favouring a better use of domestic mineral resources. As said in the Grant Agreement, such strategy shall on the medium and long terms contribute to solve the urgency in creating a sustainable provision of raw materials for the resilience of the EU industry.

The results of this RRR are consistent with the ones obtained in the deliverable D3.6 (Interregional mirroring, fertilisation & industrial plan of the project in Extremadura region and beyond).

3. I4-GREEN Pilot Replication Sites

The first element to consider in the Mirroring Strategy is the potential replication of the I4-GREEN pilots in the four regions considered in the project.

According to the replication studies performed in **D6.2 (Pilots Action Plan & Portfolio of Investment Leads)** and **D4.5 (Final public including ecosystem extension assessment)**, the possible sites to replicate both pilots -IHO and E-LIX- are located mainly in Andalusia, Alentejo and Extremadura, with some additional possible case in Castile y Leon. The following tables 1 & 2 show the list and geographic distribution of these sites.

TABLE 1 AND 2. POTENTIAL E-LIX AND IHO REPLICATION SITES

REGION	E-LIX REPLICATION SITES	STATE	COMPANY
Alentejo	Lagoa Salgada	Project	Ascendant Resources Inc.
Alentejo	Aljustrel	Mine	ALMINA-Minas do Alentejo S.A.
Alentejo	Neves Corvo	Mine	SOMINCOR
Andalusia	Romanera-Infanta	Project	Emerita
Andalusia	Lomero	Project	Denarius Metals
Andalusia	Tharsis	Project	Tharsis Mining
Andalusia	La Zarza	Mine	Tharsis Mining
Andalusia	Sotiel	Mine	Sandfire MATSA
Andalusia	Aguas Teñidas-La Magdalena	Mine	Sandfire MATSA
Andalusia	Aznalcóllar-Los Frailes	Project	Minera Los Frailes
Andalusia	Las Cruces	Mine	Cobre Las Cruces
Extremadura	Aguablanca	Project	Denarius Metals/Rio Narcea Resources
Castile and Leon	Otero de Herreros	Project	Hispania Resources

REGION	IHO REPLICATION SITES	STATE	COMPANY
Alentejo	Cercal	Closed	
Alentejo	Alvito	Closed	
Alentejo	Azenhas-Orada	Closed	
Alentejo	Monges-Nogueirinha	Closed	
Extremadura	La Bilbaina	Closed	
Extremadura	Alconchel	Project	Atalaya Mining
Extremadura	S. Guillermo, Colmenar, Sta. Justa	Mine	Active as granodiorite quarry
Extremadura	Monchi, Aurora y Consuelo	Closed	
Extremadura	La Berrona	Closed	
Andalusia	Cala and Teuler	Closed	
Castile and Leon	Ponferrada-Astorga	Closed	

In this case, the Mirroring Strategy can only note the differences in mining potential, which ultimately depend on the geology of each region. As a result of the different geology, Castile and Leon is the region with the least opportunities to replicate the pilots.

4. RIS3 Policies

This chapter analyses the RIS3 of the four regions involved to find out how mining is included in each of them. This analysis further develops the content included in D2.1, and is the second step of the Mirroring Strategy that will allow us to identify different ways of promoting mining that can complement those already being implemented in the different regions.

4.1. RIS3 Alentejo

The “Estratégia Regional de Especialização Inteligente, EREI 2030” (Comissão de Coordenação e Desenvolvimento Regional do Alentejo, 2025) includes 3 structural objectives, 2 cross-cutting domains and 6 domains of specialisation.

Mining, in its different aspects, is addressed by the 3 specific objectives, or more specifically in the associated lines of action.

- Objective 1) Increase sustainability and territorial cohesion. Mining is addressed in the following action lines:

- Development of R&D with a view to improving indicators linked to biodiversity and regional assets, as well as the sustainable enhancement of key production systems in the region such as the Extractive Industry, among others.
- Incorporation of R&TD in the economy that impacts on the energy transition (decarbonization) and on the transition from linear models to circular models (efficient use of soil and water resources, reinforcement of the use of materials secondary and waste reduction).
- Attractiveness of Alentejo based on its heritage elements and amenities provided by ecosystems, with a view to environmental citizenship and a high quality of life (economic, environmental and social).

- Objective 2) Reinforce the value of regional production chains. Mining is addressed in the following action lines:

- Incorporation of R&D in production chains that impact on “chain failures”, thus creating more efficient processes “complete” (from extraction to commercialization) and with greater added value for the region.
- Increased anchor and spill-over effects on structural projects in the region, reinforcing their interrelationship with the set of regional production chains and/or creating new business opportunities.
- Incorporation of R&TD in the regional economy that positively impact components such as valuation of products and services, on internationalization and on the weighted evolution of product sales high tech.

- Objective 3) Increase the qualification of regional human resources (talent). Mining is addressed in the following action lines:

- Regional investment in RDI actions that allow the development of applied/applied knowledge/solutions and the creation of open digital and creative ecosystems, which are conducive to attracting talent and creating qualified jobs.
- Regional investment in R&D and training/qualification/digital literacy that are capable of producing positive effects on dynamics such as the evolution of qualifications at regional level,

the reduction of inequalities in the access to employment, the evolution of patent registration, the evolution of applied innovation production and the evolution of business investment in highly qualified human resources.

- Development and prototyping of Experimental Public Policies and R&D solutions capable of generating high technology products, goods and services within the scope of different regional domains (cross-cutting and specialisation).

The EREI analyses the relationship between the 8 domains and the regional sectors with the greatest dynamics and internationalization potential, including mineral resources. The strong relationship of this sector with 3 domains stands out:

- Digitalization of the economy, with the following regional transformative action:
 - Business Models Based on Digital Technologies, an integrated model that aims to strengthen the competitiveness - through digitization and automation - of the region's traditional sectors such as agri-food and mineral resources (automation and digitalization of the extraction, processing and marketing processes).
- Circularity of the economy, with the following regional transformative actions:
 - Recursos Minerais Alentejo, an integrated action that aims to consolidate a resilient and sustainable mineral value chain, based on the re-evaluation of ores in exploration or sub-economic, considering the Critical Raw Materials present, the development of new methodologies for prospecting hidden deposits and deep deposits, and the valorisation and reclassification of pre-existing waste as a source of Critical Raw Materials.
 - Pedra Natural Alentejo, an integrated R&TD action that increases investment in automation, "Lean layouts" and circularity models that allow for a more efficient arrangement of raw materials, machines, tools and final products in the companies' production facilities, and that allow quarries to operate like stocks (exploit only what the customer needs and with the least risk, waste and impact).
- Sustainable energy, with the following regional transformative action:
 - Energy Efficiency of Production Chains, an action that aims to create a strong to decarbonization and/or experimental models to remunerate ecosystem services ecosystem services in carbon retention and/or business models based on low products and services.

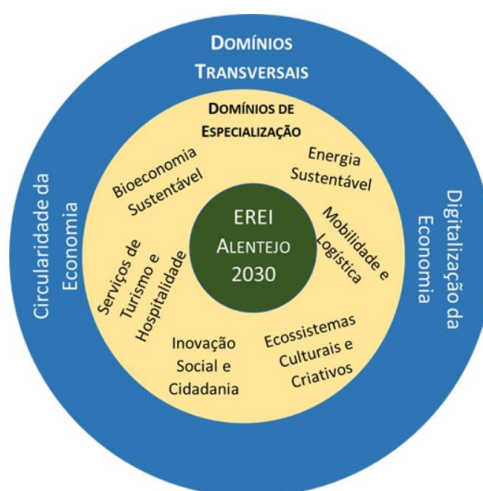


FIGURE 1. CROSS-CUTTING AND SPECIALISATION DOMAINS OF THE ALENTEJO'S RIS3

4.2. RIS3 Andalusia

The “Estrategia de Especialización Inteligente para la Sostenibilidad de Andalucía, S4Andalucía 2021-2027” (Agencia de Innovación y Desarrollo de Andalucía, 2022) has a complex structure, with Specialization Environments, Transversal Support Axes, Specific objectives and Thematic lines. It is important to highlight that mining is considered as one of the five Specialization Environments, specifically Natural Resources: Mining and Water Cycle. The challenges related to this environment are:

- Make Andalusia a region of international reference in research projects in the field of sustainable mining and metallurgy.
- Create the conditions to promote innovation in order to optimize the use of mining resources in a context of territorial capital valorisation and environmental conservation.
- Exploit existing mining resources, traditional minerals, new minerals, residues and waste elements.
- Increase efficiency in the use of both primary resources and reuse; exploration of critical and fundamental raw materials.

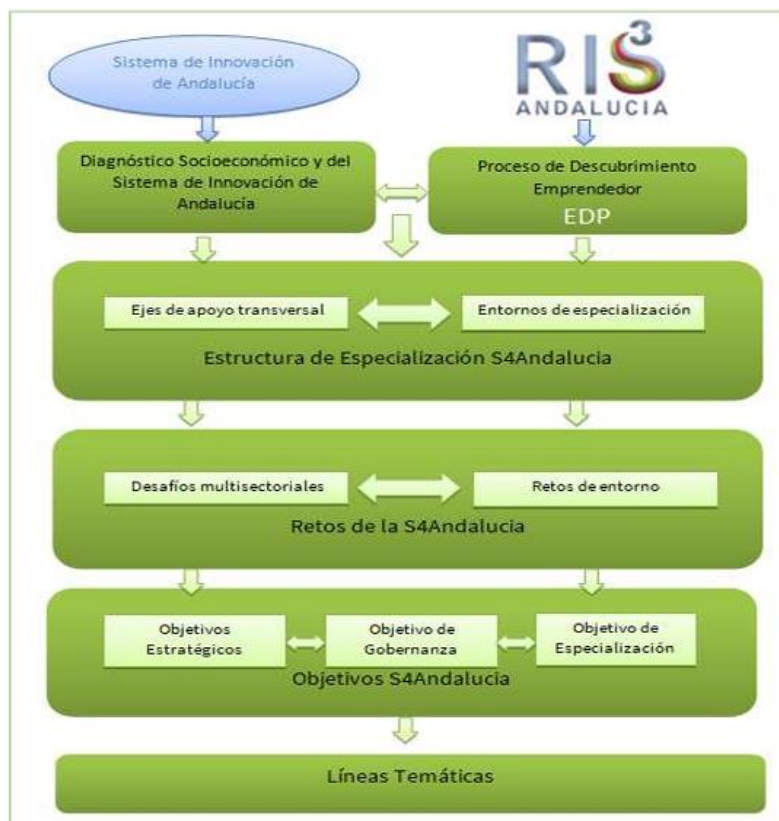


FIGURE 2. STRUCTURE OF THE ANDALUSIA'S RIS3.

Considering these challenges, the Andalusian mining sector will benefit from the implementation of actions according to the following thematic lines:

- LT.1. R&D+i
- LT.2. Knowledge transfer and generation

- LT.3. Digital transformation
- LT.4. Industrial transition
- LT.5. Training, capacity building and entrepreneurship
- LT.6. Sustainability
- LT.7. Collaboration and cooperation

It is worth to highlight the strong impact of some of these thematic lines in the Specialization Environment of Mining and Water Cycle, especially the following typologies:

- LT.1.TM.2. Financing of the different types of R&D+i projects contemplated in current or future EU regulations.
- LT.4.TM.4. Industrial transition: Financing of actions related to the internationalization of Andalusia's industrial value chains.
- LT.6.TM.2. Financing of sustainability, circularity and climate neutrality projects.
- LT.7.TM.4. Financing of the Administration's own actions aimed at improving the institutional environment for the development of innovative activity.

4.3. RIS3 Extremadura

The “Estrategia de Investigación e innovación para la especialización inteligente de Extremadura” (Junta de Extremadura, 2021) provides an analysis of the regional productive system. In this analysis, the mining sector is included in a wider sector called “Extractive industries, energy, water, and sanitation”.

Also, the RIS3 Extremadura analyses the capabilities and challenges of the Extremadura Science, Technology and Innovation System (SECTI). From this analysis, it seems that there are not I+D+I centres, nor technological agents related with the mining sector.

The RIS3 defines 4 strategic objectives:

- S01: reinforcement of the SECTI
- S02: industrial transition of the Extremadura economy
- S03: equality, communication and internationalisation of the SECTI
- S04: deployment of the entrepreneur discovery process

Related with these objectives, the RIS3 consists of 10 strategic lines:

- 1) Support instruments for R&D+I: Alignment of the R+D+i areas in which investment is made in the region with the needs of innovation, technological transformation and competitive development of the business fabric. Consolidation of the R+D+i system to respond to the needs smart specialization and competitive development of the region, and to create and develop alliances and strategic initiatives with institutional and scientific-technological agents of other regions, both at a national, European and international level.
- 2) Human capital for R&D. Increase in existing talent dedicated to R&D. increase in number of researchers and technical research professionals. Improve the capabilities to increase the investments in R&D, and its potential to define projects able to attract international competitive funds for the R&D (essentially from Horizon Europe).
- 3) Cooperation of innovative companies: Promotion of business associations and strong public-private consortiums with companies in strategic and/or emerging economic areas for the region.
- 4) Public-private collaboration in Technology and innovation: Promotion of collaborative activities for the application of science and technology for companies

- 5) Human capital for business Innovation: Training of human capital in business applications and knowledge generated by the R&D+i projects financed in the region, and promotion of the necessary skills to value the results of R&D+i.
- 6) Fabric business reactivation: Recovery of the activity of companies in strategic sectors of the region in the post-COVID-19 stage, supporting the transformation of its structure and investment in strategic projects of reactivation.
- 7) Digital transformation and Ecological Transition: Motivation to companies to promote their digital transformation, as a way to increase their productivity and capacity competitive, as well as designing new products and addressing new market opportunities. Development of capacities in human capital and in companies of the region to efficiently take advantage of the opportunities generated by digital transformation policies and of ecological transition promoted by the European Commission, the Government of Spain, and Junta de Extremadura.
- 8) Gender equality and R&D+i communication: Promotion of the full and equal participation of women and Girls in Science and Technology.
- 9) Internationalization of RDI: Strengthening capacities to attract international funds for R&D+i.
- 10) Entrepreneurial discovery: Organization and promotion of hybridisation between companies in strategic sectors, for the use and application of knowledge and technologies (KETs) to the generation new areas of opportunity in the surrounding markets.

4.4. RIS3 Castile and Leon

The “Estrategia de Investigación e innovación para una especialización inteligente (RIS3) de Castile and Leon 2021-2027” (Junta de Castilla y León, 2021) carries out in the initial diagnosis a general socioeconomic analysis, and makes a study on the situation of research & innovation and digitalisation. Also, the RIS3 performs a SWOT analysis, and identifies bottlenecks for the dissemination of innovation in the region and current trends in international technology markets. In these studies, there is no mention to the extractive industry (probably included in the epigraph “manufacturing industry”).

From these studies, the RIS3 establishes 3 priorities:

- Castile and Leon, territory with quality of life
- Castile and Leon, carbon neutral and fully circular
- Castile and Leon, a commitment to smart manufacturing and cybersecurity

Related with the second priority, the RIS3 put the focus on the sustainability of agricultural, forestry, livestock and mining activities, promoting a circular economy and minimizing the carbon footprint. This is the only mention to the mining activity in the RIS3.

The RIS3 defines 4 specific objectives and 13 related axes of action:

- S01: Developing specialisation priorities, considering Castilla and Leon as a territory with quality of life, carbon-neutral and fully circular and the commitment of the region to smart manufacturing and cybersecurity
 - o Promote flagship initiatives in a public-private partnership framework: making commitments and collaboration with the business sector of Castile and Leon and the Administration, resulting on having an impact on the objectives of the RIS3.
 - o Develop the system of support for transformative challenges for the economy and society of CyL: identifying agents of the quadruple helix ecosystem of innovation, so they can play a major role in the development of these challenges, establishing contact and collaboration networks.

- Promote the implementation of plans, programmes and other sectoral initiatives that contribute to the development of RIS3: maintenance of roadmaps for each specialisation priority for the alignment of the plans and programmes with the RIS3 priorities and identifying opportunities for the future.
- S02: Improve and strengthen Castile and Leon's research and innovation ecosystem for the advance specialisation
 - Develop and maintain capacities for smart specialisation: focus on education and training and in the capacities to meet the R&I challenges.
 - Increase R&I in Community businesses: boost the competitiveness of Community businesses on the basis of innovation and the generation of economic activity from innovative products, processes or services.
 - Foster and support entrepreneurship and intra-entrepreneurship in the area of I&I: help on the creation new lines of business and SMEs around the priorities of specialisation ensuring their consolidation and growth.
 - Develop excellence in research and enhance knowledge transfer: supporting excellent R&D and the transfer of knowledge and technology to business and society.
- S03: Castile and Leon's Digital Agenda for taking advantage of the benefits of digitalisation
 - Axes of action related with digital connectivity, infrastructures, digital transformation of companies, digitization of public services and digital skills.
- S04: Strengthening participatory governance for specialisation
 - Axes of action related with the entrepreneurial discovery process for the development of transformational challenges and for the strategic management of specialization.

4.5. Benchmarking analysis

From the description of the RIS3 of the project regions, two considerations can be made:

- Mining, as part of the productive system, can generally benefit from unspecific measures (action lines/thematic lines/strategic lines/axes of action) foreseen in the RIS3 strategies
- Mining is directly addressed in some specific fields, named action lines and domains in Alentejo, specialization environments in Andalucía, and priorities in Castile and Leon

The second consideration is the most interesting, as it involves the most direct support to mining. Table 3 summarizes the main aspects addressed in these specific fields and compares the different attention that mining receives in each of the four regions.

It is evident from table 3 the different attention given to mining in the different RIS3. The Alentejo's RIS3 is the most complete as far as mining is concerned, since it is the one that addresses the most aspects (all those in the table), followed by Andalusia. On the other hand, the RIS3 of Castile and Leon barely addresses mining and the RIS3 of Extremadura makes no specific mention of mining.

Therefore, the RIS3 of Alentejo and Andalusia can serve as a model for addressing mining issues in the smart specialization strategies of Extremadura and Castile and Leon.

TABLE 3. COMPARISON OF THE ASPECTS CONSIDERED IN THE RIS3 OF EACH OF THE REGIONS IN RELATION TO MINING

ASPECT	ACTION	ALE	AND	EXT	CYL
Sustainability	Research projects to improve sustainability		X		
Sustainability	Enhance sustainability of production systems	X			
Sustainability	Sustainability minimizing carbon footprint				X
Circularity	Promotion of circular economy				X
Circularity	Waste valorization	X			
Circularity	Circularity in natural stone	X			
Efficiency	R&D to improve efficiency	X			
Efficiency	Increase efficiency		X		
Efficiency	Reassessment of ores considering critical raw materials	X			
Efficiency	Promote innovation to optimise the use of natural resources		X		
Efficiency	Exploitation primary and secondary resources		X		
Competitiveness	Strengthen competitiveness with digitalisation	X			
Competitiveness	Strengthen competitiveness with automation	X			
Competitiveness	Automation in natural stone	X			
Exploration	Development of new technologies for hidden and deep deposits	X			
Exploration	Exploration of critical raw materials		X		
Training	R&D for training and qualification	X			

5. Thematic Smart Specialisation Partnership on Mining

The third stage in this Mirroring Strategy is to consider the possible participation of the four regions in the TSSP Mining.

The TSSP Mining, as stated in its founding documents, brings together regions interested in initiating and exploring new value chains in specific priority areas based on shared interest in their smart specialisation strategies.

The TSSP Mining engages nowadays 14 regions from 7 countries, as shown in the Table 4.

TABLE 4. REGIONS ENGAGED IN THE TSSP MINING.

COUNTRY	REGION
Finland	Lapland
Finland	North Karelia
Finland	Kainuu
Finland	North Ostrobothnia
Finland	Central Ostrobothnia
Sweden	Bergslagen
Sweden	Västerbotten
Sweden	Norrbottn
Spain	Asturias
Spain	Andalusia
Spain	Castile and Leon
Portugal	Centro Portugal
Greece	Central Greece
France	Nouvelle-Aquitaine

Among the 4 regions considered in the project, only two –Andalusia and Castile and Leon– are involved in the TSSP Mining. However, taking into account the potential for replication of the pilots and the general mining potential of these regions, as well as the attention given to mining in the RIS3, it is a fact to consider that it would be convenient for Alentejo and Extremadura to join as partners in this European initiative.

6. Calls for grants

Together with the funding opportunities at the European level described in deliverable D6.2 (Horizon Europe, I3, Interreg POCTEP), there are several calls for grants at the regional level that can facilitate the development of replication projects of the pilots implemented in I4-GREEN. Some examples are detailed in the following subsections.

6.1. Alentejo

The Alentejo 2030 Regional Program 2021-2027 includes in its Priority 6A –Just Transition Fund– the action JS08.1-01 –Productive business investment (JS08.1) (Portugal 2030, 2025). The “Productive Business Investment for a Just Transition” aims to support, on the one hand, business investment in innovative and qualified activities that contribute to the progression of the value chain and, on the other hand, operations that lead to economic diversification, modernization and reconversion, with a focus on strengthening and expanding new industries and new technologically advanced services, aimed at the climate and energy transition.

Are considered eligible investments related to creation of a new establishment; increasing the capacity of an existing establishment; and the diversification of an establishment's production into products not previously produced in the establishment.

6.2. Andalusia

The Business Agency for Economic Transformation and Development (TRADE) of the Regional Government of Andalusia has launched an Incentive Line for Industrial Research and Experimental Development Projects, in non-competitive competition, targeting business projects aimed at the search for new products, processes or services or the improvement of existing ones, within the

framework of the activities established in the Smart Specialization Strategy for the Sustainability of Andalusia (TRADE, 2025).

6.3. Extremadura

The Junta de Extremadura, by means of the General Secretariat of Science, Technology and Innovation, has launched in December 2024 a call for grants aimed at financing industrial research or experimental development projects carried out in public-private collaboration by companies and public agents of the Extremadura Science, Technology and Innovation System (SECTI). Projects submitted in all the R&D&I intervention areas for the smart specialization of Extremadura, detailed in the Research and Innovation Strategy for the Smart Specialization of Extremadura 2021-2027, will be eligible for this call (Junta de Extremadura, 2025).

This call for proposals may have limited effects on the approach of projects with a mining thematic, due to the lack of specific references to this sector in the RIS3.

6.4. Castile and Leon

The Strategic Grants Plan of the Institute for Business Competitiveness of Castile and Leon (ICE) includes several lines of aid for R+D+i within the framework of the regional RIS3, among which the following stand out (ICE, 2025):

- R&D Projects. Aid aimed at financing industrial research and experimental development projects for the creation or improvement, from a technological point of view, of production processes and/or specific products, carried out by companies in workplaces in Castile and Leon
- Strategic R&D plans. Aid aimed at facilitating the financing of strategic R&D plans to be undertaken by companies for work centres in Castile and Leon and which are declared of special interest by the Junta de Castile and Leon, at the initiative of the ICE, based on the strong impact they may have on the social, economic and/or industrial fabric of the Community. The strategic plans include one or more industrial research and/or experimental development projects.
- R&D projects of regional interest carried out by Technology Centres. Aid aimed at enhancing the excellence and scientific capacity of the technology centres of Castile and Leon, by supporting the implementation of R&D projects in line with their areas of technological specialization, which are relevant to the Community and its priority economic sectors.
- R&D projects in effective collaboration between Technology Centres of Castile and Leon and companies of Castile and Leon. Aids for R&D projects in effective collaboration between Technology Centres of Castile and Leon and companies of Castile and Leon, for the financing of R&D projects of technology centres, in order to promote research and knowledge transfer, promote research and development of new technologies and contribute to the creation of new products and services.

7. Enablers' ecosystem

In deliverable D5.1, a stakeholder database and enabler mapping were carried out. The database includes companies, studies and generation organizations (RTOs), universities and research centers, technology providers, policymakers at regional, national, and EU levels, investors, generation systems, intermediaries together with clusters, agencies, and tech parks, in addition to networks and partnerships as TSSPs.

These stakeholders are classified by type, sector, hobby area, organizational length and location. This distinct mapping will allow a nuanced information of every stakeholder's function and capacity/ knowledge/ expertise potential contribution.

The value of this database in this case is that it constitutes the ecosystem of enablers with which I4-GREEN pilot replication projects can be promoted, based on the ecosystem already created and depicted in figure 3.



FIGURE 3 -BASIS OF QUADRUPLE HELIX ECOSYSTEM IN I4-GREEN

The initial basis of ecosystem has been enlarged during the project and comprehends at the time of writing a database of 104 stakeholder records from the 4 I4-GREEN regions, distributed as follows: Alentejo 15; Andalusia 52; Extremadura 5; and Castile and Leon 32.

8. Conclusions and recommendations

From the comparison of the parameters analysed in the previous chapters, the following conclusions can be drawn:

- Pilot replication sites. Alentejo, Andalusia and Extremadura present a good opportunity to replicate the I4-GREEN pilots at a number of sites. Castile and Leon, with a different geological framework, has a lower potential.
- RIS3. The RIS3 of Alentejo and Andalusia pay attention to mining in a number of aspects that can facilitate the development of replication projects. The RIS3 of these two regions can serve as a model for formulating specific support policies for the mining sector in Extremadura and Castile and Leon.
- TSSP Mining. Andalusia and Castile and Leon are members of TSSP Mining, which may facilitate the participation of regional entities in mining-related projects promoted by this partnership. It would be desirable for Alentejo and Extremadura, with a good potential for replication of I4-GREEN pilots, to join this European initiative and also have access to the benefits of this partnership.
- Grant lines. The grant lines in the four regions offer opportunities to finance R&D&I projects, although in some cases, the lack of specific support for mining in RIS3 may limit this possibility.
- Enabler ecosystems. All four regions have a database of stakeholders who can act as enablers in the approach to replication projects. Andalusia stands out, with 52 stakeholders, while Extremadura has only 5.

Analysed by region, the following recommendations can be summarized as follows:

- Alentejo. It would be convenient for this region to join as a new member of TSSP mining and benefit from the promotion of sector-related activities and projects promoted by the partnership.
- Andalusia. Andalusia is the most complete region in terms of replication cases, RIS3 and TSSP Mining membership. This region is currently the best reference for the management of mining issues.
- Extremadura. For this case, with a good mining potential in general and with sites for pilot replication, it would be convenient: 1) promote specific actions aimed at mining in the RIS3, and 2) join as a new member of the TSSP Mining.
- Castile and Leon. Castile and Leon has hardly any replication cases for I4-GREEN pilots. However, it is one of the main mining regions in Spain and therefore it would be convenient that the RIS3 contains some specific action to promote mining in some of its aspects.

It is highly recommendable in the four regions analysed to take advantage of the lines of aid for the development of R&D&I projects and involve the stakeholders identified in deliverable **D5.1** to form consortia and achieve a greater impact of the results.

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