



Strategic analysis of EU regions and mining potential and opportunities within their RIS3

D5.1 Deliverable

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		The SWOT analysis of participant EU regions will be accompanied by a matchmaking exercise to identify complementarities between the different RIS3 strategies, in order to group them and with the final goal of creating a SWOT model tailored for each region. This model will highlight both strengths and gaps, not only for RIS3 strategies but also with respect to circular economy and resource efficiency policies. The SWOT model will complement the activity of the other WPs of MIREU. Specific guidance documents for the involved regions will be suggested in order to improve their RIS3 in accordance with MIREU’s findings				
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About MIREU

The project MIREU aims to establish a network of mining and metallurgy regions across Europe with a view to ensure the sustained and sustainable supply of mineral raw materials to the EU. The network will help the regions to share knowledge and experiences when facing the challenge to establish and maintain an extractive industry. MIREU will facilitate an exchange between all interested stakeholders in the regions, namely regulatory authorities, political and administrative bodies, development agencies, mining companies, non-government organisations, as well as the general public. The project will develop a shared knowledge base, taking into account the region-specific geographic and economic features, cultural, societal and language diversity, and their historical developments. The network will also learn from experience in other regions of the World. This knowledge base will allow to understand what has been conducive and what hampering to the development of extractive and metallurgical industries. It will also provide the context for a bottom-up integration of these activities into their respective socio-economic and socio-cultural context. Development is about people and, therefore, bringing people into the decision-making procedure in order to achieve a 'social license to operate' will be a key aspect of the project. Guidelines and recommendations for actions to be taken to foster a sustained and sustainable development of the extractive industries will be developed in close co-operation with a range of selected regions from the European Union. These regions will form a nucleus and multipliers for a more extensive network beyond the life-time of the project.

Partners



Acronyms and abbreviations

CF	Cohesion Fund
EARDF	European Agricultural Rural Development Fund
EMFF	European Maritime and Fisheries Fund
ERDF	European Regional Development Fund
ESF	European Social Fund
ESIF	European Structural and Investment Funds
EU	European Union
FI	Flagship Initiative
M&M	Mining and Metallurgy
NUTS	Nomenclature des Unités Territoriales Statistiques
RDI	Research, Development and Innovation
RIS 3	Regional Innovation Strategy for Smart Specialisation
RM	Raw Materials
SWOT	Strengths, Weaknesses, Opportunities, Threats
TP (PT)	Thematic Priority
WP	Work Package
YEI	Youth Employment Initiative

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1 EXECUTIVE SUMMARY

This summary outlines the methodology and results of the work carried out in the first two tasks of MIREU's Work Package 5 (WP5):

WP5 – Identifying and promoting regional synergies for economic growth

- Task 5.1 Review of MIREU Regions' RIS3 strategies related to their assets in economic aid programmes and measures that foster market uptake and encourage replication of innovative solutions
- Task 5.2 Conduct a SWOT analysis on Smart Specialization Strategies and benchmark the regions involved

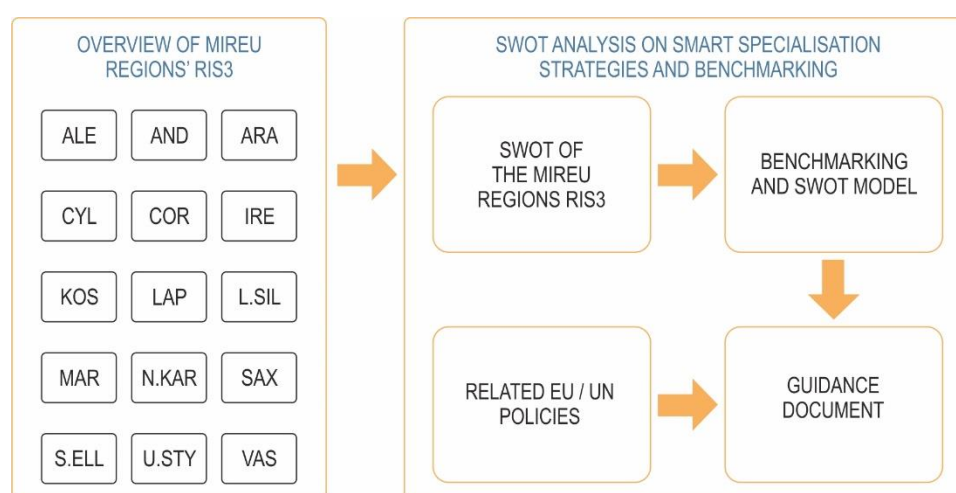
These tasks have led to the organization of D5.1 ("Strategic analysis of EU regions and mining potential and opportunities within their RIS3") in two main chapters:

- 1) Overview of RIS3 and associated information with focus on mining and metallurgy in Regional Smart Specialisation
- 2) SWOT analysis and benchmarking on Smart Specialisation Strategies

The first chapter, of a descriptive character, aims to determine key national/regional priorities, identify the challenges and needs for knowledge-based development, participation of regions in European Structural Funds (ESF) and evaluate the economic benefits of cross border collaboration (EFRD). This chapter is organised by regions, covering all of the 15 MIREU regions.

In the second chapter, of an analytic character, a SWOT analysis is performed on the regional RIS3 in those aspects related to mining and metallurgy, and on those external factors associated with this sector (mining resources, downstream processing industries and services, social concerns, workforce, policies, associations, funding capabilities, etc.). The SWOT analysis is accompanied by a matchmaking exercise to identify complementarities between the different RIS3 strategies and create a SWOT model. In addition, a short review of EU/UN raw material policies complements the regional perspective of the role of mining and metallurgy in the RIS3. Finally, a guidance document compiles the main findings of the benchmarking and raw material policies.

At a glance, D5.1 has the following internal organization:



1.1 Overview of RIS3 and associated information with focus on mining and metallurgy

1.1.1 Introduction of innovation strategies for smart specialisation (RIS3 strategies)

This chapter provides the definition of RIS3 and introduces the aim of RIS3 strategies. RIS3 strategies are relevant to EU policies, such as, Europe 2020 and EU Cohesion Policy, and EU funding, for instance, the European Regional Development Funds (ERDF) of the European Structural Investment Funds (ESIF).

Definition of Smart Specialisation

Smart Specialisation is a place-based approach characterised by the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement. It is outward-looking and embraces a broad view of innovation including but certainly not limited to technology-driven approaches, supported by effective monitoring mechanisms.

Definition and aim of RIS3 strategies

RIS3 Strategies are integrated, place-based economic transformation agendas that do five important things:

- They focus policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development.
- They build on each country/region's strengths, competitive advantages and potential for excellence.
- They support technological as well as practice-based innovation and aim to stimulate private sector investment.
- They get stakeholders fully involved and encourage innovation and experimentation.
- They are evidence-based and include sound monitoring and evaluation systems.

National and regional authorities across Europe shall design smart specialization strategies in entrepreneurial discovery process, so that the ESIF can be used more efficiently and synergies between different EU, national and regional policies as well as public and private investments can be increased. The aim of RIS3 is explained from the policy and economic rationale.

- The RIS3 policy rationale
 - To make innovation a priority for all regions
 - To focus investment and create synergies
 - To improve the innovation process
 - To improve governance and to get stakeholders more closely involved
- The RIS3 economic rationale
 - To develop and implement strategies for economic transformation
 - To respond to economic and societal challenges
 - To make regions more visible to international investors
 - To improve a region's internal and external connections
 - To avoid overlaps and replication in development strategies
 - To accumulate a “critical mass” of resources
 - To promote knowledge spill over and technological diversification

1.1.2 Regional RIS3 Strategies

According to the description of Task 5.1 in the Annex 1 (Part A) of the MIREU project, the aim of the task is “*to determine key national/regional priorities, identify the challenges and need*”

for knowledge-based development, Regions participation in European Structural Funds (ESF) (in synergy with WP6) and evaluate the economic benefits of cross-border collaboration (EFRD).

In this chapter, the priorities of the RIS3 strategies from regions of MIREU are presented with the emphasis on mining and metallurgy industries. The description of each region starts with a brief overview of the region and its RIS3 (regional/national level); for this, data generated in WP2 – Networking regions (specifically from the “Background info for SWOT analysis” documents for the different regions involved) has been used. Next, an identification exercise is carried out to summarise the thematic priorities/objectives in the fields of raw materials/mining/metallurgy for all the regions. Then the integration of structural funds and associated economic benefits is mentioned, connected to the work being developed in WP6 - R&I investments & ESIF. The current existing measures to foster market uptake are studied, followed by the identification of industrial strengths and possible symbiosis with RIS3 strategies. Finally, some conclusions for each region are included.

The source of the information to complete this review is mainly from the RIS3 Platform, the regional and national RIS3 documents, Min-Guide, information from the European Commission website (including Eye@RIS3) and presentations or documents from MIREU and REMIX projects. Additional information has been extracted from relevant Tasks being carried out in the frame of other WPs, in particular WP2 and WP6.

In this report, regions are classified by the common statistical classification of territorial units (NUTS) according to the European Commission Regulation No 1059/2003.

MIREU Regions RIS3 Summary List

This Task report is the result of an overview document related to “*RIS3 and Associated Information with Focus on Mining and Metallurgy in Regional Smart Specialisation – A Guide*”, compiled and prepared by GKZ in Q3 2018 by collecting information and outputs already available from REMIX and adding information relevant to the preparation and organization of the MIREU High-level meeting “*Governance and Policy within Mining and Metallurgy EU Regions*” that took place in León in January 2019. This workshop was the first in a series of high-level policy workshops, focusing on the future of mining and metallurgy sectors in European regions. This one-day event provided a platform for the exchange of best practices between high-level representatives of EU regions, with the aim of exploring ways for a common mining approach to raw materials in Europe and fostering discussions on sustainable mining strategies.

With the aim of compiling and comparing the information available for RIS3 strategies on all MIREU regions (including other possible MIREU regions that may join the network in the future), a preliminary exercise was carried out to list and update the different RIS3 strategies. Table 1 summarises the information.

As it can be seen from the Table 1, most of the RIS3 strategies cover the same period (2014-2020), probably in alignment with their ERDF Operational Programs. This supports the alignment of policies and strategies towards future specialization documents. Since the new/updated strategies are expected to start on 2021, the activities carried out in this Task and in the frame of MIREU are relevant in the way that the regions can use the information provided in the project in order to take appropriate measures towards the inclusion, recognition or enhancement of the position of mining & metallurgy activities as key objective or as one of their thematic priority lines.

The second conclusion to be extracted from the Table 1 is that the majority of the full RIS3 documents are only available in the local language and no English version has been published.

In some cases (3 out of 15 MIREU core regions) neither the full RIS3 document nor at least an executive summary is available in English. This is relevant since the compilation, extraction and interpretation of information must be done through other sources (additional documents, presentations in conferences, workshops, etc.) or through direct interaction with local regional authorities. This can result in delays or misinterpretations when analyzing the data. However, for the preparation of this document, the majority of MIREU regions have been very collaborative and this has allowed us to successfully compile the information for the document.

Table 1. Summary of MIREU regions and current RIS3 strategies

Country	MIREU region	RIS3 strategy (+link)	Period
PT	Alentejo	Uma Estratégia de Especialização Inteligente para o Alentejo	2014-2020
ES	Andalucía	Estrategia de Innovación de Andalucía 2020	2014-2020
ES	Aragonia	Estrategia Aragonesa de Investigación e Innovación para una Especialización Inteligente	2013-2020
ES	Castilla y León	Estrategia Regional de Investigación e Innovación para una Especialización Inteligente (RIS3) de Castilla y León	2014-2020
GB	Cornwall	Cornwall and Isles of Scilly Research, Development and Innovation Framework	2014-2020
IE	Ireland	Ireland's Smart Specialisation Strategy for Research and Innovation	2014-2020
SK	Kosice	Regionálna Inovacná Stratégia	2013-2020
FI	Lapland	Lapland's Arctic Specialisation Programme	2014-2020
PL	Lower Silesia	Strategic Framework for Smart Specialisations of Lower Silesia	2011-2020
RO	Maramures	Strategia de Specializare Inteligenta în Cercetare si Inovare Regiunea de Dezvoltare Nord-Vest (RIS3 NV)	2014-2020
FI	Northern Karelia	North Karelia's Smart Specialization Strategy	2013-2020
DE	Saxony	Innovation Strategy of the Free State of Saxony	2014-2020
GR	Stereia Ellada	RIS3 in Central Greece	2014-2020
AT	Styria	Economic Strategy Styria 2025 Growth Through Innovation	2014-2025
SE	Västerbotten	Innovationsstrategi Västerbotten	2014-2020

Summary of regional information

Finally, and before going through the individual regions, a comparative Table 2 has been prepared with overall information regarding the inclusion of mining and/or metallurgy as priorities in the regional or national RIS3. As it can be seen throughout the document, some regions do not have a national RIS3 strategy, whereas some others have both regional and national RIS3 strategies, but mining, metallurgy and/or raw materials are not included as thematic priority. In some of these regions, there is clearly a potential and historical background for mining, metallurgy and raw materials to be included as priority. The benchmarking analysis carried out in Task 5.2 is devoted to a SWOT analysis and comparative study (benchmarking) in order to highlight the strengths, weaknesses of the regions involved and suggest opportunities and threats in the mining and metallurgy fields.

Table 2 Summary of regional and national information for mining, metallurgy and raw materials

MIREU region	Regional RIS3			Regional policy in mining, metallurgy and/or raw materials sector	National RIS3			National policy in mining, metallurgy and/or raw materials sector
	Mining	Metallurgy	Potential in other priority		Mining	Metallurgy	Potential in other priority	
Alentejo, Portugal	Y	N	N		Y		Y	Y
Andalucía, Spain	Y	Y	Y	Y	(-)	(-)	(-)	(Y) – Spanish Strategy for Science, Technology and Innovation
Aragon, Spain				(Y) - Analysis and principles of the industrial strategy in Aragón	(-)	(-)	(-)	(Y) – Spanish Strategy for Science, Technology and Innovation
Castilla y León, Spain	Y	Y	Y	Y	(-)	(-)	(-)	(Y) – Spanish Strategy for Science, Technology and Innovation
Cornwall, UK			Y					
Ireland								
Košice, Slovakia		Y				Y		(Y) – National Regional Development Strategy of the Slovak Republic
Lapland, Finland			Y	(Y) – regional industrial strategy	(-)	(-)	(-)	Y
Lower Silesia, Poland	Y	Y		(Y) – regional development strategy (unclear)	Y	Y		
Maramures, Romania								Y
North Karelia, Finland	Y	Y			(-)	(-)	(-)	Y
Saxony, Germany			Y	Y			Y	Y
Stereia Ellada, Greece			Y			Y		
Styria, Austria								Y
Västerbotten, Sweden	Y	Y		Y	Y	Y		Y

* Y: Included in the policy/strategy

** (Y): Included in a general policy/strategy

*** Blank: Not included in the policy/strategy

**** (-): Indicates there is no RIS3 at the national level

***** (unclear): Found potentially relevant policy/strategy but unable to access due to language barrier

1.2 SWOT analysis and benchmarking on RIS3 strategies

1.2.1 SWOT analysis

According to the description of Task 5.2 in the Annex 1 (Part A) of the MIREU project, the purpose of this task is: *conduct a SWOT analysis on Smart Specialization Strategies and benchmarking of the regions involved; performance of a SWOT analysis on RIS3, ESF, EFRD capabilities, target markets and EU priorities as well as on associated development and transformation-oriented policies (green economy, research, consultancy, technology and creative services) for mining and metallurgy regions at the regional level.*

This Task 5.2, together with Task 5.1, matches the first objective of Work package 5: *to review RIS3 Smart Specialization Strategies of the MIREU regions concerning their assets in economic aid programmes, measures that foster market uptake and replication of innovative solutions, and strategies focusing on economic transition.*

In view of the above, the SWOT analysis was planned as a way to identify different factors to take into account to achieve the optimum integration of mining and metallurgy (M&M) in the Smart Specialization Strategy RIS3, in line with the existing development policies at regional/national level, and enable access to funds to foster the sector according to their capabilities or limitations.

Some of these factors have been identified by means of the internal analysis of the current consideration of M&M in the RIS3. These factors have been classified as strengths and weaknesses. In this approach, the internal analysis reflects the extent to which M&M is currently integrated in the RIS3, considering those stages of the raw material life cycle or related aspects covered by the RIS3 as strengths and, in principle, those that are not considered as weaknesses.

Some others have been identified by performing an external analysis (out of the RIS3) of the political, economic, social and technological framework, covering mining resources and markets, downstream processing industries and services, social concerns, workforce, policies at different levels, associations, funding capabilities, etc. These factors have been classified as opportunities and threats, in the sense that they could reinforce/justify (opportunities) or hamper (threats) a greater presence of M&M in the RIS3 and should orientate towards the questions on which the RIS3 the focus.

In short, the internal analysis reflects what there is of mining and metallurgy in the RIS3, and the external points out what aspects should be considered.

As the internal analysis depends on the presence of mining & metallurgy sector in the RIS3, a first group of regions in which this sector is specifically addressed has been selected to perform a complete SWOT analysis. These regions are:

- | | |
|-------------------|----------|
| - Alentejo | PORTUGAL |
| - Andalucía | SPAIN |
| - Castilla y León | SPAIN |
| - Kosice | SLOVAKIA |
| - Lapland | FINLAND |
| - Lower Silesia | POLAND |
| - North Karelia | FINLAND |
| - Saxony | GERMANY |
| - Västerbotten | SWEDEN |

In this case, SWOTs have been carried out by the Task partners: SIEMCALSA, ICAMCyL, GKZ, NOVA ID and NTUA.

On the other hand, the remaining MIREU regions have been invited to participate voluntarily, according to their interest in this question, by performing the external analysis. Three regions have participated in this analysis:

- Aragón SPAIN
- Sterea Ellada GREECE
- Upper Styria AUSTRIA

Thus, the SWOT analysis, either the complete one or only the external one, has been performed in 12 out of the 15 MIREU regions.

1.2.2 Benchmarking and SWOT model

According to the description of Task 5.2 in the Annex 1 (Part A) of the MIREU project: *the SWOT analysis of participant EU regions will be accompanied by a matchmaking exercise to identify complementarities between the different RIS3 strategies, in order to group them and with the final goal of creating a SWOT model tailored for each region. This model will highlight both strengths and gaps, not only for RIS3 strategies but also with respect to circular economy and resource efficiency policies.*

In view of the above, the work was organised in two phases: in the first one, a benchmarking exercise was performed by comparing and classifying different aspects pointed out by the regions in their respective SWOT/external analysis; as result, four tables have been prepared for strengths, weaknesses, opportunities and threats, grouping in each one the different aspects pointed out by the regions into categories. Then, in a second phase, each region has identified, by comparing with the others, possible gaps or aspects not considered in their previous SWOT analysis; this work has allowed the former tables to be filled out to a greater extent, highlighting the most relevant aspects related to RIS3 strategies, circular economy and resource efficiency policies.

These tables constitute the SWOT model from which each region, using the framework defined from the MIREU regions perspective, can analyze the mining and metallurgy sector in order to include the most suitable aspects and highlight strenghts and gaps, not only in the RIS3 but also in the circular economy and resource efficiency policies.

A summary of the different categories of subjects and aspects described in the benchmarking tables is shown in Table 3.

STRENGTHS

Strengths identified in this analysis are defined as those aspects of the mining and metallurgy sector that are addressed in the RIS3. In accordance with the RIS3 studied, the main findings are:

- Mining: is mainly addressed at the stage of extraction and (to a lesser extent) exploration, usually looking for innovative, efficient and sustainable processes or technologies. Additionally, actions focused on the strategic diversification and digitalisation of all relevant geological data have been pointed out in some regions (Alentejo, Saxony).
 - Processing: (including metallurgy) is included in the regional RIS3 with a general focus on technologies or expertise, in some cases with a specific interest on efficiency (Castilla y León) and with a interest in the development of new products. Also, actions related with aumation and material engineering have been described in some regions
-

(Kosice, N Karelia). Lower Silesia RIS3 has as well specific actions focused on thermal/mineral waters.

- Recycling: is tackled in most of the cases, covering both the promotion of the use of waste and technologies for recycling. In Lapland, recycling activities are included in the broader context of the Arctic Circular Economy.
- Rehabilitation: (of mining areas) is seen from two points of view: the environmental concerns (with actions to monitor, use of mining dumps and recover affected areas) and the promotion of the mining heritage (specifically addressed in Andalucía but likely assumable in other regions as cultural heritage).
- Social issues: mining is linked in some regions (e.g. Castilla y León) to the policy of taking advantage of the endogenous resources as basis of the sustainability of the territory; this is closely related with demographic problems (ageing of population, depopulation) in low population density areas. In the RIS3 of some regions (Andalucía) the creation of conditions to optimise the use of these endogenous resources is also addressed. It is worth mentioning this perspective as it represents a different approach, looking for the use of endogenous resources as a way to keep the territory alive, instead of the before mentioned perspective of increasing the efficiency of processes or developing new products.
- Business: some RIS3 plan to reinforce the technological transfer to the companies and, in one case (Alentejo), to strengthen the value chain by clustering of mineral resources. Likewise, in Lapland, the mineral and metallurgy sector could be reinforced by the planned new platforms for business.

WEAKNESSES

Weaknesses identified in this analysis are defined as those aspects of mining and metallurgy that, from the perspective of the partners involved in this work, are missing in the RIS3 studied. The most remarkable aspects are:

- Mining: regarding the mining activity, mining exploration is a basic stage missing in the RIS3 of several regions; although there are regions that recognize a lack of alternatives to the current mining (see threats), some others have a strong mining potential (e.g. in the Iberian and Scandinavian peninsulas) and their RIS3 could perfectly address the mining exploration as an important way to find new raw materials for the EU industry.
- Processing: in the related processing industry, two main aspects have been pointed out as weaknesses: the lack of RDI or technologies to increase efficiency, productivity or competitiveness, and the lack of support to develop downstream industries.
- Rehabilitation: some regional representatives are missing strategies to take advantage of the mining heritage. Alentejo has also pointed out the lack of environmental strategies to recover the mining legacy.
- Social issues: some regions have pointed out as weaknesses the lack of support to integrate mining and metallurgy in the socioeconomic model, overcoming problems of social acceptance.
- Administration: the lack of actions to enable an efficient access to resources, overcoming administrative problems of permitting procedures, has been considered as weakness in some regions. In addition, as Lower Silesia has pointed out (but probably occurs in other regions), there is certain lack of concordance or synchrony between the RIS3 and other policies.
- Business: Alentejo and Saxony have remarked the insufficient support to transfer knowledge to companies. Likewise, Kosice misses a mention to promote mining and metallurgy clusters.

- Funding: specific funding for some mining or metallurgy aspects described in the RIS3 are also missing.
- RIS3 management: finally, some criticism has arisen in several regions about the RIS3: vague definitions, lack of implementation programs, insufficient monitoring or inadequate promotion are some of the deficiencies pointed out by the regional representatives.

OPPORTUNITIES

Opportunities are regarded in this SWOT analysis as a way to justify a greater presence of mining and metallurgy in the regional RIS3. The main opportunities could be summarized as follows:

- Mining: the current and potential assets in mining, highlighted in all regions, represent ongoing or future economic activities in which it is worth investing in RDI to obtain greater returns, especially when these assets are critical to ensure a stable supply of raw materials to the European industry. Market trends point to the need of raw materials for the development of electromobility and low carbon energies, the growth of international metal trade or the supply or substitution of critical raw materials; all these issues require new and innovative mining and metallurgy projects, justifying a greater attention from the RIS3.
 - Processing: assets in the related processing industry are very important in some regions with a well-developed metallurgy industry, such as the Northern and Central European ones and Sterea Ellada, but also comprise the strong position of some regions as providers of equipment, technology and expertise, as is the case of Lapland, North Karelia and Västerbotten.
 - Recycling: in addition, most of the regions have recycling industries and available waste. Both aspects represent activities in which it is worth investing in RDI.
 - Rehabilitation: mining heritage represent an opportunity to take advantage of the mining sites beyond their end of life, as is already a reality in some regions (e.g. Alentejo, Castilla y León, Saxony, Sterea Ellada). The development of environmental technologies is also an opportunity to correct impacts related to mining activities.
 - Social issues: several regions have mentioned the mining tradition, as this activity is already integrated in regional socio-economics and a support from the RIS3 can be expected. The concern about depopulation in some regions is seen as a possible motive to take advantage of the endogenous resources, including the mineral ones. The social acceptance of mining and metallurgy means that any support to this sector will be accepted and understood; in relation to this, activities to raise awareness about the need of mining and metallurgy to obtain raw materials are ongoing or planned in some regions (e.g. Saxony, Styria, Andalucía).
 - Administration: the existence of policies at different levels promoting the mining and metallurgy activity, such as the Mining / Raw Materials Strategies, is seen as an opportunity as they could have a logical continuity in the RIS3. Mining hubs (as in Lapland, Lower Silesia, N Karelia or Saxony) and specific entities related with the administration could act as drivers for investments in this sector. Finally, the participation of the regional administration or related entities in European projects, like MIREU or REMIX, represents an opportunity to broaden perspectives and organize funding in a more effective way.
 - Business: clusters and associations can advise about needs and opportunities of RDI in the mining and metallurgy sector, improving the efficiency of the RIS3 funding.
 - Skilled workforce: universities with mining engineering or geology degrees, training centers focused on raw materials and the related skilled workforce also represent an asset and could be used as drivers for investments in innovation.
-

- Funding: the access to EU funds, sometimes by means of specific programs or institutions, is seen in most regions as an opportunity to finance RDI in the mining and metallurgy sector.

THREATS

With the same approach used for opportunities, threats are identified in this analysis as those aspects that could hamper a greater presence of mining and metallurgy in the RIS3. The main threats identified in the SWOT analysis are:

- Mining: closure of mines, depletion of resources, lack of alternatives in some regions or problems in the mining context (e.g. volatile markets, lack of infrastructures) are seen as factors that can make this sector less attractive to RDI investments.
- Processing: in the same way, an underdeveloped value chain could limit the impact of mining in the regional economy and discourage eventual investments in the sector.
- Rehabilitation: environmental problems related with the mining and metallurgy sector (emissions, wastes, hazards) could represent a hindrance.
- Social issues: the social opposition to mining and metallurgy or the competition with other economic activities (e.g. rural tourism) could act as a major obstacle for new projects. This is closely related with the lack of social awareness about the need for raw materials, the biased education described in some regions and the negative image of mining, which threatens to perpetuate and expand such opposition.
- Administration: the lack of specific policies or political support is another potential challenge that could hinder the development of possible related programs in the RIS3. In addition, restrictive land use plans (ignoring the mining potential and promoting alternative activities), together with long and complex permitting procedures (with strict environmental regulations) sometimes represent a real problem to developing mining projects.
- Business: business policies and concerns talk about problems (especially related with costs) that companies have to face and cannot be solved by RDI investment through the RIS3. Lack of automation, new exploration technologies or cluster activities have also been pointed out by some regions.
- Skilled workforce: in the same way, lack of skilled workforce due to different causes (demography regression, ageing of working population, workers leaving to other regions/sectors, sliding number of students, etc.) could represent a problem to developing mining or metallurgy activities.
- Funding: finally, some regions remark a lack of funds or regional programs specifically addressed to mining and metallurgy.

Table 3 Subjects and aspects describe d in the benchmarking tables

SUBJECT	Aspect	S	W	O	T
MINING	Current extractive industries	X		X	X
	Exploration	X	X	X	
	Mining potential			X	X
	Location			X	
	Infrastructures	X		X	X
	Markets			X	X
PROCESSING	Current processing industries			X	
	Technologies and expertise	X			
	Machinery and engineering	X			
	Service providers			X	
	Efficiency and competitiveness		X		
	New products	X		X	
	Downstream industry		X		X
	Waters	X			
RECYCLING	Waste recovery, recycling	X		X	
REHABILITATION	Environment	X	X		X
	Mining heritage	X	X	X	
	Intertwining			X	
SOCIAL ISSUES	Tradition			X	
	Endogenous resources	X		X	
	Activity in RM programmes			X	
	Compatibility with local economy				X
	Social acceptance		X	X	X
	Arising awareness			X	X
ADMINISTRATION	General (industry, development)			X	
	Mineral strategies			X	X
	Related entities			X	
	Mining hubs/centres			X	
	RDI experiences			X	
	Admin in EU mining projects			X	
	Access to res. (land use planning)			X	
	Permitting procedures		X		X
	Taxes		X		
BUSINESS	Companies	X			X
	Supplies				X
	Associations and clusters	X	X	X	X
	Technology/knowledge transfer	X	X		
	Costs				X
SKILLED WORKFORCE	Universities			X	
	Training centers			X	
	Demand and availability			X	X
FUNDING			X	X	X
RIS3 MANAGEMENT	Definition		X		
	Coordination		X		
	Governance system		X		
	Implementation		X		

1.2.3 Related EU / UN policies

This document does not intend to be a guide in a strict sense. Rather, it is a reminder of the some important European and UN policies that should be considered to include in a proper way mining and metallurgy in the RIS3. Thus, the following policies/bodies have been reviewed:

- Raw Materials Initiative (RMI)
- Critical Raw Materials (CRM)
- European Innovation Partnership on Raw Materials
- European Institute of Innovation and Technology (EIT-RM)
- Resource Efficient Europe (REE)
- Innovation Union (IU)
- Circular Economy Action Plan
- EU Industrial Policy
- Raw Materials Scoreboard
- S3 Platform
- UN Sustainable Development Goals

From the review of these documents, some conclusions should be taken into account in the Guidance Document, together with the conclusions obtained from the benchmarking analysis.

1.2.4 Guidance Document

According to the description of Task 5.2 in the Annex 1 (Part A) of the MIREU project: *Specific guidance documents for the involved regions will be suggested in order to improve their RIS3 in accordance with MIREU's findings.*

Instead of different guidance documents for each region, a single guidance document has been prepared, summarizing in a dozen recommendations the SWOT model findings and the conclusions of the reviewed EU/UN policies. Thus, each region can take into consideration the most suitable perspectives to improve its RIS3 in relation to the mining and metallurgy sector by reinforcing strengths, correcting weaknesses, taking advantage of opportunities and avoiding threats, and taking into account the main EU/UN policies relating to raw materials.

a) Harness the mineral potential

Mining exploration is the basic stage to provide primary raw materials to the industry. Some of the RIS3 studied pay attention to this issue (sustainable or innovative technologies/processes in mining exploration) and the lack of this in the RIS3 is considered a weakness by some regional representatives.

According to the Raw Materials Scoreboard, the EU has the potential to increase its capacity to source raw materials domestically; however, the mineral potential is underexplored. Mineral potential is not equally distributed throughout the EU because it depends on the geology; thus, there are areas, such as the Iberian and Scandinavian peninsulas or Ireland, with a higher mineral potential than others. Regions have pointed out this potential as an opportunity, as well as the existence of advanced exploration mining projects.

On the other hand, there are minerals much more important than others in accordance to their use, availability and market conditions; the best examples are the Critical Raw Materials, but also the materials for renewable and low-carbon energy componentry (see Sustainable Development Goals).

For all that, the regional innovation strategies should pay attention to the mineral potential, especially in those highly prospective regions from a geological point of view or with potential

for highly valued raw materials; in this sense, mining exploration should be taken into account to ensure the stable supply of raw materials to the EU industry.

b) Facilitate access to endogenous resources

Some RIS3 foresee actions to take advantage of the endogenous resources; this perspective has a social component since the economic activities linked to the endogenous resources contribute to maintaining population in rural areas, an issue of particular interest in depopulated regions. In this sense, the mineral assets as geology-linked and non-relocatable resources, can be considered as endogenous resources.

Mineral resources must be exploited where they are and an effective and secure access to land is needed. However, long and complex permitting procedures and restrictive land use planning have been described in the studied regions as a threat, and the lack of related activities in the RIS3 is considered a weakness. In an EU context, one of the conclusions of the Raw Materials Initiative is about the need for an improved regulatory framework to access the land; likewise, a stable and efficient mineral policy framework is described in the RM Scoreboard as a crucial condition to encourage mining developments.

Therefore, creating conditions to optimise the use of mineral or (more generic) endogenous resources, as is already planned in some RIS3, could be an action to be included in the regional innovation strategies of the MIREU regions.

c) Promote social acceptance for mining and metallurgy

Problems of social acceptance to the integration of mining in the socioeconomic model could represent an obstacle to the development of mining projects; this issue is considered by several regions as a threat, and the lack of support in the RIS3 in this regard as a weakness. This issue is related to the lack of awareness about the need for raw materials to keep the modern way of life. As in the previous point, RIS3 could provide a support to avoid these problems by creating conditions to gain the social acceptance for mining and metallurgy industries and integrate these activities in the local economic models.

d) Promote the rehabilitation of mining areas

Here there are two perspectives: environmental aspects and mining heritage. In the first one, problems related to mining residues have been described as a threat for future mining activities; some regions have already focussed on environmental aspects of mining in their RIS3 (recover degraded mining areas, monitor threats to environment, use of dumps), but likely they could be addressed as well in the RIS3 of other regions.

The second aspect, clearly linked with the environmental recovery, represents a way of taking advantage of the mining sites beyond the mining activity. This has only been promoted in the RIS3 of one region but can be included in some others as cultural heritage; actually, several regions see the exclusion of this aspect as a weakness of their RIS3, and many of them have remarked their heritage assets as opportunity. The promotion of the mining heritage by means of the RIS3 is a way to harness possible endogenous assets easily linkable to cultural aspects or touristic resources. Likewise, this subject would coincide with the Sustainable Development Goals.

e) Promote recycling

Several RIS3 have considered the promotion of the use of waste and the development of technologies for recycling and recovery as part of their priorities. Furthermore, most regions have pointed out the existence of recycling industries or the availability of residues as an opportunity. The use of secondary raw materials and recycling are activities to be promoted

according to the Raw Materials Initiative and could contribute to the achievement of the Sustainable Development Goals (circular economy). The RM Scoreboard highlights, in addition, the low recycling rates for most wastes and scraps in the EU.

Taking into account all these elements, it seems that it is worth reinforcing the use and management of waste and recycling technologies in the RIS3, promoting the innovation in such a suitable field of work.

f) Increase efficiency and sustainability

Both concepts are present in the RIS3 of some of the studied regions (see strengths). Some others have pointed out a lack of RDI or technologies to increase efficiency (see weaknesses). Efficiency and sustainability along the full life cycle of raw materials are also among the conclusions of the Raw Materials Initiative and linked with the Sustainable Development Goals.

It should therefore be a general objective of the RIS3 of the mining and metallurgy regions to improve, by means of the innovation, the efficiency and sustainability of technologies and processes along the full life cycle of raw materials: extraction and processing of primary raw materials and in the recycling industries. This could complement, at the regional level and according to the regional assets, those innovation-related actions promoted by the EU through funding programs such as H2020, Interreg, etc.

Again, as was pointed out in mineral potential, priority should be placed on obtaining highly valued elements such as the EU critical raw materials.

g) Develop the value chain

Some regions have pointed out as a weakness of their RIS3 the lack of support to the development of downstream industries; this is particularly clear when the mineral raw materials, with hardly any processing, are exported. In this sense, the RIS3 can support a wider development of the value chain from the endogenous resources by promoting the creation of downstream industries or the clustering of mineral resources. It is worth mentioning here, as is said in the Raw Materials Scoreboard, the huge capacity to generate wealth and employment in manufacturing sectors from the supply of raw materials.

An additional aspect with regard to the processing industries is the development of new products or materials; thus, several regions have included in their RIS3 this objective among their priorities. This is an issue with a clear innovative character that can be reinforced or expanded to other regional innovation strategies.

h) Reinforce the leadership in equipment and technologies

Some regions have pointed out as an opportunity their strong position as providers of equipment, technology and expertise for mining and metallurgy. As is said in the Raw Materials Scoreboard, the EU has been the world leading exporter of mining equipment (including technologies) in this decade. It is worth highlighting this field of specialization of the EU that should be reinforced by means of the RIS3 in the most suitable regions.

i) Generate and transfer knowledge

This point is part of the RIS3 actions of some regions, leading to the reinforcement of the regional technology transfer systems or vouchers. In this sense, the existence of universities, training centers and specific RDI entities related with mining and metallurgy have been pointed out by the regions as an opportunity, and should be reinforced as vehicles to generate knowledge and technological innovation. Industrial associations, clusters and hubs, pointed out as opportunities in several regions, could facilitate the transfer of the RDI results to the industry.

j) Coordinate the RIS3 with other strategies

Most of the regions studied have regional or national development strategies, industrial strategies and mineral strategies, even though lack of specific plans supporting the mining sector have been pointed out in some regions. These strategies are seen as an opportunity as they define the lines of action with regard to the promotion of mining and metallurgy. These aligned policies should have a projection on the regional innovation strategies, in such a way that the RIS3 could provide access to resources for innovation.

k) Take advantage from the European experiences

The regional administration of the MIREU regions participate directly or indirectly in European funded projects such as MIREU, REMIX, MINLEX, INFACIT, MINAREA, etc. and, in some cases, in S3 Thematic Platforms. These activities, considered as an opportunity by most regions, represent an occasion to share experiences and learn from each other, and the conclusions obtained from these are highly valuable for improving the RIS3 in relation to mining and metallurgy.

l) Improve RIS3 implementation and funding

Some criticism about the RIS3, at least regarding the mining and metallurgy aspects included in such strategies, have arisen in the SWOT analysis: vague or unspecific definitions of some actions, lack of inter-ministerial coordination, lack of programs to implement actions, insufficient monitoring, inadequate promotion, etc., are some of them. Likewise, lack of budget to implement planned actions has been pointed out in some regions as a weakness, although many regions have highlighted funding opportunities for the mining and metallurgical sector. It seems, therefore, that there is room to improve and make the RIS3 more efficient.

2 INTRODUCTION

2.1 Purpose

The purpose of this deliverable D5.1 is:

- To identify RIS3 priorities related to mining/metallurgy, available structural funds and existing measures to foster market uptake
- To identify industrial strengths and their possible symbiosis with the RIS3
- To perform regional SWOT and create a SWOT model to highlight both strengths and gaps in the RIS3 in relation to the mining and metallurgy sector
- To provide a guidance to improve the RIS3 in those aspects related to mining and metallurgy, in accordance with MIREU's findings

2.2 Contributions of partners

Five MIREU partners participating in WP5 have been directly engaged in the drafting of this document:

- SIEMCALSA (Ramón Cabrera & José Manuel Gómez): drafting of chapters 1, 2, 4.1, 4.3, 4.4, 4.5, 5 and 6; overview and SWOT analysis on Castilla y León (chapters 3.2.6 and 4.2.4), North Karelia (chapters 3.2.13 and 4.2.8) and Västerbotten (chapters 3.2.17 and 4.2.12).
- ICAMCYL (Jorge Pérez & Ana Losa): drafting of chapters 1 and 3.1; overview and SWOT analysis on Andalucía (chapters 3.2.4 and 4.2.2), Kosice (chapters 3.2.9 and 4.2.5) and Lapland (chapters 3.2.10 and 4.2.6)
- GKZ (Meng Chun Lee & Dorothée Grünholz): overview and SWOT analysis on Lower Silesia (chapters 3.2.11 and 4.2.7) and Saxony (chapters 3.2.14 and 4.2.9)
- NOVA ID (Rute Martins & Alexandra Ribeiro): overview and SWOT analysis on Alentejo (chapters 3.2.3 and 4.2.1)
- NTUA (Chrysa Panagiotopoulou & Maria Taxiarchou): overview and SWOT analysis on Sterea Ellada (chapters 3.2.15 and 4.2.10).

ICAMCYL and SIEMCALSA, as respective leaders of Tasks 5.1 and 5.2, have designed the general deliverable structure and have been in charge of the composition of chapters 3 and 4 respectively; in both, these entities and the remaining partners have provided information related to their RIS3 and have performed the regional SWOT analysis.

In addition, out of WP5, several MIREU partners have contributed in several ways: performing the external analysis (SWOT was limited to an external analysis in some regions, as explained in chapter 4), reviewing the SWOT analysis performed by the before mentioned partners and reviewing the benchmarking tables. Partners participating in some of these ways have been:

- DGEyM (Alfonso Arroyo & Miguel Martínez de Paz): review of the SWOT analysis on Castilla y León (chapter 4.2.4)
- IAF (Rafael Sánchez): performance of the external analysis on Aragón (chapter 4.2.3)
- RVN (Jörgen Niemann): review of the SWOT analysis on Västerbotten (chapter 4.2.12)
- UMWD-IRT (Jan Blachowski): review of the SWOT on Lower Silesia (chapter 4.2.7)
- VESTE (Gerfried Tiffner): performance of the external analysis on Styria (chapter 4.2.11) and review of the benchmarking tables (chapter 4.2.13)

2.3 Baseline

The baseline of this work is basically the Regional Innovation Strategy (RIS3) of the MIREU regions. However, a document prepared by GKZ has provided elaborated information concerning the RIS3 and its relationship with the mining and metallurgy sector: *RIS3 and Associated Information with Focus on Mining and Metallurgy in Regional Smart Specialisation – A Guide*. This document, prepared in 2018 by collecting information and outputs already available from REMIX project, shows the definition of RIS3, introduces the aim of RIS3 strategies and provides valuable information of the regional RIS3.

Table 4. Participation in MIREU and/or REMIX projects of the regions mentioned in this document

Region	Country	MIREU	REMIX
Alentejo	Portugal	√	-
Andalucía	Spain	√	-
Aragón	Spain	√	-
Castilla y León	Spain	√	√
Cornwall	United Kingdom	√	√
-	Ireland	√	-
Kosice	Slovakia	√	-
Lapland	Finland	√	√
Lower Silesia	Poland	√	√
Maramures	Romania	√	-
North Karelia	Finland	√	√
Saxony	Germany	√	√
Stereia Ellada	Greece	√	√
Styria	Austria	√	√
Vasterbötten	Sweden	√	-

2.4 Relations to other activities

This work is closely related with MIREU's WP6: *R&I investments & ESIF*. Specifically, as mentioned in the description of WP5 Task 5.1 (see Annex 1, part A of the MIREU project), the participation of regions in European Structural Funds (ESF) is planned to do in synergy with WP6.

RIS3 strategies are relevant to EU policies, such as, Europe 2020 and EU Cohesion Policy, and EU funding, for instance, the European Regional Development Funds (ERDF) of the European Structural Investment Funds (ESIF).

3 OVERVIEW OF RIS3 AND ASSOCIATED INFORMATION WITH FOCUS ON MINING AND METALLURGY IN REGIONAL SMART SPECIALISATION – A GUIDE

3.1 Introduction of National/Regional Innovation Strategies for Smart Specialisation (RIS3 Strategies)¹

This chapter provides the definition of RIS3 and introduces the aim of RIS3 strategies. RIS3 strategies is relevant to EU policies, such as, Europe 2020 and EU Cohesion Policy, and EU funding, for instance, the European Regional Development Funds (ERDF) of the European Structural Investment Funds (ESIF).

3.1.1 Definition of Smart Specialisation

Smart Specialisation is a place-based approach characterised by the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement. It is outward-looking and embraces a broad view of innovation including but certainly not limited to technology-driven approaches, supported by effective monitoring mechanisms.²

3.1.2 Definition of RIS3

RIS3 Strategies are **integrated, place-based economic transformation** agendas that do five important things:

- They **focus policy support and investments on key national/regional priorities**, challenges and needs for knowledge-based development.
- They **build on each country/region's strengths, competitive advantages and potential for excellence**.
- They support technological as well as practice-based innovation and **aim to stimulate private sector investment**.
- They **get stakeholders fully involved and encourage innovation and experimentation**.
- They are **evidence-based and include sound monitoring** and evaluation systems.

3.1.3 The aim of RIS3 strategies

National and regional authorities across Europe **shall design smart specialization strategies in entrepreneurial discovery process**, so that the ESIF can be used **more efficiently and synergies** between different EU, national and regional policies as well as public and private investments can be **increased**.

The aim of RIS3 is explained from the policy rationale and economic rationale.

- The RIS3 policy rationale
 - To make innovation a priority for all regions

¹ European Commission (2014) National/Regional Innovation Strategies for Smart Specialisation (RIS3) Cohesion Policy 2014-2020

² EC Smart Specialisation Platform <http://s3platform.jrc.ec.europa.eu/what-is-smart-specialisation-> (retrieved 15/11/18)

- Integrated RIS3 strategies respond to complex development challenges by adapting the policy to the regional context (Considering the interrelation between smart, sustainable and inclusive growth)
 - RIS3 supports the creation of knowledge-based jobs and growth in both the leading R&I hubs and less developed/rural regions
 - RIS3 is a key part of the proposed EU Cohesion Policy reform supporting thematic concentration and reinforcing strategic programming and performance orientation
 - To focus investment and create synergies
 - Focus economic development efforts and investments on each region's relative strengths, exploiting its economic opportunities and emerging trends
 - RIS3 ensures synergies between European policies and funding, complementing national and regional schemes and private investment
 - To improve the innovation process
 - RIS3 requires smart, strategic choices and evidence-based policy making
 - To improve governance and to get stakeholders more closely involved
 - The RIS3 economic rationale
 - To develop and implement strategies for economic transformation
 - RIS3 requires an integrated and place-based approach to policy design and delivery. Policies must be tailored to the local context, acknowledge that there are different pathways for regional innovation and development. These include:
 - Rejuvenating traditional sectors through higher value-added activities and new market niches
 - Modernising by adopting and disseminating new technologies
 - Diversifying technologically from existing specialisations into related fields
 - Developing new economic activities through radical technological change and breakthrough innovations
 - Exploiting new forms of innovation such as open and user-led innovation, social innovation and service innovation
 - To respond to economic and societal challenges
 - Global competition: Most regions can only acquire a real competitive edge by finding niches or by mainstreaming new technology into traditional industries and exploiting their “smart” regional potential
 - To make regions more visible to international investors
 - By focusing on what gives a region its greatest competitive potential, smart specialisation helps position the region in specific global markets/niches and international value chains
 - To attract private investment and to get the attention of international investors it is important to brand support to help strengthen this specialisation
 - To improve a region's internal and external connections
 - Improving internal connections has long been a trademark of innovation policy
 - Regions also need to be outward looking, to position themselves in European and global value chains and to improve their connections and cooperation with other regions, clusters and innovation players.
 - To avoid overlaps and replication in development strategies
 - To accumulate a “critical mass” of resources
 - To promote knowledge spill over and technological diversification
-

3.2 Regional RIS3 Strategies

In this chapter, the priorities of the RIS3 strategies from regions of MIREU are presented with the emphasis on mining and metallurgy industries. The description of each region starts with a brief overview of the region and its RIS3 (regional/national level); for this, data generated in WP2 – Networking regions (specifically from the “Background info for SWOT analysis” documents for the different regions involved) has been used. Next, an identification exercise is carried out to summarise the thematic priorities/objectives in the fields of raw materials/mining/metallurgy for all the regions. Then the integration of structural funds and associated economic benefits is mentioned, connected to the work being developed in WP6 - R&I investments & ESIF. The current existing measures to foster market uptake are studied, followed by the identification of industrial strengths and possible symbiosis with RIS3 strategies. Finally, some conclusions for each region are included.

The source of the information to complete this review is mainly from the RIS3 Platform, the regional and national RIS3 documents, Min-Guide, information from the European Commission website (including Eye@RIS3) and presentations or documents from MIREU and REMIX projects. Additional information has been extracted from relevant Tasks being carried out in the frame of other WPs, in particular WP2 and WP6.

3.2.1 Structure of the regional information

In this report, regions are classified by the common statistical classification of territorial units (NUTS) according to the European Commission Regulation No 1059/2003. The NUTS classification subdivides the economic territory of the Member States into territorial units. It ascribes to each territorial unit a specific code and name. The NUTS classification is hierarchical. It subdivides each Member State into NUTS level 1 territorial units, each of which is subdivided into NUTS level 2 territorial units, these in turn each being subdivided into NUTS level 3 territorial units. It should be noted that at the same NUTS level, two different territorial units in the same Member State may not be identified by the same name. ³

Regarding the classification criteria, existing administrative units within the Member States shall constitute the first criterion used for the definition of territorial units. The ‘administrative unit’ shall mean a geographical area with an administrative authority that has the power to take administrative or policy decisions for that area within the legal and institutional framework of the Member State. In order to establish the relevant NUTS level in which a given class of administrative units in a Member State is to be classified, the average size of this class of administrative units in the Member State shall lie within the following population thresholds: ⁴

Level	Minimum	Maximum
NUTS 1	3 million	7 million
NUTS 2	800 000	3 million
NUTS 3	150 000	800 000

³ REGULATION (EC) No 1059/2003 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003R1059-20180118&from=EN>

⁴ REGULATION (EC) No 1059/2003 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003R1059-20180118&from=EN>

3.2.2 MIREU Regions RIS3 Summary List

This Task report is the result of an overview document related to “*RIS3 and Associated Information with Focus on Mining and Metallurgy in Regional Smart Specialisation – A Guide*”, compiled and prepared by GKZ in Q3 2018 by collecting information and outputs already available from REMIX and adding information relevant to the preparation and organization of the MIREU High-level meeting “*Governance and Policy within Mining and Metallurgy EU Regions*” that took place in León in January 2019. This workshop was the first in a series of high-level policy workshops, focusing on the future of mining and metallurgy sectors in European regions. This one-day event provided a platform for the exchange of best practices between high-level representatives of EU regions, with the aim of exploring ways for a common mining approach to raw materials in Europe and fostering discussions on sustainable mining strategies.

With the aim of compiling and comparing the information available for RIS3 strategies on all MIREU regions (including other possible MIREU regions that may join the network in the future), a preliminary exercise was carried out to list and update the different RIS3 strategies. Table 4 summarises the information:

As it can be seen from the Table 4, most of the RIS3 strategies cover the same period (2014-2020), probably in alignment with their ERDF Operational Programmes. This supports the alignment of policies and strategies towards future specialization documents. Since the new/updated strategies are expected to start on 2021, the activities carried out in this Task and in the frame of MIREU are relevant in the way that the regions can use the information provided in the project in order to take appropriate measures towards the inclusion, recognition or enhancement of the position of mining & metallurgy activities as key objective or as one of their thematic priority lines.

The second conclusion to be extracted from the Table 4 is that the majority of the full RIS3 documents are only available in the local language and no English version has been published. In some cases (3 out of 15 MIREU core regions) neither the full RIS3 document or at least an executive summary is available in English. This is relevant since the compilation, extraction and interpretation of information must be done through other sources (additional documents, presentations in conferences, workshops, etc.) or through direct interaction with local regional authorities. This can result in delays or misinterpretations when analyzing the data. However, for the preparation of this document, the majority of MIREU regions have been very collaborative and this has allowed us to successfully compile the information for the document.

Finally, and before going through the individual regions, a comparative Table 5 has been prepared with overall information regarding the inclusion of mining and/or metallurgy as priorities in the regional or national RIS3. As it can be seen throughout the document, some regions do not have a national RIS3 strategy, whereas some others have both regional and national RIS3 strategies, but mining, metallurgy and/or raw materials are not included as thematic priority. In some of these regions, there is clearly a potential and historical background for mining, metallurgy and raw materials to be included as priority. The benchmarking analysis carried out in Task 5.2 is devoted to a SWOT analysis and comparative study (benchmarking) in order to highlight the strengths, weaknesses of the regions involved and suggest opportunities and threats in the mining and metallurgy fields.

Country	MIREU region	RIS3 strategy (+link)	Period	Language	Full document (EN)	Executive Summary (EN)
PT	Alentejo	Uma Estratégia de Especialização Inteligente para o Alentejo	2014-2020	Portuguese	No	No
ES	Andalucía	Estrategia de Innovación de Andalucía 2020	2014-2020	Spanish	No	No
ES	Aragonia	Estrategia Aragonesa de Investigación e Innovación para una Especialización Inteligente	2013-2020	Spanish	No	Yes
ES	Castilla y León	Estrategia Regional de Investigación e Innovación para una Especialización Inteligente (RIS3) de Castilla y León	2014-2020	Spanish	No	Yes
GB	Cornwall	Cornwall and Isles of Scilly Research, Development and Innovation Framework	2014-2020	English	Yes	Yes
IE	Ireland	Ireland's Smart Specialisation Strategy for Research and Innovation	2014-2020	English	No	Yes
SK	Kosice	Regionálna Inovacná Stratégia	2013-2020	Slovak	No	Yes
FI	Lapland	Lapland's Arctic Specialisation Programme	2014-2020	Finnish	Yes	No
PL	Lower Silesia	Strategic Framework for Smart Specialisations of Lower Silesia	2011-2020	Polish	Yes	No
RO	Maramures	Strategia de Specializare Inteligenta în Cercetare și Inovare Regiunea de Dezvoltare Nord-Vest (RIS3 NV)	2014-2020	Romanian	No	No
FI	Northern Karelia	North Karelia's Smart Specialization Strategy	2013-2020	Finnish	No	Yes
DE	Saxony	Innovation Strategy of the Free State of Saxony	2014-2020	German	Yes	No
GR	Stereia Ellada	RIS3 in Central Greece	2014-2020	Greek	No	Yes
AT	Styria	Economic Strategy Styria 2025 Growth Through Innovation	2014-2025	German	Yes	No
SE	Västerbotten	Innovationsstrategi Västerbotten	2014-2020	Swedish	No	Yes
Other possible MIREU regions						
CZ	Czech Republic	National Research and Innovation Strategy for Smart Specialisation of the Czech Republic	2012-2020	Czech	Yes	No
FR	Occitanie	Stratégie régionale de l'innovation pour une spécialisation intelligente en Midi-Pyrénées	2014-2020	French	No	No
CY	Cyprus	Smart Specialisation Strategy for Cyprus	2014-2020	Greek	No	No
HU	Hungary	National Smart Specialisation Strategy	2014-2020	Hungarian	Yes	No
BG	Bulgaria	Innovation Strategy for Smart Specialisation of the Republic of Bulgaria	2014-2020	Bulgarian	Yes	No

Table 5 . Summary of MIREU regions and current RIS3 strategies including period, language and availability of the full document and/or an executive summary in English

MIREU region	Regional RIS3			Regional policy in mining, metallurgy and/or raw materials sector	National RIS3			National policy in mining, metallurgy and/or raw materials sector
	Mining	Metallurgy	Potential in other priority		Mining	Metallurgy	Potential in other priority	
Alentejo, Portugal	Y	N	N	(unclear)	Y		Y	Y
Andalucía, Spain	Y	Y	Y	Y	(-)	(-)	(-)	(Y) – Spanish Strategy for Science, Technology and Innovation
Aragon, Spain				(Y) - Analysis and principles of the industrial strategy in Aragón	(-)	(-)	(-)	(Y) – Spanish Strategy for Science, Technology and Innovation
Castilla y León, Spain	Y	Y	Y	Y	(-)	(-)	(-)	(Y) – Spanish Strategy for Science, Technology and Innovation
Cornwall, UK			Y					
Ireland								
Košice, Slovakia		Y				Y		(Y) – National Regional Development Strategy of the Slovak Republic
Lapland, Finland			Y	(Y) – regional industrial strategy	(-)	(-)	(-)	Y
Lower Silesia, Poland	Y	Y		(Y) – regional development strategy	Y	Y		
Maramures, Romania				(unclear)				Y
North Karelia, Finland	Y	Y			(-)	(-)	(-)	Y
Saxony, Germany			Y	Y			Y	Y
Stereia Ellada, Greece			Y			Y		
Styria, Austria								Y
Västerbotten, Sweden	Y	Y		Y	Y	Y		Y

Table 6 Summary of regional and national information for mining, metallurgy and raw materials

* Y: Included in the policy/strategy

** (Y): Included in a general policy/strategy

*** Blank: Not included in the policy/strategy

**** (-): Indicates there is no RIS3 at the national level

3.2.3 Alentejo, Portugal

3.2.3.1 Brief overview of the region and its RIS3

Alentejo is the biggest NUTS II region in Portugal and occupies an extension of 31.550,9 km², representing 34,3% of the national territory. Its capital is Evora (57.000 inhabitants) and the current population is over 750.000 inhabitants. The regional GDP is 11,252 m€, 6.51% of the national GDP. The unemployment rate is currently at 12.4%. The urbanization rate (population >2,000 inhabitants) reached 49,8% in 2001, which is relatively close to the national average (54,8%), in particular the Central Alentejo (56,1%).



Figure 1 Portugal map highlighting the location of Alentejo region

Regional RIS3

The table presents the S3 priorities of Alentejo (**NUTS 2: PT18**). Mining and metallurgy are covered by the RIS3 strategy of Alentejo.

PRIORITY	DESCRIPTION
Heritage, Cultural and Creative Industry and Services for Tourism	Add value to the natural and cultural heritage of the region through links with cultural and creative industries, with the objective of increasing the cultural and creative profile of Alentejo. Supporting the expansion of tourism services and their links with priority areas related to food and the environment.
Mineral, Natural and Environmental Resources	Add value to the geological resources and natural environment of the region, supporting the growth and clustering of innovative economic activities and strategic diversification from extraction industries, promoting the emergence of activities related to design and new construction materials, sustainable production and exploration, recycling, energy, marine bio technologies, while promoting the natural and cultural heritage.
Critical technologies, Energy and Smart Mobility	Critical technologies for network management and IT security / interactive systems, applied to the fields of energy and smart mobility
Social Economy - technologies and services	Steer scientific and entrepreneurial competencies to create new technological solutions and ways of working that can respond to societal challenges.
Food & forestry	Add value to the territorial and climatic conditions of the region, strengthening links between the agricultural and food processing industries, integrating and coordinating value chains, making links with culture and tourism, explore market opportunities and technologies for precision agriculture, advanced production systems with a focus on electronics, sensors and ICT solutions as well as new control methods of production.

Reference: S3 Platform, last updated 13/09/2019

Mining is part of the priority of the Alentejo RIS3⁵, “**Mineral, Natural and Environmental Resources**”. The rational specialisation of this priority aims at a related diversification instead of concentration. The description of the priority objectives is shown below.

1. To promote mineral exploitation and resources exploration, research and innovation in the industrial sector, as well as greater control over the value chain and its densification;
2. Strengthen the Regional Technology Transfer System, reinforcing cooperation between Universities, Research Centres, Business Associations and Companies, in order to

⁵ <https://www.portugal2020.pt/Portal2020/Media/Default/Docs/EstrategiasEInteligente/EREI%20Alentejo.pdf>

consolidate R & D and Innovation systems in this area and promote excellence and innovation, in a logical of intelligent specialization;


3. To promote the creation of new companies and the attraction of players to the territory that promote the densification of the corporate masses around the valorisation of these territorial resources. This aspect is central to the rational and maintenance of this domain as a regional priority.

According to the Alentejo RIS3, the research trends relevant to mineral resources are shown below. Mineral resources in Alentejo RIS3 cover considerable regional reserves of ornamental rocks (marble, granites and schists), industrial rocks (aggregates) and metallic minerals (with emphasis on the resources of the Baixo Alentejo Iberian Pyrite Belt, shared by Portugal and Spain, and considered a world-class mineral province).

- Sustainable exploration processes - new mining, extraction and processing technologies with greater operational flexibility, improved energy efficiency and lower environmental impact, notably through reduction of water consumption and the use of chemicals, increasingly efficient production in the field water and energy consumption, as well as safety at work
- Recycling of materials, in a context of circular economy and "zero waste" and sustainable exploitation and processing, given the huge volume of waste produced, plays an important role in the region, and it is urgent to find solutions to reduce liabilities future management. From a competitive perspective, the reuse of waste as a raw material for other applications will lead to the emergence of new enterprises and the consequent of employment and the economy in the region. To complement activities related to the use and new applications of waste, product design can make an important contribution

National RIS3

At the national level, ore/spar mining and metallurgy are also covered by the Portugal RIS3⁶ through the priority "**Raw materials and materials**", classified under the theme "*Transverse technologies and their applications*", along with energy and information and communication technologies (ICTs).

PRIORITY	DESCRIPTION
Energy	Energy sustainability based on R&I and a competitive advantage in new forms of renewables
 Raw materials and materials	Sustainable exploitation of raw materials based on eco-efficient technologies, a leader in composite and new materials, and exploration of applications in traditional and high tech industries.
Production technologies and Process Industries	Application of new technologies to make processes more efficient and sustainable, especially in petrochemical, pulp and paper, textiles, paint and varnish.
Automotive, aeronautics and space	Specialisation in automotive spare parts and aeronautic maintenance.
Information and Communication Technologies	ICTs as transversal economic and social enablers
Transport, Mobility and Logistics	Management of port infrastructures, new modes of sustainable transport, Intelligent transport systems, standardisation and certification, new public policies for transport.
Agro-food	Link between food and health, organisation of the rural territory, agro-engineering and new technologies, wine, links with blue growth and tourism

⁶ https://www.portugal2020.pt/Portal2020/Media/Default/Docs/EstrategiasEInteligente/ENEI_Versão%20final.pdf

PRIORITY	DESCRIPTION
Forestry	Development of forest eco systems, sustainable production of raw and processed materials
Blue growth - Ecosystems and renewable energy resources	Increase knowledge and sustainable use of marine ecosystems
Water and environment	Sustainable environmental solutions, especially related to water
Health	Translational medicine, health tourism, ageing, Portugal as a living laboratory for health solutions
Tourism	Application of ICTs and diversification of services
Cultural and creative industries	Clustering of activities, application of ICTs, internationalisation
Habitat	Eco-construction, sustainable production and consumption, new materials and innovation applications
Blue growth	Blue growth is an important national priority for Portugal and includes 1. Fishing and aquaculture (in land and off shore, food processing and safety), 2. Marine ecosystems and renewable energy resources, 3. Deep sea resources (Marine biotechnology, mining of minerals, natural gas and hydro carbons) 4. Coastal tourism, culture, sport and leisure

Reference: S3 Platform, last updated 13/09/2019

The identified existing raw materials competitive advantages are shown below.

- Existence of mineral resources of great geologic-mining diversity in the continental shelf with economic potential, from quartz, feldspar, lithium, copper, zinc, tungsten, antimony, beryllium, germanium, iron, gold, silver, tungsten, tin, indium, elements of rare earths, elements of the Platinum and Kaolin Group, used in the ceramic, glass, cement, paper, automobile, aerospace and electronics industries, ornamental rocks (marble, limestone and granite);
- Existence of mineral resources (copper, zinc, gold, cobalt, other metals) and methane hydrates on the seabed;
- Accumulated mining and metallurgical waste likely to contain precious metals and other metals with economic value;
- In-depth exploration potential (below 500m) using new technologies, both in the ground and in the subsoil;
- Efficient exploitation and use of raw materials using new eco-efficient processes and re-engineering of production processes.

Innovation potential and topics relevant to metallic minerals sector are listed below.

- Innovation potential – (No listed innovation potential in RIS3 is relevant to metallic minerals sector)
- Topic – Development of Innovative Technologies for Sustainable Mineral Resources
 - Use of New Materials, Mineral Processing, Eco-innovative Technologies, Scarce Mineral Resources, Materials for Low Carbon Energy Technologies
- Topic – Application of Advanced Technologies Raw Materials and Materials
 - Resource Efficiency through the Application of ICTs, New Materials
- Topic – Efficient, Safe and Sustainable Use of Industrial Production of Resources
 - Alternatives to Critical Raw Materials, Efficiency in the Exploration and Use of Raw Materials, Exploration of Raw Materials on Earth and Sea, Exploration of Rare Earths

The insertion of the RIS3 priority, Raw materials and materials, in the public policy refers to the National Strategy for Geological Resources - Mineral Resources.

3.2.3.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

Alentejo with considerable reserves of ornamental rocks (marble, granites and schists), industrial rocks (aggregates) and metallic minerals (with emphasis on the resources of the Baixo Alentejo pyrite range) has the potential to promote the emergence of new industries and support services. With regards to mining activity, recent years have been characterized by significant fluctuations in the prices of metals in the international markets, with a translation in the levels of activity in the region. The fact that the number of mining companies is reduced (two operating mines located in the Baixo Alentejo), conditions access to data (statistical confidentiality), adding that there is some isolation of the main operators from the regional economy, resulting in the absence or reduced expression of related economic activities, namely manufacturers of equipment or even packaging. Therefore, the quantitative analysis focuses mainly on ornamental stones, an activity that has been reorganized and shows a growing export trend that needs to be capitalized, increasing control over the value chain.

There is a high relative concentration in these activities, compared to the national total. However, the Alentejo region shows weaknesses in technological resources and the economic transformation of mineral resources, with the sector's economy being too vertical and limited to a few value chain links. For example, in the case of ferrous ores, the processing is done abroad and the mining equipment is imported. In this sense, it will be important to promote the emergence of new economic activities that cluster around these activities and create a related variety that fosters greater incorporation of knowledge and innovation.⁷ Figure and Table below present the mineral occurrence in Alentejo with information regarding active mining.⁸

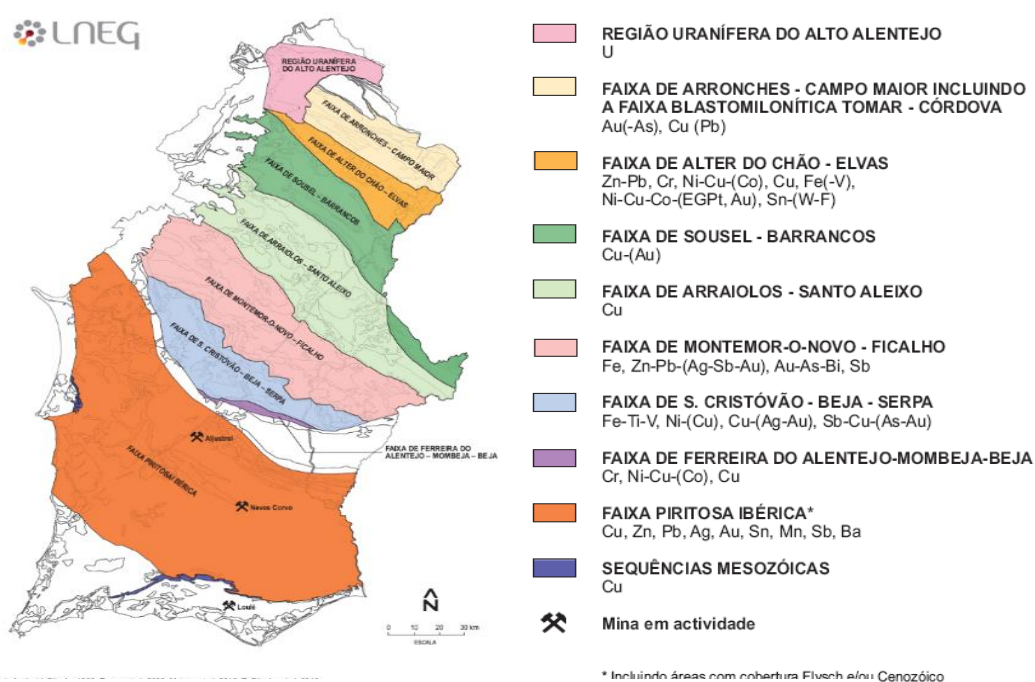


Figure 2: Iberian pyrite belt with active mining in Neves Corvo and Aljustrel.

⁷ <https://www.portugal2020.pt/Portal2020/Media/Default/Docs/EstrategiasEInteligente/EREI%20Alentejo.pdf>

⁸ Alentejo and Algarve mineral occurrences map Atlanterra project, EU Interreg Atlantic Area, Matos and Filipe Eds, LNEG 2013 <http://www.lneg.pt/download/7904> (Presentation from CCDRA, the 2nd MIREU SLO Workshop)

Location, Mining Company	Description & Commodities
Aljustrel, Almina⁹	<p>Almina is a Portuguese mining company, whose social goal is the extraction and valuing of pyrites, sulphides and other ores, the trade, transport of the products and derivatives and the research, purchase and development of technological methods for its mining activities. The Exploitation Permit was given by the Portuguese Government and until now there are >10600 people (600 direct jobs) working in the extraction of massive and stockwork sulphide ores, allowing the production of > 2Mt7y copper and zinc concentrates playing, for this reason, an important role in the region's economy.</p> <ul style="list-style-type: none"> • Mine: Copper, lead, Zinc • Type: Underground Mine • Ownership: ALMINA – Minas do Alentejo, SA <p>Location: Aljustrel, Alentejo Region, Portugal</p>
Neves Corvo, Somincor/Lundin Mining¹⁰	<p>Neves-Corvo is a mainly copper and zinc mine producing copper, zinc and lead concentrates. In the Neves-Corvo mine work > 1 800 people (900 direct jobs). The operation is owned and operated by Lundin Mining's Portuguese subsidiary Somincor. Lundin Mining acquired Neves-Corvo as part of the company's 2006 merger with EuroZinc Mining.</p> <ul style="list-style-type: none"> • Mine: Copper, Zinc, Lead and Silver • Type: Underground Mine • Ownership: 100% Lundin Mining <p>Location: Castro Verde, Alentejo Region, Portugal</p>

3.2.3.3 Integration of structural funds and associated economic benefits

Portugal, through 16 national programmes, benefits from ESIF funding of EUR 25.9 billion (total budget EUR 33.04 billion). This represents an average of 2.480€ per person from the EU budget over the period 2014-2020. The breakdown of the total budget by fund for 2014-2020 is presented on the next Table:

FUND	PORTUGAL (M€)
EARDF	4,971 (15%)
EMFF	502 (1.5%)
ERDF	14,898 (45.1%)
ESF	8,817 (26.7%)
CF	3,366 (10.2%)
YEI	486 (1.5%)
TOTAL (B€)	33.04 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/PT>

It is worth to point that 199.40M€ of the regional ERDF are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector. 58.3M€ from the Alentejo ESIF funds in the period 2014-2020 are directed to the priority axis “Emprego e Valorização Económica dos Recursos Endógenos” (Employment and Economic Valorization of endogenous resources).

3.2.3.4 Existing measures to foster market uptake

In addition to be included by the Portugal national RIS3, there are two policies relevant to mining and metallurgy sectors, the *National Strategy for Geological Resources – Mineral*

⁹ <http://www.almina.pt/english/location.html>

¹⁰ <https://www.lundinmining.com/operations/neves-corvo/>

*Resources*¹¹ and the *Green Growth Commitment*¹². **The National Strategy for Geological Resources – Mineral Resources** was announced in 2012 with an action plan and a time frame until 2020. It is the insertion of the Portugal RIS3 priority, Raw materials and materials. It aims to promote a mining sector that is dynamic, sustainable, promote the growth of national economy by ensuring supply of essential raw materials and promote regional development with the initial strategic focus to boosting the geological resources sector in Portugal is focused in metallic minerals. The guidelines of the National Strategy are based on four areas of actions listed below.

- Axis A - Adequacy of the sector bases, by redefining the role of the State and the revision of the rules of organization and discipline of the activity;
- Axis B - Development of knowledge and appreciation of the national potential, through the improvement of collection methods and systematization of information for a better use of resources
- Axis C - Dissemination and promotion of the national potential, through communication initiatives and the creation of an Office of the Mining Investor within the General Directorate of Energy and Geology, to act as a one-stop-shop;
- Axis D - Economical, social, environmental and territorial sustainability.

One of the changes related to the Strategy is the new royalty regulation (2012) which finances sustainable projects for the benefit of local communities. The action plan is financed by European Regional Development Fund (ERDF), the Cohesion Fund and revenue from royalties and other operational expenses.

The Green Growth Commitment set out 14 quantifiable goals for 2020 and 2030, 111 initiatives in ten key sectors and six catalysts. Manufacturing and extractive industries is one of the ten key sectors. One of the highlights of the initiatives is to promote the sustainable use of metal resources (which may reach 1% of GDP and 25,000 jobs) by mapping the resources, attracting investments in the sector, setting up One-stop Mining Store and reviewing the mining licensing model to shorten the application process with higher transparency.

3.2.3.5 Identification of industrial strengths and possible symbiosis with RIS3

RIS3 is prepared by the Alentejo Commission for Coordination and Regional Development (**Comissão de Coordenação e Desenvolvimento Regional do Alentejo, CCDRA**)¹³. CCDRA is partner of MIREU, follows REMIX and Cluster das Pedras Naturais¹⁴ (Cluster Portugal Mineral Resources Association), located at Estremoz, gives support to the development of activities related to the Mineral Resources Sector involving innovation, training and modernisation of companies. The goal is to ensure cooperation among companies, corporate associations, technological centres, R&D institutions, training centres and other Sector organisations, thus contributing to a sustainable economic valuation of mineral resources, boosting competitiveness levels and export capacity, internationalisation and the creation of value. The Cluster participates in the following projects: INTERSTONE (Reinforcing the Competitive Capacity of Portuguese Companies); FIRST STONE (First Stone is an international research program on the potential of the use of Portuguese Pavement Stone, based on its material properties and distinctive characteristics); INTERMARBLE – ALENTEJO

¹¹ https://ec.europa.eu/growth/tools-databases/eip-raw-materials/en/system/files/ged/47%20mss-portugal_en.pdf

¹² http://www.crescimentoverde.gov.pt/wp-content/uploads/2014/10/CrescimentoVerde_ing_v_pq_bx.pdf

¹³ <https://www.ccdr-a.gov.pt>

¹⁴ <https://www.clustermineralresources.pt>

MARBLE INTERNATIONALISATION (The project consisted of a set of activities for the Internationalisation of the Alentejo Marbles in order to promote its economic revitalisation).

Laboratório Nacional de Energia e Geologia, I.P. (LNEG) Campus of Aljustrel – CEGMA - Center for Geological and Mining Studies of Alentejo (Centro de Estudos Geológicos e Mineiros do Alentejo¹⁵) is the relevant body regarding the scientific potential in metallic minerals resources. The LNEG Aljustrel is focused in the development of mineral resources and thematic mapping R&D projects. The infrastructure includes technical archives and a drill hole core shed and rock, soil and stream sediments archives. The technical file of Aljustrel has extensive documentation on the geology of the Alentejo and in particular on the Iberian Pyrite Belt and the Ossa-Morena Zone, resulting from dozens of state and private campaigns for prospecting of deposits, environmental characterization of abandoned mining areas and of geological-mining heritage valorization programs. At the LNEG Aljustrel the follow projects are being developed: EXPLORA¹⁶ and ZOM 3D¹⁷ (co-financed by Alentejo2020/Portugal2020 and ERDF) and GEO-FPI¹⁸ co-financed by Interreg POCTEP.

3.2.3.6 Conclusions

To summarise, with abundance mineral reserves, active mining and significant exploration investment, Alentejo expects to develop innovative activities within existing ore/spar mining operations and extend the activities to upstream and downstream sectors, for instance, mining equipment, processing and recycling materials. Therefore, ore/spar mining and metallurgy are part of the Alentejo RIS3 priorities, Mineral, Natural and Environmental Resources. With being included in RIS3 priorities and subsequently translated into regional policies, ore/spar mining and metallurgy sectors have the potential to access the ERDF and/or the European Social Fund (ESF) at the regional level through the regional European Structural and Investment Fund (ESIF) programme. At the national level, ore/spar mining and metallurgy are also part of the Portugal national RIS3 priorities, Raw materials and materials. The RIS3 priority is translated into the *National Strategy for Geological Resources – Mineral Resources* with an action plan until 2020. The National Strategy aims to promote a mining sector that is dynamic, sustainable, promote the growth of national economy by ensuring supply of essential raw materials and promote regional development with the initial strategic focus to boosting the geological resources sector in Portugal is focused in metallic minerals. The action plan is financed by European Regional Development Fund (ERDF), the Cohesion Fund and revenue from royalties and other operational expenses. The other national policy relevant to metallic raw materials is the *Green Growth Commitment*. One of the highlights of the initiatives is to promote the sustainable use of metal resources (which may reach 1% of GDP and 25,000 jobs) by mapping the resources, attracting investments in the sector, setting up One-stop Mining Store and reviewing the mining licensing model to shorten the application process with higher transparency.

¹⁵ <http://www.lneg.pt/contactos/polos/8>

¹⁶ <http://www.lneg.pt/iedt/projectos/582>

¹⁷ <http://www.lneg.pt/iedt/projectos/583/>

¹⁸ <http://geo-fpi.igme.es/pt/proyecto.htm>

3.2.4 Andalucía, Spain

3.2.4.1 Brief overview of the region and its RIS3

Andalucía is a region that has an area of 87.597,7 km², the second largest in Spain after Castilla y León. Andalusia has an extension of more than 14 EU25 member states, and 11 in terms of population, with a population of 8,4 million inhabitants. Andalusia is made up of 8 provinces (Almería, Cádiz, Córdoba, Granada, Huelva, Jaén, Málaga and Sevilla), with Sevilla being its capital and most populated city. Due to its geographical situation, Andalusia takes a role as peripheral region in southern Europe but at the same time a critical role as connection between Europe and northern Africa (connection of Atlantic Ocean and Mediterranean sea) as well as being a European south Atlantic façade in its projection towards Ibero-America.



Figure 3 Spain and Andalusia map

Likewise, Andalusia is a region with a high level of urbanisation with 12 cities with over 100.000 inhabitants. The unemployment rate is higher than the average in Spain (23.1 vs. 15,3%), with a high unemployment rate for youth people (less than 25 years old, 47,3%).

Regional RIS3

The table below presents the S3 priorities of Andalucía (NUTS2:ES61).

PRIORITY	DESCRIPTION
Promotion of Renewable Energies and Energy Efficiency	Generation and integration systems of renewable energies. smart energy networks (smart grids): capture, transformation, transport and storage. high capacity energy storage systems. efficient energy management in production activities. energy efficiency in building and restoration. new materials and processes for sustainable building. energy sustainability in rural areas.
Transport and logistics	Innovative business activities on logistics and transport, particularly regarding the major productive sectors in Andalucía (agri-food, aeronautics, energy sectors); mobility and urban transport infrastructures.
Advanced Transport Systems and advance manufacturing	Development of Advanced Transport Systems, new materials and production processes for the transport industry, including autonomous systems (UAV, AGV); new developments in electric vehicles; advanced manufacturing technologies and systems for the transport industry.
Natural resources management	Research and innovation on sustainable management of natural resources; improved competitiveness of agriculture and cattle industry; CO2 capture by natural and cultivated ecosystems; water cycle management. Bio based economy. Experimentation on new models to fight against desertification. Integrated management of coastal areas; mining and mining recovery. Experimentation on new models of integrated water cycle management. Research on bio products and biorefineries preparing the bio based economy. Experimentation on new models of fight against desertification. Integrated management of coastal areas (blue economy).
Tourism innovation	Research, experimentation, demonstration and technology transfer projects in the field of the tourism industry; cultural heritage management; leisure and cultural tourism.
Health and well-being systems	Fostering the public health and welfare systems through new integrated models of health and well-being management based on e-health and big data exploitation; biotechnology, regenerative medicine, healthy leaving and ageing
Digital Economy	Incorporation of ICT infrastructure, development, and digital processes to strategic industries, business activities, civil society and for the development of e-government. This will include IoT, Big Data, Cloud Computing, etc.
Healthy and safe food	Innovation in agri-food industry, including functional and customized food habits; food safety traceability; aquaculture and fish industries with the exploitation of opportunities resulting from green and blue economy.

Reference: S3 Platform, last accessed 13/09/2019

Mining is part of the RIS3 priority, endogenous territorial-based resources (“Natural resources management” priority), in Andalucía. Taking advantage of existing mining resources to carry out research, development, experimentation and innovation projects, from which new products and processes are derived that are applied in the Andalusian business fabric is identified as the third challenge of this RIS3 priority.¹⁹

Metal mining is gaining presence in the Andalusian socio-economic context as an activity capable of generating wealth and employment. The evolution of available technologies and the rise in prices that has taken place in international markets is allowing access to and the enhancement of important natural resources that have always been in the subsoil of the Andalusian community and which are essential raw materials for development, for industry, for transport, for health and ultimately for the quality of life and well-being of people.

The line of actions corresponding to the third challenge is the L33 Mining integrated in the territory. Metal mining is re-emerging in Andalusia, driven by the increase in the demand for metals in the world market and by better mining and territorial planning and by the application of innovative techniques. It indicates that the new innovative extractive techniques showing that it is possible to develop extractive activities while ensuring the protection of nature. Moreover, mining can be an engine for regional development and employment. Therefore, the new technologies allow the valorisation of resources that were not economically possible before, for instance, the use of tailings or mining tourism, industrial archaeology and the industry itself. The industry may generate greater added-value in Andalucía and minimising the environmental liabilities of old farms, giving them new uses. In addition, another opportunity offered by the new stage of mining industry is the recovery of areas degraded by mining, dumping, etc. In this regard, Andalusia has experienced a very notable advance as a result of the response to the Aznalcóllar mining disaster.

Regarding metallurgy, the regional presentation at the second MIREU (Mining and Metallurgy Regions of Europe – H2020 project) SLO (Social License to Operate) workshop by the Dirección General de Industria, Energía y Minas Junta de Andalucía indicates that mining and metallurgy are both included in the RIS3 priority, Endogenous territorial-based resources. Mining and metallurgy relevant topics covered by RIS3 include the high mineral potential, exploration, sustainable mining, mining restoration, metallurgy technology and natural stone.

According to the *Andalusian Plan for Research and Innovation* (PAIDI 2020)²⁰ which the complementary document for RIS3 Andalucía, the *Andalusia Mining Strategy 2020*²¹ constitutes as the planning instrument that strategically guides the activities of research and exploitation of mineral resources in the territory of Andalusia in accordance with social and economic interests, both sectoral and general, in a coordinated manner and compatible with the economic, environmental and territorial planning of Andalusia, and within the framework of European, national and regional regulations. All of this, in accordance with the priority, Endogenous territorial-based resources, of RIS3 Andalucía, in which integrated mining in the territory is one of its lines of action.

National RIS3

No RIS3 at this level.

¹⁹ <https://www.juntadeandalucia.es/export/drupaljda/Documento-Ris3-version-final-8-27-02-15.pdf>

²⁰ <https://www.paidi2020.es/wp-content/uploads/PAIDI2020.pdf>

²¹ https://www.juntadeandalucia.es/export/drupaljda/planes/16/03/Estrategia_Minera_de_Andalucia_2020_0.pdf

3.2.4.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

Metallic mining is an ancient activity in Andalucía and periodically reborn strongly in one of the mining districts. In recent years, the metal mining sector is resurging in Andalusia due to the increase in demand for metals in the world market with the consequent increase in prices. Better planning and the application of innovative techniques have favoured this take-off. All favoured by new extractive techniques that allow the exploitation of deposits that were not profitable and makes the development of extractive activities compatible with the protection of nature.²²

It is worth mentioning the bet that important international companies are making on Andalusia as the preferred place to develop mining projects. Some of them are already solid realities. Others are firm bets to initiate mining productions or to increase the exploration of deposits susceptible of being exploited. The implementation of these projects would mean an aggregate turnover of more than 1.100 M€ and the direct employment generated would be 2.200 people. To this figure should be added that of indirect employment associated with the activity of the companies, which would bring the total figure to 5.000 people.

In 2011, Andalusia ranked first in Spain in terms of the value of mining production with 22,4% of the national total and second in terms of employment with 18,5% of national employment in the mining sector.

Today, there are many explorations permits with more than 20M€/y estimated investment. Companies like First Quantum, Trafigura, Grupo Mexico, Glencore, Freeport-McMoran, etc, are exploring metallic minerals in Andalusia. Currently, there are 5 actives metallic mines, producing copper cathodes, copper concentrates and conc-lead concentrates (See Table at the end of the section for details). Regarding the metallurgy sector, there is a copper smelting and refinery in Huelva, Atlantic Copper, a Freeport McMoran company. It processes the concentrates from Grasberg mine, Indonesia and produces 300ktn/y copper metal. The other metallurgy plant is in Los Barrios (Cádiz), ACERINOX, a stainless-steel smelting and processing plant that produces 1Mtn/year stainless steel from scrap iron.²³

The structure of the mining sector in Andalucía is as follow:²⁴

- Number of total exploitations: 480; Number of total employees: 6.473
 - Aggregates: 363 exploitations; 2.230 employs
 - Natural stone: 73 exploitations; 356 employs
 - Industrial minerals: 37 exploitations; 262 employs
 - Energetic minerals: 2 exploitations; 29 employs
 - **Metallic mining**: 5 exploitations; 3.596 employs – Metallic mining provides more jobs (more than double) than the each of the other exploitation operations (aggregates, natural stones, industrial minerals and energetic minerals)
- Smelters:
 - Hydrometallurgy industries: Cobre las Cruces (CLC) manages an hydrometallurgy process plant, which produces 72.000 tn/y cathodes Cu 99,99%. The employs are included in general datas of the exploitation.

²² <https://www.juntadeandalucia.es/export/drupaljda/Documento-Ris3-version-final-8-27-02-15.pdf>

²³ Information from the preparatory document: MIREU regional background information for SWOT analysis – Andalucía by DGEyM

- Atlantic Copper manage a pyrometallurgy process plant in Huelva, which process concentrates from Grassberg (Indonesia) Freeport McMoran mine, and is starting to process concentrates from Iberian Pyrite Belt mines (MATSA, Atalaya Mining). It produces 300.000 tn/y Cu 99.99% in a smelting plant and a refinery plant; 1.150 employees.

Tables below show the active mining companies and smelters in Andalucía.

Location, Mining Company	Description & Commodities
Aguas Teñidas-Magdalena-Sotiel, MATSA²⁴	<ul style="list-style-type: none"> • A joint venture company between Mubadala Investment Company and Trafigura Group Pte Ltd. • Operates three polymetallic mines in the north of the Iberian Pyrite Belt, Huelva, Spain • Cu, Zn, Pb & Ag <p>Concentrates are shipped from the Port of Huelva or Algeciras, mainly to China and Europe²⁵</p>
Riotinto, Atalaya Mining²⁶	<ul style="list-style-type: none"> • Owned by Trafigura-Yangu Yiangguan Copper-Liberty Metals-Orion Mines-others company and Cobre Las Cruces, a First Quantum Company. • Open-pit copper mine in the Iberian Pyrite Belt, 65 km northwest of Seville <p>They produced 72.000 tn/y metal copper, and 700ktn/y concentrates copper 78%, zinc 20% lead 2%.</p>
Gerena, Guillena and Salteras in Seville, Cobre las Cruces (CLC)²⁷	<ul style="list-style-type: none"> • Owned by First Quantum Minerals Ltd., a Canadian metals company • Open pit copper mine • With a hydrometallurgical process plant (See next Table) <p>Expecting annual production averages 72,000 tonnes of copper</p>
Aznalcollar mine, Grupo Mexico²⁸	<ul style="list-style-type: none"> • In the permitting process that it is expected to be completed by 2019 • Open pit mine • Polymetallic project: Zinc, Copper and Lead

Location, Mining Company	Description & Commodities
Atlantic Copper, Huelva²⁹	<ul style="list-style-type: none"> • Pyrometallurgy process plant • Processing the concentrates from <ul style="list-style-type: none"> ○ Grassberg (Indonesia) Freeport McMoran mine and produces 300ktn/y copper metal ○ Iberian Pyrite Belt mines (MATSA, Atalaya Mining) • Producing 300.000 tn/y Cu 99.99% in a smelting plant and a refinery plant <p>1.150 employs</p>
ACERINOX, Los Barrios (Cádiz)³⁰	A stainless-steel smelting and processing plant that produces 1Mtn/year stainless-steel from scrap iron
Cobre las Cruces (CLC)³¹	<ul style="list-style-type: none"> • Hydrometallurgy process plant <p>Producing 72.000 tn/y cathodes Cu 99,99%.</p>

²⁴ <https://www.matsamining.com>

²⁵ <https://www.matsamining.com/media/3925/2018-matsa-corporate-presentation.pdf>

²⁶ <http://atalayamining.com/riotinto-copper-mine/>

²⁷ <http://www.cobrelascruces.com/index.php/quienes-somos/?lang=en>

²⁸ http://www.gmexico.com/site/en/us/our_presence.html

²⁹ <http://www.atlantic-copper.es>

³⁰ <https://www.acerinox.com>

³¹ <http://www.cobrelascruces.com/index.php/quienes-somos/?lang=en>

3.2.4.3 Integration of structural funds and associated economic benefits

Spain, through 64 national programmes, benefits from ESIF total funding of EUR 56.3 billion (39.8 billion from EU) over the period 2014-2020 and represents an average of 856 euro per person. The breakdown of the total budget by fund for 2014-2020 is³²:

FUND	SPAIN (M€)
EARDF	12,277 (21.8%)
EMFF	1,558 (2.8%)
ERDF	29,266 (52.0%)
ESF	10,246 (18.2%)
YEI	2,923 (5.3%)
TOTAL (B€)	56.31 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/ES>

It is worth to point that 3,457M€ of the regional ERDF are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector. At the national level, the sources of financing are those corresponding to the own resources of the General State Administration linked to the Agenda for the strengthening of the industrial sector in Spain and the resources incorporated in the multiregional Operational Programmes linked to the European Structural and Investment Funds.

3.2.4.4 Existing measures to foster market uptake

In addition to the RIS3, Andalucía has published two regional policies concerning mining and metallurgy sectors, the *Andalucía Mining Strategy 2020*³³ and the *Andalucía Industrial Strategy 2020*³⁴. The *Andalucía Mining Strategy 2020* is a planning instrument which corresponding to the Andalucía RIS3 priority, Endogenous territorial-based resources. The objectives of the *Andalucía Mining Strategy 2020* are to (1) exploit the regional mining potential for creating employment and improving the competitiveness of the mining sector, (2) improve the service public linked to the mining sector and adapt the administrative to the needs of the sector, (3) enhance the environmental integration of the mining activity and mining heritage and (4) develop the frameworks for preventing occupational risk and personnel training and qualification.³⁵ In the field of mining, research and innovation actions will be carried out on better available techniques that seek to promote the generation of knowledge and technology, among others, on:

- Sustainable mining and mining recovery, such as innovative metallurgical treatments that allow obtaining optimum yields from metal mines, minimizing environmental and landscape impacts, regeneration treatments for land and water polluted by mining, waste treatment generated by extractive industries, new technologies and restoration methodologies.

³² <https://cohesiondata.ec.europa.eu/countries/ES#>

³³ http://www.juntadeandalucia.es/economiainnovacioncienciayempleo/pam/Pormian.action;jsessionid=BA1BCB94C1FF56CE86C1A732C32D46FE?request_locale=en

³⁴ http://estrategiaindustrialdeandalucia.org/wp-content/uploads/2017/01/6c1114_3a6891ea308141ccbf4471f3655d9e83.pdf

³⁵ http://www.juntadeandalucia.es/economiainnovacionciencia/pamdoc/archivos/pormian/Presentation_strategy_mining_EN.pdf

- Industrial activity related to the transformation and enhancement of mineral resources, development of new materials and applications.³⁶

The *Andalucía Industrial Strategy 2020*³⁷ (SIA 2020) shows metallurgy is one of the four branches represent almost three quarters of the manufacturing production of Andalusia and are in which Andalusia is more specialized with respect to Spain and the EU. In the chapter of strategic proposal and programming, horizontal and vertical measures are introduced. The vertical measures, unlike horizontal measures, are those aimed at specific industrial needs and environments. Mining and metallurgy are included in the vertical measure, Environment. (The measures are in coordination with the actions contemplated in the different sectoral and branch strategies, for instance, the Andalucía RIS3 and the *Andalucía Mining Strategy 2020*.) The Table below shows the EIA 2020 detected industrial environment and opportunities for mining and metallurgy sectors. Once the EIA 2020 has been approved, these opportunities will be submitted to the governance process, where appropriate, to become vertical measures with their corresponding action sheet.

Vertical measure: Environment	Industrial environment	Industrial opportunities
Mining (Auxiliary of mining)	Mining Tractor	Promote the creation of a network of suppliers that are well connected to the mining companies that carry out or will develop their activity in Andalucía
	Mining recovery	Develop innovations that reduce the impact of mining activity both in its exploitation period and in the subsequent recovery
	Innovation in mining transformation	Valorise mining products and liabilities through technological improvements that introduce innovations in the processes
Metallurgy	Energy-efficient metallurgy	Support the incorporation of energy efficiency measures that reduce the pressure of input costs in the field of metallurgy
	Innovative metallurgical processes	Develop new metallurgical techniques of exploitation that allow to valorise mining minerals and liabilities
Mining transformation	Advanced manufacturing in the mining transformation	Support the introduction of advanced manufacturing in the processing companies of mining products
	New activities in mining transformation	Promote the development of new mineral transformation activities and the attraction of companies installed abroad

At the national level, one policy is identified to be relevant to mining and metallurgy, the *Spanish Strategy for Science, Technology and Innovation providing a framework for the period 2013-2020*³⁸. The Strategy highlights eight national challenges and one of them refers to the Climate change and the efficient use of resources and raw materials. The challenge suggests the transition to new production models that reduce the pressures on the environment, natural resources and raw materials and trigger the application of cleaner industrial process (Fundación Biodiversidad, 2014).³⁹ However, the strategy did not explicitly mention ore/spar mining and metallurgy.

3.2.4.5 Identification of industrial strengths and possible symbiosis with RIS3⁴⁰

The beneficiaries of the priority, endogenous territorial-based resources, will be the companies, entities and public or private organizations that carry out R & D & I projects in Andalusia to

³⁶ <https://www.paidi2020.es/wp-content/uploads/PAIDI2020.pdf>

³⁷ http://estrategiaindustrialdeandalucia.org/wp-content/uploads/2017/01/6c1114_3a6891ea308141ccbf4471f3655d9e83.pdf

³⁸ <https://rio.jrc.ec.europa.eu/en/library/spanish-strategy-science-technology-and-innovation-eesti>

³⁹ https://ec.europa.eu/environment/eoap/sites/eoap_stayconnected/files/field/field-country-files/spain_eco-innovation_2015.pdf

⁴⁰ <https://www.juntadeandalucia.es/export/drupaljda/Documento-Ris3-version-final-8-27-02-15.pdf>

develop new processes that improve those currently existing in areas related to the environment, cultural heritage, production primary and mining.

These beneficiaries correspond to the following target groups:

- Agents of the Andalusian System of Knowledge linked to the sustainable use of the endogenous resources of the territorial base.
- Research groups of the Andalusian universities.

Research and innovation are essential elements in mining, both for the identification of resources and in the design of new extractive technologies that allow profitable access to seams. The business sector collaborates with the research groups in this area, as well as with the universities, especially with the mining engineering schools, and has specific research centres such as the Research Centre for Sustainable Mining Engineering.

Companies in the sectors involved: agricultural, livestock, mining, water and waste of environmental services, bio-enterprises and management of cultural heritage.

Complementary, this area must take into account its future projection beyond the exhaustion of resources, in everything related to the experience generated by its link with environmental research and developments, based on the demands of sustainable exploitation and the necessary restoration processes. These activities may generate added value for Andalusia by transferring its experience to other regions and countries.

3.2.4.6 Conclusions

To summarise, ore/spar (metal) mining is part of the Andalucía RIS3 priority, Endogenous territorial-based resources. As technologies advance, Andalucía expect the new techniques to allow the valorisation of resources that were not economically possible before, including the use of tailing, mining tourism, industrial archaeology and areas degraded by mining and dumping. The mining industry is also expected to generate greater added-value. The corresponding RIS3 Line of action, Mining integrated in the territory, is reflected by the regional policy instrument, the *Andalucía Mining Strategy 2020*. The *Andalucía Mining Strategy 2020* is to carry out research and innovation actions on better available techniques that seek to promote the generation of knowledge and technology, for instance, on sustainable mining, mining recovery (such as, innovative metallurgical treatments) and industrial activity related to the transformation and enhancement of mineral resources, development of new materials and applications. As ore/spar mining and metallurgy sectors are part of the Andalucía RIS3 priorities and elaborated further through the *Andalucía Mining Strategy 2020*, they have the potential to access the ERDF and/or ESF at the regional level through the regional ESIF programme. In addition to the *Andalucía Mining Strategy 2020*, mining and metallurgy are also part of the other regional policy, the *Andalucía Industrial Strategy 2020* (EIA 2020). The identified industrial opportunities of mining and metallurgy sectors include mining tractor, mining recovery, innovation in mining transformation, energy-efficient metallurgy, innovative metallurgical processes, advanced manufacturing in the mining transformation and new activities in mining transformation. Once approved, the measures are to be translated into measures and actions.

In Spain, there is no national RIS3. While the *Spanish Strategy for Science, Technology and Innovation providing a framework for the period 2013-2020* includes the efficient use of resources and raw materials as one of the national challenges alongside climate change, mining and metallurgy sectors are not explicitly mentioned.

3.2.5 Aragon, Spain

3.2.5.1 Brief overview of the region and its RIS3

Aragon is an inland region located in the northeast of Spain, composed of the provinces of Huesca, Zaragoza and Teruel. It has been distributed organizationally in 33 counties and has one of the lowest population densities in Europe:

- 47.719 km² (9,4% part of the national total and 1,1% part of the UE27);
- 1.171.829 inhabitants⁴¹ (2,85% part of the national total). Main cities: Zaragoza (854.731 inhabitants); Huesca (196.070 inhabitants); Teruel (121.028 inhabitants);
- Population density: 27,80 inhabitants/km² (Spain: 82,68 inhabitants/km²; Europe (EU25): 117,25 inhabitants/km²);
- 95% of the territory is “fragile and hardly structured” rural zones. More than half of the population lives in Zaragoza and its metropolitan area.



Figure 4 Aragon map

Regional RIS3

The table below presents the S3 priorities of Aragon (NUTS2:ES24).

PRIORITY	DESCRIPTION
Management of water resources	Information systems and monitoring of hydrological management
ICT	Digital Agenda
Resources efficiency	Closing cycles of water, materials and energy
Transport and logistics	Integration and improvement of supply chains (resources efficiency and intermodal transport)
Tourism and leisure	Touristic activities based in natural resources and cultural heritage and quality of life; new technologies for innovative solutions in tourism
Healthy ageing	Improvement of the quality of life with special attention to the dispersed and ageing population
Development of more efficient vehicles	Innovation in vehicle engineering and design; and in equipment for vehicle refuelling, particularly for hydrogen fuels
Energy storage and efficiency	Storage and integration of energy systems including hydrogen and fuel cells, smart grids and water cycles.
Agri-food value chain	Development of new products, processes and technologies in the agricultural, food and forestry sectors

Reference: S3 Platform, last updated 13/09/2019

Mining and metallurgy are not part of the Aragón RIS3⁴² but mining and metallurgy industries has the potential to link to the S3 priority: Resources efficiency, Tourism and Leisure. In the industrial sector analysis, while metallurgy (i.e. metallurgy and manufacture of metal products, except machinery and equipment) is one of the sectors that shows better quantitative indicators (for instance, the turnover, GVA, etc.), its value in terms of qualitative indicators (i.e. the scientific and technological specialisation) is not as promising. Therefore, it is excluded from the RIS3 main industrial sectors (for instance, manufacture of transport materials). Regarding

⁴¹ <http://www.ine.es/jaxi/Datos.htm?path=/t20/e245/p04/provi/l0/&file=0ccaa007.px>

⁴² http://www.aragon.es/DepartamentosOrganismosPublicos/Departamentos/InnovacionInvestigacionUniversidad/AreasTematicas/Investigacion/ci.03_RIS3Aragon.detalleInaem

the potentially relevant priority, Resources efficiency, it focuses on energy and water management. Hence, it includes neither mining sector nor metallurgy sector.

National RIS3

No RIS3 at this level.

3.2.5.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

Mining Companies Group of Aragon⁴³ considers that among the energy resources we highlight the coal deposits located in the mining basins of Oliete, Utrillas-Aliaga and Mequinenza. The main destination of their exploitation are the thermal power stations, although it is necessary to emphasize the increasing use in the agriculture of altered lignite rich in humus. The exploitation of metallic minerals is a historical heritage in the autonomous community Aragon, although there is still some residual extraction plant. In the past, it was of enormous importance to extract iron from Sierra Menera, which supplied the Sagunto steel industry.

Location, Mining Company	Description & Commodities
Santa Rosa Mine, PROMINDSA⁴⁴	<ul style="list-style-type: none"> The Santa Rosa Mine is the main deposit worldwide for iron ore destined for the industrial production of pigments. Underground exploitation

Regarding non-metallic minerals, Aragon is a reference in underground extraction. Special clays like sepiolite are used for the preparation of domestic and industrial granular adsorbents. In addition, Aragón is very rich in refractory clays used for fabrication of stoneware, porcelain, pavements, etc. Due to its strategic relevance, we can also highlight here rock salt used for caustic soda and chlorine, with the highest concentration in Remolinos and less availability in some zones of the Huesca province.

3.2.5.3 Integration of structural funds and associated economic benefits

Spain, through 64 national programmes, benefits from ESIF total funding of EUR 56.3 billion (39.8 billion from EU) over the period 2014-2020 and represents an average of 856 euro per person. The breakdown of the total budget by fund for 2014-2020 is⁴⁵:

FUND	SPAIN (M€)
EARDF	12,277 (21.8%)
EMFF	1,558 (2.8%)
ERDF	29,266 (52.0%)
ESF	10,246 (18.2%)
YEI	2,923 (5.3%)
TOTAL	56.31 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/ES>

It is worth to point that 3,457M€ of the regional ERDF are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector. The allocations planned for

⁴³ <http://www.aema-aragon.com/htm/productos.asp>

⁴⁴ <https://www.promindsa.com/en/>

⁴⁵ <https://cohesiondata.ec.europa.eu/countries/ES#>

the financing of RIS3 activities are complemented by a significant increase in contributions from outside, including those from European Union funds.

At the national level, one policy is identified to be relevant to mining and metallurgy, the *Spanish Strategy for Science, Technology and Innovation providing a framework for the period 2013-2020*⁴⁶. The Strategy highlights eight national challenges and one of them refers to the Climate change and the efficient use of resources and raw materials. The challenge suggests the transition to new production models that reduce the pressures on the environment, natural resources and raw materials and trigger the application of cleaner industrial process (Fundación Biodiversidad, 2014).⁴⁷ However, The Strategy did not explicitly mention ore/spar mining and metallurgy.

3.2.5.4 Existing measures to foster market uptake

Regional

Regional plans, programmes and strategies in force are introduced in RIS3 in order to analyse the coherence between different policy instruments. Among the policy instruments, mining appears in the *Analysis and principles of the industrial strategy in Aragón*⁴⁸ as the one of the industrial sectors, Extractive industry and energy, with high capabilities or with development potential, which should preferably be addressed in an industrial policy with a future for Aragón. However, this document does not provide measures or actions for individual industrial sector.

National

At the national level, one policy is identified to be relevant to mining and metallurgy, the *Spanish Strategy for Science, Technology and Innovation providing a framework for the period 2013-2020*⁴⁹. The Strategy highlights eight national challenges and one of them refers to the Climate change and the efficient use of resources and raw materials. The challenge suggests the transition to new production models that reduce the pressures on the environment, natural resources and raw materials and trigger the application of cleaner industrial process (Fundación Biodiversidad, 2014).⁵⁰ However, the strategy did not explicitly mention ore/spar mining and metallurgy.

3.2.5.5 Identification of industrial strengths and possible symbiosis with RIS3⁵¹

The RIS3 responsible body is the Aragon Government. In the document *Analysis and Principles of the Industrial Strategy of Aragon*⁵² the good functioning and potentialities of certain branches of industrial activity are pointed out, specifically the extractive industry and energy due to their proportion in the Gross Added Value. (VAB) of the Aragonese industrial sector (22%). Determines that it should preferably be attended in an industrial policy with a future for Aragon, among others, the extractive industry and energy, considering as extractive industry the following, according to the classification CNAE 2009:

⁴⁶ <https://rio.jrc.ec.europa.eu/en/library/spanish-strategy-science-technology-and-innovation-eesti>

⁴⁷ https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/spain_eco-innovation_2015.pdf

⁴⁸ <http://aragon.es/estaticos/GobiernoAragon/Departamentos/IndustrialInnovacion/Departamento/Estrategia.pdf>

⁴⁹ <https://rio.jrc.ec.europa.eu/en/library/spanish-strategy-science-technology-and-innovation-eesti>

⁵⁰ https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/spain_eco-innovation_2015.pdf

⁵¹ <https://www.juntadeandalucia.es/export/drupaljda/Documento-Ris3-version-final-8-27-02-15.pdf>

⁵² <https://www.aragon.es/estaticos/GobiernoAragon/Departamentos/IndustrialInnovacion/Departamento/Estrategia.pdf>

- Extraction of anthracite, coal and lignite
- Extraction of crude oil and natural gas
- Extraction of metallic minerals
- Other extractive industries
- Support activities for extractive industries

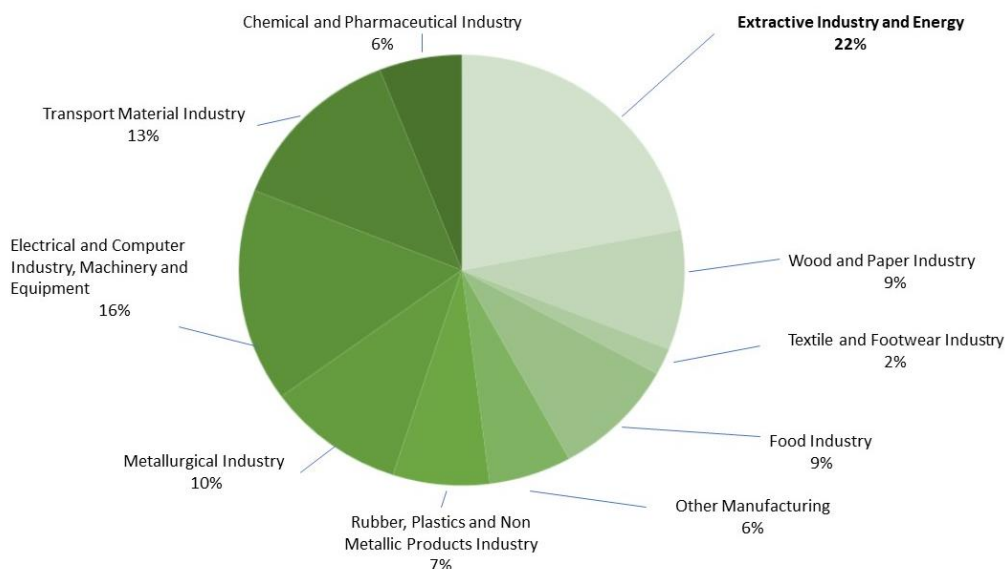


Figure 5 Gross Added Value of Industry by branches. Aragon (2010).

Furthermore, there are other relevant administrative, private companies and research institutes:

The ***Institute for the Restructuring of Coal Mining and Alternative Development of Mining Regions***, is an Autonomous Body, attached to the Ministry of Energy, Tourism and Digital Agenda, chaired by the Secretary of State for Energy. It is the managing body of the "aid scheme for coal mining and alternative development of mining areas". All its activity revolves around achieving two main objectives:

- Execute the coal mining restructuring policy.
- To develop and implement measures to promote the economic development of those areas considered to be coal mining municipalities.

The **Geological and Mining Institute of Spain (IGME)** is an autonomous public research body attached to the Ministry of Science, Innovation and Universities. The IGME's mission is to provide the General Administration of the State and the Autonomous Communities that request it, and society in general, with the necessary knowledge and information in relation to Earth Sciences and Technologies for any action on the territory.

The **University of Zaragoza (Unizar)** is the central element of the University System of Aragon. It has campuses in Huesca, Teruel and Zaragoza, and five affiliated centres.

Corporate Group SAMCA.

General Mining Company of Teruel.

Likewise, there are associations at regional and national level. Usually, associations group companies working in a same sub-sector or in a specific product. The most outstanding in Aragon are:

- National Federation of Coal Mining Companies (CARBUNION)
- National Confederation of Mining and Metallurgy Companies (CONFEDEM)
- Confederation of Industrial Rock and Mineral Extractive Industries (COMINROC)

- National Association of Industrial Minerals Producers (AINDEX)
- National Association of Aggregate Producers (ANEFA)
- Gypsum Technical and Business Association (ATEDY)
- National Association of Cement Producers (OFICEMEN)
- National Association of Tiles and Bricks Producers (HISPALYT)
- Regional Association of Mining Basin Businessmen (ACECMI)

There are as well professional associations of geologists and mining engineers as well as the Official College of Technical Engineers and Degrees in Mines and Energy of Aragon (COITMA).

3.2.5.6 Conclusions

To summarise, mining and metallurgy sectors are not included in the Aragón RIS3. Regarding regional policy instruments, while the *Analysis and principles of the industrial strategy in Aragón* indicates extractive sector is one of the industrial sectors with high development potential, measures and actions are not clear.

In Spain, there is no national RIS3. While *the Spanish Strategy for Science, Technology and Innovation providing a framework for the period 2013-2020* includes the efficient use of resources and raw materials as one of the national challenges alongside climate change, mining and metallurgy sectors are not explicitly mentioned.

3.2.6 Castilla y León, Spain

3.2.6.1 Brief overview of the region and its RIS3

Castilla y León, with a surface of 94,226 km², is the biggest of the 17 regions (autonomous communities) in which Spain is divided. The population in 2017 was 2,425,801 inhabitants, which represents a density of 25.74 inhabitants/Km². The capital city is Valladolid with other relevant cities being Salamanca, Burgos, León or Ávila. Castilla y León has a total of 9 provinces and 2,248 municipalities.

The most outstanding aspects of the Castilla y León demography are the dispersion and ageing of the population. Regarding to the first one, the 51.12% (2016) of regional population lived in cities and villages >20,000 inhabitants. Only there are 20 cities/villages with more than 10,000 inhabitants, of which 9 are province capital cities. On the other hand, percentage of elder population (65 years or more) was 25.07% in 2017.⁵³



Figure 6 Castilla y León and its location in Spain

Regional RIS3

The tables below present the S3 priorities of Castilla y León (NUTS 2: ES41). Mining is covered by the S3 priority: Agri-food and sustainable use of natural resources.

PRIORITY	DESCRIPTION
Agri-food and sustainable use of natural resources	Food security, development of bio-industries. Agriculture, livestock and continental aquaculture, food quality and food technology, bioenergy & forestry.
Transport (in particular automotive and aeronautics)	- Productive efficiency in the transport sectors. - Applications of KETs such as advanced materials (incl. nanocomposites and graphene), ICT, biotechnology (bio-polymers, use of bio-fuels and bio-catalysts) and advanced manufacturing and processing. - Sustainability, security and mobility of persons and goods (logistics)
Health, social care, demographic change and well-being	. Biomedical research and applications, innovative medicines, research and innovation in social care, ageing and ambient-assisted living. - Cancer research and new therapeutic and diagnostic solutions, biomedical research, attention to long-term patients, technologies for social inclusion. - KETs: biotechnology (cellular therapy, molecular diagnostic, pharmacology, tissue engineering), ICT (e-Health), and advanced materials (biopolymers, nanomaterials)

⁵³ CESCYL (<http://www.cescyl.es/es/publicaciones/informes-anuales>)

EUROSTAT

(<https://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tgs00099&language=en>)

INE (<http://www.ine.es/jaxi/Tabla.htm?path=/t20/e245/p04/provi/10/&file=0ccaa007.px&L=0>)

PRIORITY	DESCRIPTION
Cultural and natural heritage and Spanish language	- Heritage and language as endogenous resources for economic development and social welfare. Language technologies and applications to cultural heritage. - Environmental sustainability, climatic change and water. - Application of ICT and new productive processes in languages. - Application of KETs to diagnostics, conservation and management. Advanced materials (new treatments for wood, stone, and other materials, advanced materials for the conservation of cultural heritage). Biotechnology (bio-damagers, bio-cleaning and bio-consolidation) and fossil DNA.
ICT	cybersecurity, applications and technologies of mobility, M2M communications, big data and cloud computing technologies and Internet of the future.
Energy and sustainability	- Technologies for energy management, energy efficiency, renewable energies, environmental sustainability of industry and human habitat (buildings, constructions etc.). Smart cities, energy efficient buildings, factories of the future, sustainable processing industry through resource and energy efficiency. - ICT applied to energy and sustainability (home automation, district heating and cooling, monitoring), advanced materials (biomaterials, recyclable and recycled materials, new treatments for wood and construction materials), advanced manufacturing and processing.

Reference: S3 Platform, last updated 13/09/2019

According to the update for the period 2018-2020 of the RIS3 of Castilla y León 2014-2020, approved on July 2018, mining is covered by the thematic priority 4 (TP4) ***“Natural Heritage, Cultural Heritage and the Spanish Language, and endogenous resources as basis of the sustainability of the territory”*** in the Action Area “Mineral raw materials”, including:

- Development of mining and metallurgical techniques to increase the efficiency of processes
- Use and promotion of wastes
- Development of competitive products from indigenous mineral raw materials (natural stone and others)

In this sense, mining is seen as a part of the endogenous resources of Castilla y León, together with cultural and natural heritages and forest products.

3.2.6.2 Identification and summary of thematic priorities/objectives in the field of raw materials/mining/metallurgy⁵⁴

According to Mining Statistics of Spain, the recent evolution of the sector, in terms of number of exploitations, employment and value of production is as follows⁵⁵:

Spain	Nº exploit.	Employment	Value of production (€)
2015	4,227	45,292	3,984,819,949
2010	3,612	37,698	3,427,175,777
2016	2,807	29,520	2,890,403,155
CyL	Nº exploit.	Employment	Value of production (€)
2005	647	7,661	568,933,147
2010	580	6,390	404,776,824
2016	449	3,515	290,438,589

According to the last published data (Mining Statistics of Spain), in 2016 there were 449 active exploitations with 3,515 employees and a total value of production of 290,438,589 €. Compared with the national context, these numbers represent the 16.0% (exploitations), 11.9% (employment) and 10.1% (production value). The breakdown by sectors is as follows (2016):

⁵⁴ Information from the preparatory document: MIREU regional background information for SWOT analysis – Castilla y León by SIEMCALSA

⁵⁵ <https://www.mincotur.gob.es/energia/mineria/Estadistica/Paginas/Consulta.aspx>

Sector	Nº exploit.	Employment	Value of production (€)
Energetics	8	292	15,817,378
Metallic mining ²⁰¹⁰	1	137	-
Industrial mining	19	505	129,170,256
Ornament	94	1,169	70,073,756
Quarry P.	327	1,412	63,705,099
TOTAL	449	3,515	290,438,589

- **Metallic minerals:** Nowadays there is an only active exploitation (Los Santos W mine) that represent around the 90% and 25% of the national and EU tungsten production respectively. A new tungsten mine (Barruecopardo W mine) is expected to start operations in 2019. Both exploitations represent, as well as other advanced projects, the resurgence of the W-Sn mining in western provinces (Salamanca and Zamora), very active along the 20th century. On the other hand, there are advanced projects of iron, lead-zinc and tin-tungsten that could be in production in a medium term. There is furthermore an interesting potential for mining exploration of copper, cobalt, nickel, gold and some other metals that were exploited in the past.
- **Industrial Minerals:** Industrial minerals represent in Castilla y León the 44.5% of the value of production. The most outstanding activities in this field correspond to the exploitations of glauberite (Na-Ca sulphate) in Burgos and K-feldspar in Segovia; in both cases, Castilla y León is the national leader in production in Spain. It is also remarkable a magnesite exploitation in Soria province, started up in 2015, that represents the 25% of the national production. There is an interesting potential for mining exploration of talc, graphite, lithium, etc.

MINE	OWNER	MINERAL	START
Los Santos	DAYTAL Resources Spain SL	W	2008
Barruecopardo	SALORO SLU	W	2019
Borobia	MAGSOR	Magnesite	2015
Cerezo del R. Tirón	Grupo CRIMIDESA	Glauberite	
Belorado	Grupo SAMCA	Glauberite	

Mining industries in Castilla y León include both underground and open-pit exploitations, with a clear predominance of the latter. There is not metal extraction in Castilla y León as final product of the mining industry, in the case of tungsten the final saleable product is a concentrate of scheelite (Los Santos W mine). In the magnesite mine of Borobia, saleable MgO is obtained by means of calcination of the magnesite. A special case is the glauberite exploitation, in which salts are extracted by dissolution in situ (directly in the deposit) and later Na-sulphate precipitation in the treatment plant.

Downstream industries related with the mining activity in Castilla y León include 4 coal power plants; 4 cement plants, many concrete plants, 1 factory of absorbent products, several glass and ceramic factories, and one silicon carbide plant. Many of them are nearby (concrete plants) or very close (power plants, ceramic factories) to the mining exploitations. In the past, there were also steel and ferroalloys industries. There is still an **Al-recycling industry** in Valladolid. Furthermore, raw materials produced in Castilla y León also feed to tiles industries in the Spanish Mediterranean Coast, fertilizers in several plants in Spain, ferrosilicon industries in Norway and tungsten-related industries in USA. The Figure below shows the distribution of different minerals in Castilla y León.

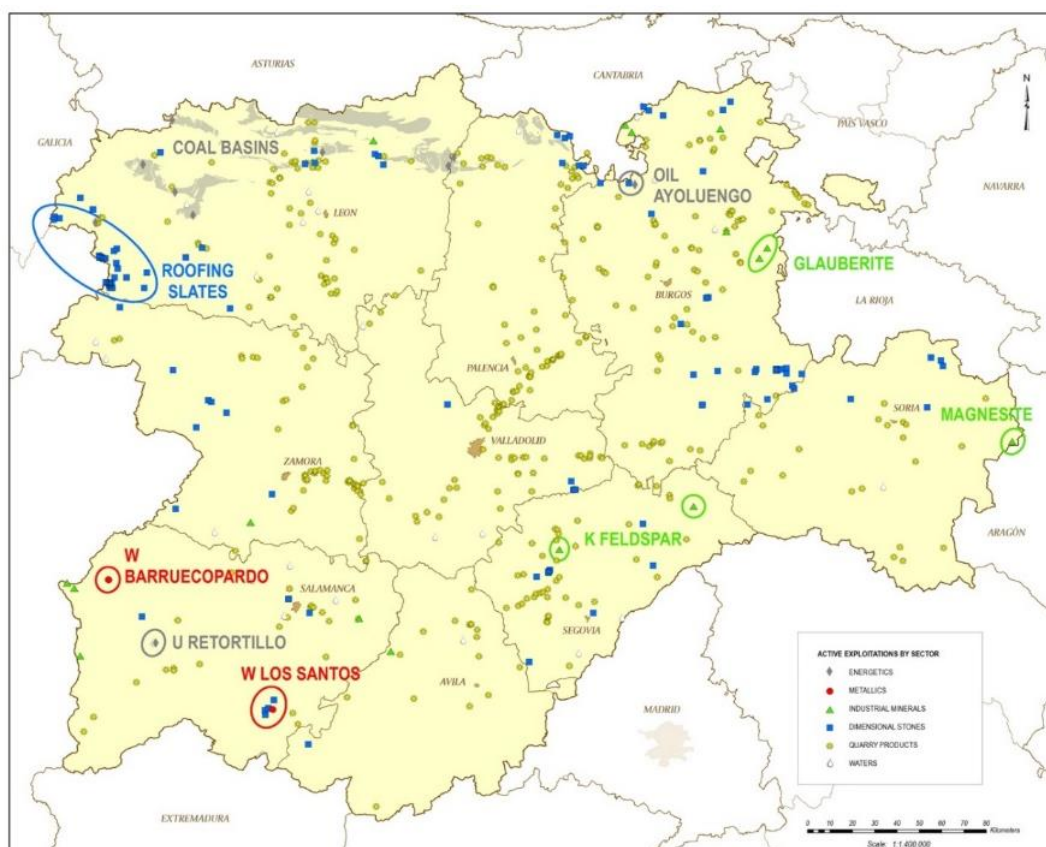


Figure 7 Mineral distribution in Castilla y León.

3.2.6.3 Integration of structural funds and associated economic benefits

Spain, through 64 national programmes, benefits from ESIF total funding of EUR 56.3 billion (39.8 billion from EU) over the period 2014-2020 and represents an average of 856 euro per person. The breakdown of the total budget by fund for 2014-2020 is⁵⁶:

FUND	SPAIN (M€)
EARDF	12,277 (21.8%)
EMFF	1,558 (2.8%)
ERDF	29,266 (52.0%)
ESF	10,246 (18.2%)
YEI	2,923 (5.3%)
TOTAL	56.31 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/ES>

It is worth to point that 154M€ of the regional ERDF are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector. At the national level, one policy is identified to be relevant to mining and metallurgy, the *Spanish Strategy for Science, Technology and Innovation providing a framework for the period 2013-2020*⁵⁷. The Strategy

⁵⁶ <https://cohesiondata.ec.europa.eu/countries/ES>

⁵⁷ <https://rio.jrc.ec.europa.eu/en/library/spanish-strategy-science-technology-and-innovation-eesti>

highlights eight national challenges and one of them refers to the Climate change and the efficient use of resources and raw materials. The challenge suggests the transition to new production models that reduce the pressures on the environment, natural resources and raw materials and trigger the application of cleaner industrial process (Fundación Biodiversidad, 2014).⁵⁸ However, The Strategy did not explicitly mention ore/spar mining and metallurgy.

3.2.6.4 Existing measures to foster market uptake

The *Regional Strategy of Mineral Resources 2017-2020*⁵⁹ is the mining and metallurgy policy at the regional level approved by the Council of Government Castilla y León in 2017. There are three main objectives of the Strategy which are listed below.

- Promote the creation of wealth and employment around the sector, through 33 measures, among which are those aimed at enhancing the regional geo-mining heritage and those aimed at facilitating the generation of business activity.
- Show the important mining potential of the Autonomous Community, Castilla y León, and adopt the administrative measures that allow the creation of adequate conditions that guarantee the development of actions and projects that activate this mining potential and selectively and deliberately support the mining regions and the sector business, joining forces and seeking the internationalization of the sector.
- Contribute to boost the productive industrial fabric based on the valorisation of the use of mineral resources, by supporting the modernization of its productive capacity aimed at improving competitiveness and with the consequent creation of employment.

The structure of the Strategy is based on the demonstration of the regional mineral potential, the adoption of administrative measures to activate the latent mining potential and the support to the mining business sector and the mining municipalities in regarding the harmony with the society and the internationalisation. The strategic aims include the mining and environmental ordinance, surveillance and control, economic valuation, administrative effectiveness and knowledge management. Corresponding actions are listed under each strategic aim.

3.2.6.5 Identification of industrial strengths and possible symbiosis with RIS3

The relevant administrative, private companies and research institutes

- Regional Directorate for Energy and Mines⁶⁰
- SIEMCALSA⁶¹
- ICAMCYL⁶²
- Institute for Enterprise Competitiveness (ICE)⁶³
- Geological Survey of Spain (IGME)
- Fundación Sta. Bárbara
- Univ. León (School of Mines)
- Univ. Salamanca (Faculty of Geology)
- Univ. Burgos (ICCRAM)

⁵⁸ https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/spain_eco-innovation_2015.pdf

⁵⁹ <https://energia.jcyl.es/web/jcyl/Energia/es/Plantilla100/1284750663713/Programa/>

⁶⁰ <http://www.jcyl.es/web/jcyl/Portada/es/Plantilla100Directorio/1248366924958/0/1284182442153/DirectorioPadre>

⁶¹ <http://www.siemcal.com>

⁶² <https://www.icamcyl.com>

⁶³ <https://empresas.jcyl.es>

Roughly, there are twelve associations at the regional or national level. Usually, associations group companies working in a same sub-sector or in a specific product. The most outstanding in Castilla y León are:

- CARBUNIÓN: national federation of coal mining companies
- CONFEDEM: national confederation of mining and metallurgy companies
- COMINROC: national confederation of extractive industries of ind. min.
- AINDEX: national association of industrial minerals producers
- PINACAL: regional association of ornamental rock producers
- APICAL and APROPICAL: regional assoc. of roofing slate producers
- ANEFA: national association of aggregate producers
- AFARCYL: regional association of aggregate producers
- ATEDY: national technical and business association of gypsum
- OFICEMEN: national association of cement producers
- HISPALYT: national association of tiles and bricks producers

There are as well professional associations of geologists and mining engineers.

In 2018, the *Iberian Sustainable Mining Cluster (ISMC)*⁶⁴ was constituted, promoted and managed by ICAMCYL and with the support of the regional administration. Nowadays more than 50 regional and national private industries (most of them SMEs) from the mining industry and associated services are part of the cluster. The cluster will act as a vehicle to improve business competitiveness, and contribute to innovation, shared knowledge and integration of technological solutions to boost a new sustainable mining activity.

3.2.6.6 Conclusions

To summarise, Castilla y León is a large region with low density and disperse population. There is a wide array of raw materials in production, and good perspectives regarding to the mining potential. Regional mining sector is mostly integrated by microcompanies, even though there is a wide number of enterprise associations and mining-related entities in CyL, as well as a recently created Cluster of Iberian Mining.

Mining sector in Castilla y León has the potential to access the ERDF and/or the ESF at the regional level through the regional ESIF programme as the mineral raw materials are included in the RIS3Thematic Priority TP4: Natural Heritage, Cultural Heritage and the Spanish Language, and endogenous resources as basis of the sustainability of the territory. The most important regional policy instrument related with the mining sector is the Regional Strategy of Mineral Resources 2017-2020. Its objectives are to promote the creation of wealth and employment around the sector (ex. Geo-mining heritage), adopt the administrative measures providing conditions that guarantee the development of actions that activate the mining potential and contribute to boost the productive industrial fabric (ex. by supporting the modernization of its productive capacity). The objectives are reflected by five strategic aims (axis) with lines of actions. In Spain, there is no national RIS3. While the *Spanish Strategy for Science, Technology and Innovation providing a framework for the period 2013-2020* includes the efficient use of resources and raw materials as one of the national challenges alongside climate change, mining and metallurgy sectors are not explicitly mentioned.

⁶⁴ <http://www.ismc-iberiamine.com/>

3.2.7 Cornwall and Isles of Scilly, UK

3.2.7.1 Brief overview of the region and its RIS3

With a population of 541,663 inhabitants, Cornwall is a county located in the southern-west side of UK. It covers an area of 3,600km² (mainland plus Isles of Scilly) with the capital being Truro. The regional GDP is 9,551£€ (0.56% of the National GDP) with a rate of unemployment around 6%. Economically, Cornwall relies on agriculture and tourism as the two main sectors, with one third of Cornwall being a designated Area of Outstanding Natural Beauty. The Cornish natural, historic and built environment attracts visitors who spend over £1.2 billion a year and contribute about 24 % of Cornwall's Gross Domestic Product (GDP), supporting around one in five jobs.

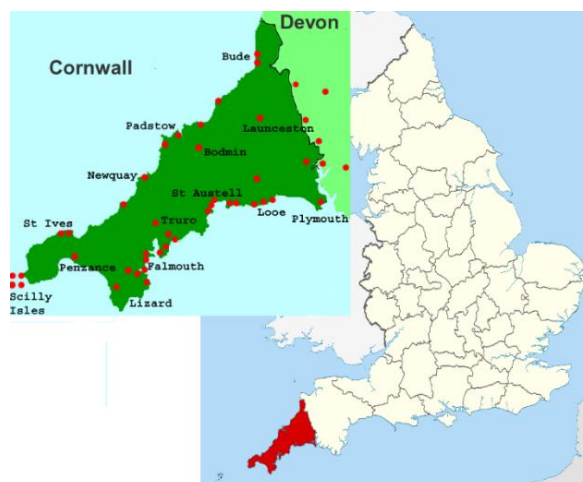


Figure 8 Cornwall location within the United Kingdom

Regional RIS3

The table below presents the S3 priorities of Cornwall and Isles of Scilly (**NUTS 2: UKK3**). The target growth markets (Smart Specialisation priorities) are seen in Space and aerospace, Agri-tech, Digital economy, E-health/E-wellbeing and Marine technology. While mining and metallurgy industries are not mentioned in the S3 priorities, there is the intension of achieve synergies between the future development of mining projects and the digital economy smart specialisation in Cornwall (REMIX status report 2018).

PRIORITY	
Health & well being	Smart grids
Energy efficiency	Creative sectors
Bio medicine	Marine energy
Digital Tele-Health	Biofuel

Reference: S3 Platform, last updated 13/09/2019

National RIS3

Mining and metallurgy are not part of the England national RIS3 priorities. There is currently no mining and metallurgy relevant policy/strategy/plan at the national level, only the legislations.

3.2.7.2 Identification and summary of thematic priorities/objectives in the field of raw materials/mining/metallurgy⁶⁵

Cornwall has a wealth of mineral resources, many of which have strategic regional and/or national significance and are safeguarded from non-mineral developments. Cornwall is a rich metallogenic province and there remains potential for the discovery of new metalliferous deposits and for new technologies to augment the production from lower grade deposits and secondary resources from mining wastes.

⁶⁵ The preparatory documents: MIREU regional background information for SWOT analysis – Cornwall and REMIX status quo report cited on 29 11, 2018 by UNEXE

Tin Mining

Currently the only producer of tin in Cornwall is Blue Hills Tin Streams. They are a small-scale operation that uses traditional methods to process tin they extract from beaches and waste dumps. They use the tin to produce jewellery and other decorative products.⁶⁶ Strongbow Exploration inc. purchased the South Crofty Mine in 2016. South Crofty was the last Cornish tin mine to close in 1998. Strongbow has a mining licence that is valid until 2071 and are currently in the processes of dewatering the mine. The mine also includes copper and zinc.⁶⁷

There is also a tin-tungsten exploration project in North Cornwall. Redmoor Tin-Tungsten Project and has been owned by NAE since 2012 and through their subsidiary Cornwall Resource Limited own a 15-year exploration licence. At any point when the exploration licence valid CRL has the right to a 25-year mining licence, which can be extended by another 25 years. CRL is owned jointly between NAE and Strategic Minerals plc. The inferred resource in Redmoor has 45Tn of tin equivalent and further drilling aims to increase this.⁶⁸

Lithium

Lithium has never been commercially produced in Cornwall, however there is lithium in the hydrothermal brines which have been found at depth in the old mine workings. Lithium is also present at low grade within the micas of the St Austell granite.⁶⁹

A company called Cornish Lithium has agreements with several holders of mineral rights within Cornwall to explore for and commercially develop lithium brines in prospective areas. To summarise, currently there is no active mine in Cornwall. However, there are exploration projects for tin, copper, lithium and tungsten underway, including:

- Strongbow Exploration – South Crofty site (the last metalliferous mine to close in 1998)
- Strategic Minerals PLC - Redmoor tin/copper/tungsten project with a 23km² exploration licence
- Cornish Lithium – exploration work to look at the commercial viability of extracting lithium from ‘brines’ carrying lithium-rich hot water.

Locations and types of mineral projects in the South West, in a UK context, are illustrated in Figure 9.⁷⁰

The mineral resources map for Cornwall from the British Geological Survey can be downloaded [here](#).⁷¹

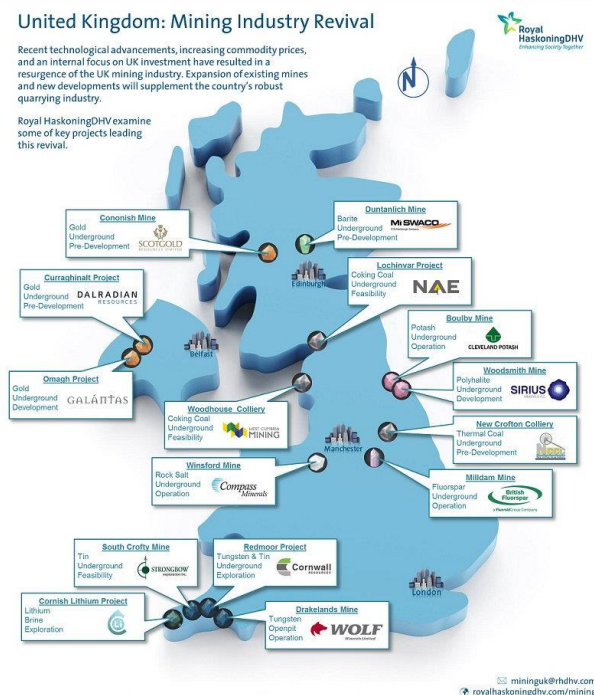


Figure 9 Cornwall and UK mineral projects

⁶⁶ <https://www.cornishtin.com/>

⁶⁷ <https://www.strongbowexploration.com/projects/uk/south-crofty/>

⁶⁸ <https://www.nae.net.au/projects/united-kingdom/redmoor/>

⁶⁹ Cornwall Council. Metals Minerals Safeguarding DPD Evidence Report. Truro: Cornwall Council, 2017

⁷⁰ <https://www.royalhaskoningdhv.com/en-gb/united-kingdom/news/uk-events/royal-haskoningdhv-sponsoring-uk-mining-conference-london/7489>

⁷¹ <https://www.mindat.org/photo-805489.html>

3.2.7.3 Integration of structural funds and associated economic benefits

United Kingdom, through 17 national programmes, benefits from ESIF total funding of EUR 26.69 billion (16.5 billion from EU) over the period 2014-2020 and represents an average of 256 euro per person. The breakdown of the total budget by fund for 2014-2020 is⁷²:

FUND	UNITED KINGDOM (M€)
EARDF	6,772 (35,4%)
EMFF	310 (1,2%)
ERDF	10,339 (38,7%)
ESF	8,692 (32,6%)
YEI	578 (2,2%)
TOTAL (B€)	26.69 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/UK>

It is worth to point that 275M€ of the ERDF funds are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector.

3.2.7.4 Existing measures to foster market uptake

Cornwall and Isles of Scilly Local Enterprise Partnership (CioS LEP) aims to facilitate sustained growth through long term, joined up investment. Through their ambitious economic plan for the region called “Vision 2030”, the aim is to transform Cornwall and Isles of Scilly in the place where business thrives and people enjoy an outstanding quality of life. To achieve this, the plan outlines three objectives: **Business** (achieve thriving businesses which excel at what they do); **People** (achieve inclusive growth and improve the skills of our workforce) and **Place** (improve infrastructure and economic distinctiveness involving people, places and businesses).

Mining is one of the ten opportunities included towards a local industrial strategy, alongside creative sector, space, energy or agri-food. LEP refers to business-led private-public partnerships which typically span a number of local authorities but not an entire NUTS1 region. The focus of LEPs is to drive sustainable private sector growth and job creation in their area. While there is no explicit requirement from a national level to focus on innovation, LEPs share responsibility to deliver part of the ESIF to innovation at the local level. Hence, the document will be used to inform future discussions with Ministers and investors as the Government implements its Industrial Strategy. These will inform subsequent bids to the Government’s Shared Prosperity Fund which is designed to replace EU funding when it runs out in 2020.

The opportunities of mining sector identified by the Cornwall and Isles of Scilly LEP are listed below.

- Secure research investment and funding to **accelerate the exploration of new minerals**, such as lithium, which would play a key part in the future of mobility; the electrification of vehicles and smart energy system
- Work with UK Government, Innovate UK and the Department for International Trade to **develop Cornwall’s global mining offer** in a wide range of areas, from exporting materials and purification to mineral analysis to mining services.

⁷² <https://cohesiondata.ec.europa.eu/countries/UK>

3.2.7.5 Identification of industrial strengths and possible symbiosis with RIS3

As mining and metallurgy are not part of the RIS3, the relevant clusters and bodies below are gathered from the preparatory document: MIREU regional background information for SWOT analysis – Cornwall.

Regional networks: The *Cornwall Mining Alliance* typifies the types and sizes of mining related organisations in the region. This industry network was established in response to the UK Government (Department for International Trade) wish to service high value opportunities in the global mining sector. The network comprises 96 members across 12 broad categories, including Geological; Mining Engineering and Surveying, Mineral Processing, Mines and Quarries or Mining Heritage.

Many organisations are multi- disciplinary and have therefore listed under several service sectors. An estimated 80% or more are micro business or SMEs.



Figure 10 Relevant clusters and bodies in Cornwall.

3.2.7.6 Conclusions

To summarise, although mining and metallurgy sectors are not part of the Cornwall and Isles of Scilly RIS3 target growth markets, they have the potential to access the England ESIF programme through applying to the RIS3 support of general innovation at the regional level. As mining is listed as one of the ten opportunities by the Cornwall and Isles of Scilly LEP, it has the potential to be taken into consideration to the future Industrial Strategy (national) and the Government's Shared Prosperity Fund (replacement of EU funding).

Regarding to policies related to mining and/or metallurgy, none could be found at either the regional level or the national level. Mining and metallurgy sectors are not part of the national RIS3 either.

3.2.8 Ireland

3.2.8.1 Brief overview of the region and its RIS3

The Republic of Ireland is an island located the north-atlantic (northwest Europe). It is the second-largest island of the British Isles, the third-largest in Europe, and the twentieth-largest in the world. With a size of 69,797.0 km² and a population of 4.5 million inhabitants, its capital and biggest city is Dublin with over 1 million inhabitants in the urban area. The national GDP is €106 billion (€79,000 per capita) while the % of unemployment is around 5.5%. The SME sector accounts for more than 70% of private employment.



Figure 11 . Map of Ireland and location within Europe

Regional/National RIS3

Ireland's Smart Specialisation Strategy for Research and Innovation is the “*National Research Prioritisation Exercise*” (NRPE)⁷³, including its implementation framework, the Action Plans for each of the Priority Areas and the governance arrangements. It is a national strategy with no separate smart specialisation strategies for each of the 2 regions (BMW and South & East). The NRPE process takes into account the regional dimension. Next table presents the S3 priorities of Ireland (NUTS 0: IE); mining and metallurgy are not considered in any of the 14 priorities for Ireland.

IRELAND's RIS3 PRIORITIES	
Future Networks & Communications	Food for Health
Innovation in Services & Business Processes	Therapeutics – Synthesis, Formulation, Processing & Drug Delivery
Processing Technologies & Novel Materials	Diagnostics
Manufacturing Competitiveness	Medical Devices
Smart Grids & Smart Cities	Connected Health & Independent Living
Marine Renewable Energy	Digital Platforms, Content & Applications
Sustainable Food Production & Processing	Data Analytics, Management, Security & Privacy

However there is potential within the priority of *Processing Technologies & Novel Materials*.

3.2.8.2 Identification and summary of thematic priorities/objectives in the field of raw materials/mining/metallurgy

Ireland has a rich mining history dating back to the Bronze Age (ca 2000 B.C.) when Ireland was an important copper and alluvial gold producer. During the 16th and 17th centuries iron was the main metal mined but it was not until the late 18th and 19th centuries that the Irish metal mining industry really flourished. This was triggered by the needs of the Industrial Revolution which we supplied with copper, lead, silver, gold, coal, slate and pyrite.

Today, Ireland is an internationally renowned zinc-lead province which includes the giant ore deposit at Navan (>110Mt) owned by **Boliden** Tara Mines Ltd. Prior to the recent closure of

⁷³ <https://dbe.gov.ie/en/Publications/National-Research-Prioritisation-Exercise-First-Progress-Report.html>

the Lisheen (2015) and Galmoy Mines Ireland (2012) was the largest zinc producer in Europe and the second largest producer of lead.

In addition to metal mining, Ireland has a rich heritage of industrial mineral and coal extraction. The Scheduled industrial Minerals of gypsum, marble, dolomite and brick shale are currently worked and until recently fireclay were also exploited. Other industrial minerals previously extracted in Ireland include barite, dimension stone, phosphate, silica sand and slate. The large demand for road and building construction aggregates in Ireland supports a thriving quarrying industry. Today crushed rock and sand and gravel are exploited from in excess of 400 sites across the country.

The metallurgy industry in Ireland is limited to the **Boliden** Tara Mines concentrator and the **Aughinish** Alumina plant in Co Limerick. The Aughinish plant refines imported bauxite into alumina and then exports the refined alumina to outside the EU for further processing to aluminium metal. It is the largest alumina refinery in Europe with about 450 employees with the capacity to produce up to two million tonnes of aluminium oxide a year.

Ireland's mineral policy is called the *New Minerals Policy 1995*. The policy provides a regulatory context in which to facilitate exploration and mining in a sustainable manner. It recommends that the State adapt a positive pro-active strategy that maximises the contribution of the minerals industry to the national economy and employment, while ensuring the highest standards of environmental protection, health and safety are maintained.

It is planned to update the policy when the secondary legislation from the 2017 Minerals Development Act is complete.

3.2.8.3 Integration of structural funds and associated economic benefits

Ireland, through 5 national programmes, benefits from ESIF total funding of EUR 6.14 billion (EUR 3.36 billion from EU) over the period 2014-2020 and represents an average of 729 euro per person from the EU budget over the period 2014-2020. The breakdown of the total budget by fund for 2014-2020 is⁷⁴:

FUND	IRELAND (M€)
EARDF	3,921 (63.9%)
EMFF	239 (3.9%)
ERDF	821 (13.4%)
ESF	952 (15.5%)
YEI	204 (3.3%)
TOTAL	6.139 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/IE>

It is worth to point that 74M€ of the ERDF funds are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector.

3.2.8.4 Existing measures to foster market uptake

The Government is committed to continuing the process of economic reform and recovery. In its “*Medium Term Economic Strategy 2014-2020*” (MTES). The overall objective of Enterprise Policy is to grow incomes and standards of living in Ireland through competitive and sustainable enterprise, innovation, productivity and employment growth; aligned and

⁷⁴ <https://cohesiondata.ec.europa.eu/countries/IE>

synchronised with the EU 2020 Strategy objectives and approach to improving European competitiveness overall.

The Irish government has appointed a Research Prioritisation Steering Group managed by Forfás (Ireland's National Policy advisory agency) comprised by a range of entrepreneurial actors including academia, enterprise, finance, public sector organisations and advisory bodies and the Chief Scientific Adviser to the Irish Government. This group has delivered several background studies on topics like "Global Market Opportunities" or "Growth Markets and the Positioning of the Irish Enterprise Base". The SG established four Thematic Working Groups (TWGs) with deep knowledge of thematic areas under consideration, one of them being "Natural Resources and Sustainable Environment" somehow related to mining and raw materials.

3.2.8.5 Identification of industrial strengths and possible symbiosis with RIS3

- **The Irish Centre for Research in Applied Geosciences (iCRAG):** Ireland's national geoscience research centre supported by Science Foundation Ireland, the European Regional Development Fund, Geological Survey Ireland and industry partners.
- **Trinity College Dublin (TCD):** Ireland's oldest university, and the most productive internationally recognised research centre in Ireland. Associate partner of EIT Raw materials.
- **University of Limerick:** First university established since the foundation of the independent state of Ireland. Among others, it creates state-of-the-art research on topics of industrial significance in the fields of surface science and materials. Associate partner of EIT Raw materials.
- **Advanced Materials and BioEngineering Research (AMBER):** Science Foundation Ireland funded centre that provides a partnership between leading researchers in materials science and industry.

3.2.8.6 Conclusions

In summary mining and metallurgy are not prioritised within the Ireland RIS3. Mining and metallurgy is a small component of the Irish Economy which is dominated by the pharmaceuticals and chemicals industry, computer hardware and software, food products, beverages and brewing and medical devices.

3.2.9 Košice, Slovakia

3.2.9.1 Brief overview of the region and its RIS3

The Slovak Republic is in central Europe, bordering Poland to the north, Ukraine to the east, Hungary to the south and Austria and the Czech Republic to the west and in the east borders with a non-EU state, Ukraine, which allows it to enjoy a strategic position.

Area: 49.035 km². Population: 5.441.309 inhabitants (December 2014) and is divided into eight regions. Its capital is Bratislava (429.000 inhabitants) and one of its main cities is Košice (234.000 inhabitants) along with Presov and Zilina. Košice region is the 4th largest region of Slovak Republic by the area (13.8% of territory) and the 2nd largest region of Slovak Republic by population (14.3% of total population of Slovak Republic).



Figure 12. Slovakia & Košice map

Regional RIS3

Kosice RIS3 was approved on 2015⁷⁵. According to the strategy of smart specialization among the areas of economic specialization of Kosice counties include:

- Automotive and engineering.
- Information and communication products and services.
- Production and processing of iron and steel.

The prospective areas of specialization of the Kosice Region include:

- Automation, robotics and digital technologies.
- Processing and recovery of light metals and their alloys.
- Creative industry.

Areas of specialization in terms of available scientific and research capacities Kosice Region include:

- Material research and nanotechnology.
- Information and communication technologies.
- Biomedicine and biotechnology.
- Sustainable energy and energy.

It should be noted that there is no individual regional EU funding programme in Slovakia, but each region is free to compete for innovation policy schemes launched by the central government and supported by the ESIF.

⁷⁵https://web.vucke.sk/files/dokumenty/pub/regionalny_rozvoj/phsr/2015/prilohy/priloha_7_regionalna_inovacna_strategia_k_osiskeho_kraja_2013_2020.pdf

National RIS3

PRIORITY	DESCRIPTION
Cars for the 21st century	<ul style="list-style-type: none"> • Manufacturing of motor vehicles, trailers and semi-trailers. • Manufacturing of other transport equipment.
Industry for 21st century	<ul style="list-style-type: none"> • Manufacturing of chemicals and chemical products. • Manufacturing of rubber and plastic products. • Production and processing of metals. • Manufacture of fabricated metal products, except machinery • Manufacture of electrical equipment. • Manufacture of machinery and equipment Electricity, gas, steam and air conditioning supply.
Digital Slovakia and creative industries	<ul style="list-style-type: none"> • Manufacture of computer, electronic and optical products. • Computer programming, consultancy and related services information services.
Healthy food and the environment	<ul style="list-style-type: none"> • Crop and animal production, hunting and related service. • Forestry and logging.
Public health and medical technology	<ul style="list-style-type: none"> • Health.

Reference: S3 Platform, last updated 13/09/2019

In the Slovakia national RIS3, metallurgy is included in the chapter of “*Areas of economic specialisation*” based on traditional sectors, due to its contribution to increasing domestic value-added products through improving production process. Development trends selected based on relation to metallurgy are listed below.

- to develop of production processes in industry focusing on better use of available resources, greater use of recycling materials and environment-friendly materials through the R&D&i development.
- to develop of technological investment units, particularly in the field of metallurgy, engineering, energy and integrated industrial equipment, with respect to the application and use of light metals and advanced materials in the manufacture of transport and construction facility to reduce overall weight and contribute to the green economy (development and application usage of composite materials).
- to use of ICT and robotics in the production processes.

In addition to the “Area of economic specialisation”, increasing the value of domestic raw material base is one of the “*Prospective areas of specialisation*”. Development trends selected based on relation to raw materials sector include: smart production system; smart technologies for the intelligent management of smart products consumption and support of the smart technologies in the field of raw materials processing in regions of their occurrence.

3.2.9.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

In Košice self-governing region several important mining companies have been closed since 90s. Nowadays in the region the main companies that are in mining industry are: **Nafta, a.s.** that is exploiting a several natural gas deposits (Senné, Trebišov, Stretava, Trhovište-Pozdišovce); **Eurotalc, s.r.o.** - the new company that is mining talc deposit in Gemerská Poloma; **Carmeuse Slovakia s.r.o.** exploiting several limestone and dolomite open pit mines.

Metallurgy is one of the basic branches of heavy industry in which metals, their alloys, various metallurgical products and products are produced from ores and other materials. Košice

recognises iron and steel metallurgy - black metallurgy and metallurgy of non-ferrous metals - coloured metallurgy. Non-ferrous metal metallurgy mainly produces copper, lead, zinc, tin and their alloys. The metallurgy of light metals mainly produces aluminum and its alloys. Metals are produced from ores (pyrometallurgy), wet (hydrometallurgy) or electric current (electrometallurgy). Metallurgy belongs to the core industries of heavy industry, which has a strong position in the regional economy, is represented by the largest production company in the region of the **U.S. Steel Košice, s.r.o.**⁷⁶ The other larger metallurgy company is the **C.L.N. Slovakia, s.r.o., Košice**⁷⁷ which produces iron and ferro-alloys.

Slovakia has significant deposits of lignite, the only significant energy source in Slovakia, which are located mainly in the Trenčín region. Slovakia buys almost 80% of the primary energy sources outside the internal market of the European Union, mainly in Russia.

Natural gas and oil fields are very scarce and cover 3% and 2% of national consumption, respectively. Slovakia has several nuclear power plants where it generates more than half of the electricity consumed in the country. In 2005 there were 70 ore deposits and total geological stocks reached 356 million tons.

Wind, solar and biomass projects are also underway, with electricity from these sources being very marginal in 2011. An analysis of the socio-economic development of the Košice region accrue following facts. Assessment of the financial situation of selected key decision-makers broken down by sectoral classification of economic activities (for the metal mining industry and metallurgy industry):

- Mining of non-energy RM - extraction and processing of iron and non-ferrous ores:
 - **Želba, a.s.** mining and processing barite and siderite ores⁷⁸
 - **Želba, a.s. Spišská Nová Ves** with focus on mining and other spare parts, especially engineering programs, managed a huge loss. Production capacities were used up to 70%, the sales were partially secured, the company suffered from secondary insolvency, the number of employees decreased. Currently, the company has **terminated mining operations**.
 - **Želba a.s. OZ Siderit Nižná Slaná** was focused on the extraction of iron ore - the siderite in the deep way and the thermal way it was processed into Fe concentrates and blast pellets and was the monopoly producer of this production in the SR, the main customer was U. S. Steel Kosice and Komag, a.s.
- Košice with a focus on mining the reserved magnesite deposit on the Bankov locality in a deep way, for the processing and refining of magnesite, the production of concentrates, magnesite clinkers, spinels and calcins, refractories also ceased its activity. Strength of a.s. was the unique technology of producing clinker-based clinker concentrates, rewarding the domestic raw material base. Problems persisted due to a lack of funding to ensure traffic, rock mining in Mine Bankov and the upgrading of production in the projected capacity. The company had a good position on foreign markets, out of a production of 16,471 t 74% went to export (France, Germany, Hungary, Poland, Ukraine). **Bankov is currently closed mine**.

⁷⁶https://web.vucke.sk/files/dokumenty/pub/regionalny_rozvoj/phsr/2015/prilohy/priloha_7_regionalna_inovacna_strategia_k_osiskeho_kraja_2013_2020.pdf

⁷⁷ <https://www.gruppocln.com/en/plant/kosice-slovakia>

⁷⁸ International Business Publications, USA (2015). Eastern European Countries Mineral Industry Handbook Volume 1 Strategic Information and Regulations, p.123

- U. S. Steel Košice, the largest integrated steel producer in Central Europe. USSK⁷⁹ is situated on the outskirts of Košice and is the second biggest employer in Slovakia, the biggest in Košice Region and Eastern Slovakia.⁸⁰

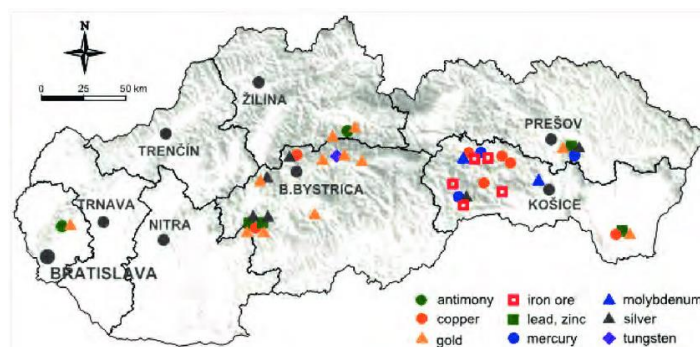


Figure 13. Distribution of reserved deposits of metals in Slovakia.

3.2.9.3 Integration of structural funds and associated economic benefits

Slovak Republic, through 9 national programmes, benefits from total funding of EUR 19.35 billion (EUR 15.3 billion from EU) ESIF funding. This represents an average of 2.830 €/person from the EU budget over the period 2014-2020. The total budget breakdown by fund, combining national and European sources, are⁸¹:

FUND	SLOVAK REPUBLIC (M€)
EARDF	2,099 (10.8 %)
ERDF	9,533 (49.3%)
ESF	2,461 (12.7%)
CF	5,009 (25.3%)
YEI	228 (1.2 %)
TOTAL (B€)	19.5 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/SI>

It is worth to point that 2,428M€ of Slovak Republic are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector, of which 102M€ are from ERDF.

3.2.9.4 Existing measures to foster market uptake

Regional

(See National policy instrument)

National

The *National Regional Development Strategy of the Slovak Republic*⁸² is the policy at the national level relevant to mining and metallurgy activities in Košice. The duration of the Strategy is from 01/2013 to 12/2018. The aim of the strategy is to comprehensively define the strategic approach of the State to the promotion of regional development in Slovak Region (SR)

⁷⁹ <https://www.usske.sk/en/>

⁸⁰ https://www.researchgate.net/Distribution-of-reserved-deposits-of-metals-2013-Source-Slovak-Minerals-Yearbook-2014_fig1_292762644 [accessed 29 Nov, 2018]

⁸¹ <https://cohesiondata.ec.europa.eu/countries/SK#>

⁸² https://trimis.ec.europa.eu/sites/default/files/project/documents/national_regional_development_strategy.pdf

with national funding (i.e. the Ministry of Transport and Construction).⁸³ The national government realised that resources from the EU funds should be only viewed as supplementary as the EU funds results from regulations of the European community. Hence, it is very important to promote regional development at national level with its internal resources.

In Košice, metallurgy is recognised one of the main factors of development in industry which has the potential for strengthening of export (i.e. strong export position in metallurgical and electrical industries). Therefore, it should be covered by the strategic objectives of Košice, strengthen of productivity and competitiveness of key and promising sectors of industry and services, putting stress on their export performance and innovation of products, processes and services. In the framework of priority areas one: Science, research and innovation, Košice should implement strategic activities putting stress on areas according to the approved Innovation Policy SR and areas of new (supporting) services and veterinary medicine, new construction materials, selected areas of medicine, IT, creative economy, green – low-carbon economy, metalworking industry.

Furthermore, Košice region should focus its strategic activities, putting stress on the increased use of renewable sources of energy and raw materials in main sectors – engineering, metallurgical, chemical and electrical industries and in the sector of services and rural enterprise, and in promising sectors such as energy (renewable sources) and production of ecological construction materials, foot industry and tourism.

3.2.9.5 Identification of industrial strengths and possible symbiosis with RIS3

The information is contributed by the preparatory documents: MIREU regional background information for SWOT analysis – Košice since there is no mention of relevant mining and metallurgy clusters or bodies in the Košice RIS3.

- **EIT RawMaterials HUB Regional Center Košice⁸⁴** - HUB was established in January 2018 by the European Institute of Innovation and Technology (EIT RawMaterials) in cooperation with the Technical University of Kosice. Activities of the HUB Center are run by the Faculty of Mining, Ecology, Process Control and Geotechnology (FBERG) and its objective is to mobilize all stakeholders falling to knowledge triangle and to support the local ecosystem in order to enhance the innovative potential of the region. All this in line with European strategies.
- **Association of Mining Guilds of Slovakia** - the association applies the interests of organizations in the field of mining and preserves tangible and intangible cultural and industrial heritage, especially mining and metallurgical traditions and customs as well as mining-technical monuments in Slovakia. It cooperates with state administration bodies, local authorities, educational and research institutions in Slovakia and abroad. The association expresses and recommends for the approval and implementation of projects proposed by individual members of the association.
- **Slovak Mining Chamber⁸⁵** - member of EUROMINES.
- **Association of Metallurgy, Mining Industry and Geology of the Slovak Republic⁸⁶** - the mission of the association is to create fair conditions for the dynamic development

⁸³ <https://trimis.ec.europa.eu/project/national-regional-development-strategy#tab-funding>

⁸⁴ <https://eitrawmaterials.eu/regional-center-kosice/>

⁸⁵ <http://www.banskakomora.sk>

⁸⁶ <http://zhtpg.sk/en/zvaz/poslanie-a-ciele-zvazu/>

of employer and business activities regarding protecting and advocating the interests of its members, and to comment on major issues relating to economic, social and legal matters. To advocate the interests of its members (from the areas of iron and steel making, non-ferrous production, metallurgical secondary production, the coal industry, ore and non-ore mining, the magnesite industry and geology in Slovakia, as well as other educational institutions and professional organizations) in negotiations with the state administration authorities and trade unions regarding economic and social policies, collective negotiations and the making of higher degree collective agreements. The Association is a member of enterprise, negotiating and consulting organizations. It coordinates procedures and advocates the common interests of its members regarding representative and state administration bodies, trade union organizations regarding all domestic and foreign partner organizations of the employers. The Association provides services, consulting and information to its members, supports education and promotion of its member organizations.

3.2.9.6 Conclusions

To summarise, metallurgy is not only one of the RIS3 priorities in Košice but also part of the RIS3 priorities. Therefore, if there are policy instruments (ex. Strategy, plan or programme) reflecting the regional and/or national RIS3 priorities, metallurgy sector should have access to the Slovak ESIF through both the regional RIS3 and the national RIS3. In addition, there is financial support from the national government to the metallurgy sector due to the National Regional Development Strategy of the Slovak Republic. However, due to the language barrier, it is unclear if there is any regional policy relevant to mining and metallurgy.

3.2.10 Lapland, Finland

3.2.10.1 Brief overview of the region and its RIS3

The region of Lapland or Finnish Lapland is one of the nineteen regions of the Republic of Finland. Its administrative capital is the city of Rovaniemi. Finnish Lapland is part of a larger geographical region called Lapland. The starting point of Finland's Strategy for the Arctic Region 2013 is that Finland, crossed by the Arctic Circle, is an Arctic country. Lapland is the most Arctic region in Finland and the EU. There are almost four million inhabitants in the Arctic Region, of whom some 10% represent indigenous peoples.



Statistical facts on Lapland:

- Land area 92.665 square kilometres, which is 25,7% of Finland's land area.
- 182.810 inhabitants, which is 3,4% of Finland's population (in August 2013).
- Largest residential centres: Rovaniemi (60.944 inhabitants), Tornio (22.399 inhabitants) and Kemi (22.172 inhabitants)
- Six sub-regions: Rovaniemi, Kemi-Tornio, Eastern Lapland, Northern Lapland, Fell Lapland and Torne Valley.

Figure 14. Finland map

Regional RIS3

Lapland was one of the first regions in Finland adopting smart specialisation strategies (S3). The systematic approach and strong strategic focus have led to recognition by the European Commission in good practice of governance. The vision of Lapland's smart specialisation is to enjoy a leading position in sustainable utilisation and commercialisation of Arctic natural resources and conditions. Lapland is a melting pot of industries and it is one of Finland's fastest growing regions with its backbones in forestry, mining, metallurgy and tourism.

The tables below present the S3 priorities of Lapland (**NUTS 3: FI1D7**). Mining is one of the S3 priorities in Lapland.

PRIORITY	DESCRIPTION
Information society	
Tourism safety	<ul style="list-style-type: none"> • Tourism safety.
Traditional process industry	<ul style="list-style-type: none"> • Traditional process industry
Mining	

Reference: S3 Platform, last updated 13/09/2019

Mining is part of the latest Lapland RIS3⁸⁷ 2018-2022 strategy "*Lapland: an Arctic and international highflier. The Strategic Priorities for International Smart Specialisation 2018-*

⁸⁷ https://arcticmartness.eu/wp-content/uploads/2018/12/KV-julkaisu_englanti_4.12.2018.pdf

2022". The current thematic priorities are: f the RIS3 priority, Refining of Arctic natural resources are:

TP1. Advanced Arctic business – foundation for the growth. Strategic themes: Arctic circular economy, Arctic sustainable tourism, Growth in business by increasing the refining of natural resources; New emerging industries.

TP2. Arctic expertise, renewal and innovations strengthening the growth and international business activities. Strategic themes: Arctic innovation platforms; education solutions and internationality.

TP3. Regional ecosystem as the base for internationalisation. Strategic themes: A renewing regional ecosystem; clustering and internationalisation.

In addition, the document *“East and North Finland in Industrial Transition – Smart Specialisation Strategy 2019–2023”*⁸⁸ identifies a fourth cross-cutting thematic priority including: Innovative activities, Digital technology, Low-carbon solutions and Energy efficiency.

National RIS3

There is no RIS3 at the national level.

3.2.10.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy⁸⁹

Lapland in facts⁹⁰:

- Annual revenue of mining and metal industry approx. € 5.000 M.
- World’s northernmost bio, mining, metal industry and services hub.
- Europe’s only chromium mine and the largest gold mine in Europe.

Due to its mineral potential, Lapland has become one of the most prominent regions for the extractive industries at the global level. The ore resources in Lapland are amongst the richest in the whole of Europe. Many new mines have been opened and other ones are currently being planned. Mining is especially extensive in the Kemi region and in Kittilä, Sodankylä and Kolari. Tornio is globally renowned for its extensive steel industry, for which additional investment plans have been drawn up. The Lapland region is rich in gold, which is being extracted in the **Kittilä mine**, also known as the Suurikuusikko mine, which is the largest gold mine in Europe. Around 8.000 kilogrammes of gold are mined in the Kittilä mine each year. The **Pahtavaara mine** is another gold mine where significant quantities of gold is extracted. Nickel, copper, gold, platinum and palladium are extracted in the **Kevitsa mine**. In 2017, around 7,911 thousand tonnes of ore were extracted in Kevitsa. The **Kemi mine** is the only chromium mine in the European Union. Currently, the mine extracts 2.4 million tonnes of chrome ore per year.

LOCATION (MINING COMPANY)	DESCRIPTION
Kittilä mine/ Suurikuusikko mine (Agnico Eagle) ⁹¹	<ul style="list-style-type: none"> • Underground mining • Gold
Pahtavaara mine	<ul style="list-style-type: none"> • Open pit mining turned underground mining (since 2006) • Gold

⁸⁸ https://issuu.com/ip-suomi.elmo/docs/elmo-strategy_english_web

⁸⁹ <https://www.mireu.eu/partners/region-lapland>

⁹⁰ <http://www.lappi.fi/lapinliitto/en/statistics>

⁹¹ <https://www.agnicoeagle.com/English/operations-and-development-projects/operations/kittila/default.aspx>

(Rupert Resources)⁹²	
Kevitsa mine (Boliden)⁹³	<ul style="list-style-type: none"> • Open pit • Nickel, copper, gold, platinum and palladium.
Kemi mine (Outokumpu)⁹⁴	<ul style="list-style-type: none"> • Underground mining • Chromite ore that is concentrated into upgraded lumpy ore and fine concentrate through sophisticated industrial operations at the surface • Both are then transported to the Tornio Ferrochrome (Outokumpu) Works for processing.

Figure 15 shows the mining and metals in Finland, and mine, exploration tenements and main targets in 2016.⁹⁵

Mining & Metals in Finland

- 42 mines reported production in 2016:
 - 12 metal, 30 industrial minerals
- Mine investments 2008–2014: 2300 M€
 - 242 M€ in 2016
- Estimated investments 2016–2025: 3000 M€
- Turnover 1500 M€ in 2015
- Mining and metal-related exports 6700 M€ in 2014

2015 ore output (Mt)

- > 10
- 1.0 - 10
- 0.5 - 1.0
- 0.1 - 0.5
- < 0.1
- Metals
- Industrial minerals



Figure 15 Mining & Metals in Finland. 2016.

3.2.10.3 Integration of structural funds and associated economic benefits

Partners of the **Arctic Industry and Circular Economy Cluster**, namely GTK, LUKE and Lapland UAS, have formed successful partnerships under the Horizon 2020 programme (H2020)⁹⁶. GTK alone received three projects as a result of cluster co-operation in the call for projects of the Horizon 2020 programme in 2017; these projects will be carried out in 2017–2021. The Mining and Metallurgy Regions of EU (MIREU) project establishes a Europe-wide network of areas that have mutual interests in the production of mineral raw materials. The MIREU project is coordinated by GTK, and the Lappish partners include the Regional Council of Lapland and the University of Lapland. GTK is also coordinating the **NEXT** project, aimed at developing modern mineral exploration methods. Other Lappish participants include the University of Lapland and several SMEs. Thirdly, GTK is involved in the H2020 project **Minland**, focusing on land use issues in the mining industry.

In addition, LUKE and the Lapland University of Applied Sciences are representing Lapland in the H2020-funded **ROSEWOOD** project, which focuses on the mobility of raw materials in the forest bioeconomy and on building regional collaboration models. The strategic approach

⁹² <https://rupertresources.com/pahtavaara-mining/>

⁹³ <https://www.boliden.com/operations/mines/boliden-kevitsa>

⁹⁴ <https://www.outokumpu.com/locations/kemimine>

⁹⁵ http://www.oulu.fi/sites/default/files/184/09_20_Tero_Niiranen GTK_Exploration%20potential%20of%20Finland.pdf

⁹⁶ <https://arcticsmartness.eu/>

adopted in the Arctic Smartness cluster work has resulted in a total of 23 million euros received through Lappish partnerships from EU direct funding programmes, and 40–50 % of these funds benefit the Lappish actors directly.

At the national level, there are two key policies relevant to mining and metallurgy sectors, the ***Making Finland a leader in the sustainable extractive industry – Action plan (2013)***⁹⁷ and the ***Finland's Mineral Strategy***⁹⁸. The Action plan includes measures to be taken by the industry to obtain society's support for its activities. Proposals for improving the operating conditions for the extractive industry are made with regard to administration, training and infrastructure. In addition, the action plan proposes more active, open exchange of information and experiences, along with ongoing dialogue regarding the action plan's implementation and development within the industry. The Finland's Mineral Strategy proposes a **Vision 2050** where Finland is a global leader in the sustainable utilisation of mineral resources and the minerals sector is one of the key foundations of the Finnish national economy. The strategic objectives include promoting domestic growth and prosperity solutions for global mineral chain challenges and mitigating environmental impacts. The themes of the action proposals are strengthening mineral policies, securing the supply of raw materials, reducing the environmental impact of the minerals sector and increasing its productivity and strengthening R&D capabilities and expertise.

Finland, through 6 national programmes, benefits from a total funding of EUR 8.43 billion (EUR 3.8 billion from EU). This represents an average of 690 € per person from the EU budget over the period 2014-2020. The total budget breakdown by fund, combining national and European sources⁹⁹, are:

FUND	FINLAND (M€)
EARDF	5,673 (67.3%)
EMFF	141 (1.7%)
ERDF	1,583 (18.8%)
ESF	1,036 (12.3%)
TOTAL (B€)	8.43 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/FI>

It is worth to point that EUR 1,907 million of the total ERDF of Finland are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector.

3.2.10.4 Existing measures to foster market uptake

Regional

Industrial Strategy of Lapland 2030¹⁰⁰ is the regional policy that has the potential to influence mining and metallurgy activities at the regional level. The aim of the strategy is to provide guidelines for securing industrial growth and internationalisation, developing the operating environment and targeting public aid measures. The strategy also assesses development prospects in the industrial sector over a long-time span until 2030 and sets short- and medium-term objectives for promoting growth. The industrial strategy of Lapland has been built on the region's strengths - vast natural resources accompanied by skills and competences.

⁹⁷ <https://tem.fi/documents/1410877/3437254/Making+Finland+a+leader+in+the+sustainable+extractive+industry+04072013.pdf>

⁹⁸ <https://ec.europa.eu/growth/tools-databases/eip-raw-materials/en/system/files/ged/42%20FinlandsMineralsStrategy.pdf>

⁹⁹ <https://cohesiondata.ec.europa.eu/countries/FI>

¹⁰⁰ http://www.lappi.fi/lapinliitto/c/document_library/get_file?folderId=21301&name=DLFE-13077.pdf

On the other hand, different tools have been developed to promote the utilisation of industrial and societal side-streams, the industrial symbiosis, and the circular economy in a business-oriented manner in the context of an extensive collaboration network.

The goal of the circular economy is to strengthen Lapland's status as a sustainable and resource-efficient utiliser of natural resources. In Lapland, the circular economy is profiled around developing the business opportunities of industrial enterprises in the forestry, metal, mining and energy sectors and of their service actors.

National

The mining industry in Finland is one of the rare industrial sectors that is currently targeted by considerable foreign investment. Exploration is inherently a high-risk activity, and establishing a mine requires substantial capital investments. For maintaining long-term growth, it is therefore necessary to further strengthening financing mechanisms that promote development of the sector. Contributions to high-risk investment by institutional investors and the government, either through direct ownership or as a creditor, are important because in this way mining and prospecting projects can be efficiently accelerated. An additional objective should also be to gradually increase Finnish ownership in the sector. In recent years, the government has begun providing support for infrastructure investment for mining projects; such support should be continued in the future.

National strategies are required to secure resources and to promote the minerals sector. Accordingly, the ministerial working group on climate and energy policy has commissioned the preparation of a *Minerals Strategy for Finland*¹⁰¹. The key terms of reference have been to anticipate international and domestic development trends in the minerals sector over the next few decades, and to make recommendations concerning the formulation of a sustainable minerals policy and the development of the minerals sector in a way that satisfies the needs of both society and business. The strategic objectives are:

- Promoting domestic growth and prosperity.
- Solutions for global mineral chain challenges.
- Mitigating environmental impact.

The themes of the action proposals are:

- Strengthening minerals policy.
- Securing the supply of raw materials.
- Reducing the environmental impact of the minerals sector and increasing its productivity.
- Strengthening R&D capabilities and expertise.

3.2.10.5 Identification of industrial strengths and possible symbiosis with RIS3

There is no relevant clusters and bodies mentioned in the RIS3 of Lapland. The stakeholders below are contributed by the REMIX project: Status report from Lapland.

- **KATEPAL** network (Arctic Industry and Circular Economy cluster)
- Lapland Centre for Economic Development, Transport and the Environment (ELY centres)
- **Kemin Digipolis Oy**

¹⁰¹ http://projects.gtk.fi/minerals_strategy/index.html

- Cities and municipalities: Sodankylä, Kittilä, Kolari and Ylitornio
- Lapland University, Lapland University of Applied Sciences (UAS)
- **Geological Survey of Finland (GTK)**
- University of Eastern Finland

On the other hand, as set out in the document *Lapland – an Arctic and international highflier*, the aim of the Lapland strategy is to reinforce the priorities of Lapland's Arctic Specialisation Programme. The strategic choices for smart specialisation were updated as part of priority setting for the Lapland.

Smart specialisation has been put into practice on grass-roots level in Lapland under the Arctic Smartness brand.¹⁰² Through the five chosen **Arctic Smartness clusters** Lapland is looking beyond the boundaries of traditional ways of doing things to get the best use of the regional expertise and strategic partnerships over the borders. All of the five clusters are implementing new local and European initiatives and projects creating a breeding ground for growth in the regional economy.

The clusters represent a new way of cooperating across organisational boundaries and developing new regional value chains. The core of cluster activities is to create growth and innovation opportunities for SMEs in Lapland. The clusters functioning in Lapland have established a firm foothold in regional development work and discovered their own networks in international arenas as well.

In 2016, the five clusters of Lapland received the Bronze Label of the European Secretariat for Cluster Analysis (www.cluster-analysis.org). In 2017, the Rural cluster and the Industry and Circular Economy Cluster secured the Silver Label. The clusters are being continuously developed further in order to meet the needs of SMEs and cluster organisations.

- **Arctic Industry and Circular Economy Cluster** aims to develop its leading position in exploiting and commercialising Arctic natural resources and conditions while maintaining balance of sustainable development. Mix of industrial expertise and commitment to sustainable development are at the core of refining resources in the Lapland region. We are reaching the vision by promoting regional clusters and ecosystems of emerging industries that focus on refining natural resources throughout the value chains.
- **Arctic Smart Rural Communities** mission is to avoid capital outflow from rural Lapland and create new innovative enterprises based on circular economy. The cleanest corner of Europe offers a surplus of raw-materials to wide-range smart resource-intensive business. Our goal is to transfer the added value of local natural resources for a benefit of the communities.
- **Arctic Development Environments** is serving as a supporting network to all clusters with i.e. enabling technologies to all industries and especially SMEs. The tool for measuring the performance and effectiveness of innovations is Technology Readiness Level (TRL). TRL is used as a meter to indicate the level of cluster's readiness to produce development services to the market.

¹⁰² <https://arcticsmartness.eu/>

3.2.10.6 Conclusions

To summarise, mining and metallurgy are one of the Lapland top priorities. Therefore, mining and metallurgy sectors should be able to access the Finland ESIF through the regional RIS3 if the priorities of the Lapland RIS3 are reflected in regional policy instruments. While there is no RIS3 at the national level, funding from the national government is available/possible to the mining and metallurgy sectors through the policies (*Making Finland a leader in the sustainable extractive industry – Action plan* (2013) and the *Finland's Mineral Strategy*).

3.2.11 Lower Silesia, Poland

3.2.11.1 Brief overview of the region and its RIS3

Lower Silesia, located in the southwestern part of Poland, is the country's seventh largest province. The region covers an area of 19,947 km² with a population of nearly 3 million people. The province is home to over 169 municipalities, forming 26 rural counties and 3 townships. Wrocław, as the capital of Lower Silesia with around 650 thousand inhabitants, is the fourth largest Polish city in terms of population. It is one of the fastest growing regions in Poland. One of the most important industries in terms of production value include: mining and extraction.



Figure 16. Location of Lower Silesia region within Poland.

Regional RIS3


Mining and metallurgy are part of the Lower Silesia RIS3¹⁰³ priority **"Raw materials and recyclable raw materials/Natural resources and recyclable materials"**. It was identified that the mining sector (including mining, processing and recovery) has great potential for cooperation with research and development (R&D) centres, particular in areas such as, new mining technologies, full characteristic technologies (processes, equipment and materials) and rare-earth elements extraction technologies (material recovery). The identified smart specialisation subareas are listed below.

1. Technologies of the acquisition, processing and utilization of useful minerals
 - a. technologies of the acquisition of new products from the main mineral
 - b. integrated systems for monitoring the threats in the environment of the mining plants
 - c. technologies of the acquisition, treatment and use of ordinary, thermal and mineral waters
 - d. technologies of the acquisition and processing, and the use of wood, vegetable raw materials in the innovative products
 - e. new treatment and spa services on the basis of the use of the natural resources
2. Technologies for the recovery of useful materials, recycling and disposal of waste
3. Advanced materials

The table below present the S3 priorities of Lower Silesia (NTS2:PL51). Raw materials and recyclable raw materials are one of the S3 priorities in Lower Silesia.

¹⁰³Strategic Framework for Smart Specialisations of Lower Silesia, 2015:

http://www.umwd.dolnyslask.pl/fileadmin/user_upload/Strona_glowna/Strategic_Framework_for_Smart_Specialisations_of_Lower_Silesia.pdf

PRIORITY	DESCRIPTION
Information and communication technologies	Wide scope of ICT application like data mining, mechatronics and robotics, visual & multimedia data processing, cyber-security, SaaS applications, man-technology interaction systems employed in business process management supporting systems, smart buildings, smart cities, ambient assisted living, mobile application, computer game, e-services, e-health, e-commerce systems and financial & insurance.
Chemical and pharmaceutical industry	Development of organic and non-organic chemical substance and technologies to be used in medical and pharmaceutical products.
High quality food	Focus on nutrition aspect of food for human-beings and animals.
Manufacture of machinery and equipment, materials processing	Development of new technologies for the manufacture and production of all types of machinery and equipment (including their components).
 Raw materials and recyclable raw materials	Acquisition, advanced processing and utilization of raw materials, secondary materials recovery, recycling and waste disposal technologies, advances materials creation.
Spatial mobility	Mainly production of spare-parts, drones and engines and sources of power supporting e-mobility.

National RIS3

Mining and metallurgy are part of the RIS3 of Poland¹⁰⁴ as they are covered by the priority, Natural resources and waste management. The direction of smart specialisation includes modern technologies for sourcing, processing and use of natural resources and production of substitutes thereof, minimising waste, including waste unfit for processing and use of waste for material and energy purposes (recycling and other recovery methods) and innovative technologies for processing and recovery of water and reducing its consumption.¹⁰⁵

3.2.11.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

Regarding metallic mining and metallurgy in Region¹⁰⁶, the Lower Silesian Voivodship is one of the most diversified regions in terms of nature, landscape and culture. It is also one of the most industrialized regions in Poland. The oldest traces of extraction of such metals as gold, silver, lead, copper, iron, tin date back to the 5th-6th century (in the Kaczawskie Mountains). The organized gold extraction in the area of Złotoryja was started in the 12th century, and in Złoty Stok in the 13th century (or probably even from prehistory – 4000 years ago). Besides metals, also industrial raw materials constitute significant group of minerals in Lower Silesia with long history. Extraction of construction stones dates to prehistoric times, as indicated by Celtic sculpture circles from Ślęża. The first documented data on the use of Strzelin granites dates to the first half of the 12th century, and since the 13th century, chalky sandstones have been commonly used (Final report 2017).

Nowadays, in Lower Silesia region minerals from each group occur: metallic (copper and accompanying elements: silver, gold, nickel, zinc, cobalt, molybdenum, lead, vanadium), chemical (rock salt, barite, fluorspar and sulphur as an accompanying mineral), industrial (e.g. dimension and crushed stones, backfilling, sand and gravel, glass raw materials), energy (brown

¹⁰⁴ http://s3platform.jrc.ec.europa.eu/documents/20182/223684/PL_RIS3_2014_Final.pdf/0abc3c93-7868-45f8-b27f-fbdfb28bb437

¹⁰⁵ Poland's presentation in 16th Peer Review - Ireland (IE), 03 & 04 July 2014
http://s3platform.jrc.ec.europa.eu/documents/20182/89832/WEB_Poland_Dublin_PPT_FINAL_30June2014.pdf/0806b16b-298d-40a3-941f-58440255d9ae

¹⁰⁶ The preparatory documents: MIREU regional background information for SWOT analysis – Lower Silesia by AGH/AGH-UST and UMWD-IRT

coal, natural gas) as well as brines, healing and thermal waters. Some of the minerals like copper ore, silver, nickel, gold, whiteware ceramic clays, quartz veins, magnesites, quartz rocks and kaolin are unique on a national scale. Lower Silesia is a leader in the mining of road and construction stones, refractory clays and natural aggregates. The largest amount of sand and gravel resources is documented in the Lower Silesian (2 212 mln t) (source: The balance of mineral resources deposits in Poland as of 31.12.2017). About 95% of all magma and metamorphic resources in Poland are in Lower Silesia (source: Urząd Marszałkowski Województwa Dolnośląskiego). The Lower Silesia is the leader in voivodship when it comes to the total area of rock mining (22 496 ha). These areas represent a significant percentage of total rock mining areas in Poland (25%) (Machniak, 2015).

The most important part of the economy in the region is the exploitation of copper and silver ore in the Legnica-Głogów Copper District. KGHM Polska Miedź S.A. - is one of the world leaders in the production of electrolytic copper, silver and rhenium. KGHM owns production plants on three continents - in Europe, South and North America. Lower Silesia copper deposits - one of the biggest in the world - are exploited by three underground mines: "Lubin", "Polkowice-Sieroszowice" and "Rudna". The extracted material is enriched in the Concentrator Plant, while the production of copper, silver, gold, lead and other metals takes place in smelters:

"Głogów", "Legnica" and "Cedynia" (Figure 17). All plants belong to KGHM Polska Miedź S.A. (source: KGHM Polska Miedź S.A.). The extraction of copper, silver and associated metals (Ag, Au, Re, Se, Zn, Pb, and platinum) by KGHM became one of the major sources of Polish income in the 21st century. Among these metals, Cu, Ag and Re were the most prospective for the development of smart specialisations (Final report 2017).

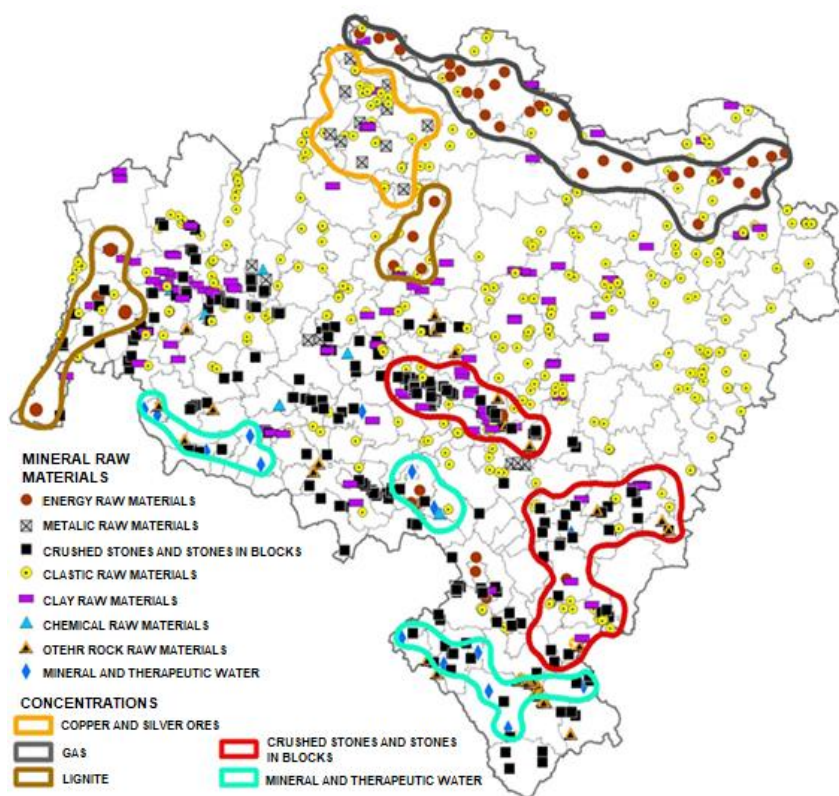


Figure 17. Source: WBU study based on "Report on Spatial Development and Social and Economic Development of Lower Silesian Voivodeship 2011"

3.2.11.3 Integration of structural funds and associated economic benefits

Poland through 24 national programmes, benefits from a total funding of EUR 104.9 billion (EUR 86.1 billion from EU). This represents an average of 2.262 € per person from the EU budget over the period 2014-2020. The total budget breakdown by fund, combining national and European sources, are:

FUND	POLAND (M€)
EARDF	13,612 (13%)
EMFF	710 (0.7%)
ERDF	47,501 (45.3%)
ESF	15,203 (14.5%)
CF	27,299 (26%)
YEI	585 (0.6%)
TOTAL (B€)	104.9 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/PL>

It is worth to point that 10,911M€ of Poland are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector, of which 3,200 M€ are from ERDF.

3.2.11.4 Existing measures to foster market uptake

Regional

The *Development strategy for Lower Silesia 2020*¹⁰⁷ indicates that the Voivodeship policy needs to be directed at creating industrial processing plants, including copper and silver, and counteract export of non- processed non-renewable natural resources of Lower Silesia. Effective use of resources is among the eight strategic aims. Within its priorities there are sustainable and economically rational use of natural resources including the potential of mineral, therapeutic and geothermal waters.¹⁰⁸

National

There is no mineral strategies or policies at regional or national level. However, the Polish Government is working on a project of national raw material policy (PSP). Currently, it is at the consultation stage. Another mining and metallurgy relevant policy in progress in the Poland's mineral security action plan from the Ministry of Economic Development. The action plan covers several aspects listed below.¹⁰⁹

- Assurance of legal protection of areas of known and expected mineral deposits
- Monitoring of mineral deposits in official state asset monitoring
- Education, knowledge and skills of geological association
- Efficient management of state-owned extraction companies
- Introduction of a uniform, transparent system of financial charges put on mining as the instrument of state mineral policy,
- Combating the problem of illegal exploitation of mineral resources
- Technology in exploration and exploitation
- Define clear roles of the state concerning financing of exploration and permitting
- Promotion of the knowledge of the importance of mining

3.2.11.5 Identification of industrial strengths and possible symbiosis with RIS3

According to Lower Silesia RIS3, there are two relevant clusters in the region, the *Lower Silesia Mineral Resource Cluster*¹¹⁰ and the *Wałbrzych Raw Materials Cluster and Stone Cluster*.

¹⁰⁷ Development Strategy for Lower Silesia 2020

http://www.umwd.dolnyslask.pl/fileadmin/user_upload/Rozwoj_regionalny/SRWD/SRWD_2020-final.pdf

¹⁰⁸ The trial preparatory documents: MIREU regional background information for SWOT analysis – Lower Silesia by AGH/AGH-UST and UMWD-IRT

¹⁰⁹ Minguide Minerals Policy Country Profile - Poland cited on 04 12, 2018 https://www.min-guide.eu/sites/default/files/project_result/Minerals_Policy_Country_Profile_PL.pdf

¹¹⁰ <https://kghmcuprum.com/en/>

Relevant stakeholders in mining and metallurgy sector introduced in REMIX status report of Lower Silesia are listed below:

- Institute for Territorial Development
- KGHM Cuprum sp. z o.o. - Research and Development Centre
- Stone cluster
- Walbrzych raw materials cluster
- District Mining Authority in Wrocław
- Lower Silesian Branch of the Polish Geological Institute
- Katarzyna Zboińska Department of Geoengineering, Mining and Geology of Wrocław University of Science and Technology
- "Poltegor-Institute" Institute of Opencast Mining
- Wrocław Research Centre EIT+

3.2.11.6 Conclusions

To summarise, mining and metallurgy sectors are part of Lower Silesia RIS3. With the corresponding regional policy instrument, the Development Strategy for Lower Silesia 2020, including "Effective use of resources" as one of the eight strategic aims, mining and metallurgy sectors should have access to the regional ERDF/ESF programme and regional budget.

While mining and metallurgy are part of the Polish RIS3, there is currently no mining and/or metallurgy related policies at the national level. Nonetheless, two relevant policies are being developed, the State mineral policy and the Poland's mineral security action plan.

3.2.12 North-West (Maramures), Romania

3.2.12.1 Brief overview of the region and its RIS3

Romania is a country located at the intersection of Central and South-Eastern Europe, on the border with the Black Sea. It is bordered by Hungary and Serbia to the west, Ukraine and Moldova to the northeast and east, and Bulgaria to the south. With 238.391 km², Romania is the ninth largest country in the European Union by area and has the seventh largest population in the European Union with more than 19 million inhabitants. Its capital and most populated city is Bucharest, the tenth largest city in the European Union. The North-West Region of Romania is geographically and strategically placed in Europe. Established in 1998 as a NUTS II development region by the association of 6 counties: Bihor, Bistrița-Năsăud, Cluj, Maramureș, Satu-Mare and Sălaj. Surface 34,159 km² – 14.32% of the total surface of Romania. Population over 2,6 million – 13% of the total population of Romania.¹¹¹



Figure 18. Romania and North-West Region map.

Regional RIS3

The table below presents the S3 priorities of North-West Romania (**NUTS 2: RO11**). The priority having the potential to be relevant to mining and metallurgy is New Materials – Furniture, Paper and Packaging, Plastic and Metal Processing.

PRIORITY	DESCRIPTION
Agri-Food	Production of safe, healthy, affordable and nutritionally optimized food products, sustainable and precision agriculture, as well as new veterinary and agricultural genetics, and production of functional foods.
Cosmetics and Food Supplements	Production of cosmetics and natural food supplements (bio/ organic) without harmful chemical additives in particular; production of food supplements and extracts for several health issues (particularly oncology and implantology).
Health	Innovation in oncology; new pharmaceutical products common diseases (eg. hybrid drugs) reducing side-effects, new developments in the field of biosimilars and biopharmaceuticals, including phytochemicals
New Materials – Furniture, Paper and Packaging, Plastics and Metal Processing	Innovative materials and products based on / using advanced materials, composites, biomaterials, (eg. biofilm, bioplastic, etc.), including recycled materials, new functional coatings, nanomaterials, multifunctional materials
Advanced Production Technologies	Innovative machinery and equipment in robotics, mechatronics, automation, advanced manufacturing and processing, additive manufacturing / rapid prototyping, innovative machinery and equipment for energy production using renewable sources or generating less pollution, machinery, equipment and solutions for energy efficiency.
ICT	IoT, cyber-physical systems, cyber-security and space applications for civil use, cloud computing, gamification, intelligent systems, artificial intelligence, digital currencies and FinTech solutions, smart city solutions, e-government, e-agriculture, e-health

Reference: S3 Platform, last updated 13/09/2019

¹¹¹ <http://www.nord-vest.ro/>

Maramures is part of the **North-West** region of Romania. The RIS3 priority of the North-West region, **Pillar II – New materials and products**, covers metallurgy¹¹². The general objective of Pillar II – New materials and products is marketing new, innovative products by exploiting the benefits offered in particular by key generic technologies and sustainable use of resources. This Pillar includes priority areas such as, Furniture, Plastic, paper and packaging, Production technologies, machines, equipment and machinery and Metal processing technologies. The smart specialisation tendencies of the Metal processing technologies are new materials (including powder metallurgy and new materials with new or better properties, for instance, special alloys) and automation/digitalisation of the process to increase efficiency with an emphasis on reducing energy consumption. Intelligent specialization in this field could have synergic effects with intelligent development in production technologies (machinery, equipment, machinery).

National RIS3

Mining and metallurgy is not covered by any of the Romanian national RIS3 priorities¹¹³: Safe, accessible, nutritionally optimized; Analysis, Management and Security of Big Data; Increasing end-use energy efficiency; New-generation vehicles and ecological; Service and process innovations; Development of innovative space.

3.2.12.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

Romania is known as a country with great potential in mineral resources, especially oil, natural gas, salt, gold, silver and ferrous and nonferrous metals. Various mineral deposits (Au, Cu, Pb, Zn, Mn, Fe, etc.) were mined in ancient times. Ore production became better organized, in Roman, with diversification processing techniques. In the last 150 years extensive data was collected on mineral deposits and potential for Romania. Moreover, there are a number of minerals that have been identified for the first time in the fields in our country, such as the element tellurium, discovered gold ore deposit Baii Gira (county. Zlatna) in the Ore Mountains.

Romania has a significant investment potential in order to achieve operations exploration and re-evaluation perimeters which there is already substantial. Also, recent geological and geophysical activity revealed that there are many blocks with potential for further investigation, and offers exciting opportunities for investors interested in the country's mineral resources. At present, the mining sector in Romania is regulated by the Mining Law 85/2003¹¹⁴. The two acts set:

- The procedure for approval and issuance of permits for prospecting, exploration licenses, mining licenses and mining permit,
- The procedure for approval of the exploration and exploitation of minerals,
- The fees, charges and royalties and financial guarantee for environmental rehabilitation
- Access to data and information on the Romanian mineral resources,
- The conditions for organizing and conducting the public auction for the concession of mining activities.

¹¹² <http://www.nord-vest.ro/specializare-inteligenta/>

¹¹³ http://s3platform.jrc.ec.europa.eu/documents/20182/223684/RO_RIS3_201410_Final.pdf/8ca80cc7-62a8-4481-84d0-f207c80cd621

¹¹⁴ <http://extwprlegs1.fao.org/docs/pdf/rom73606E.pdf>

3.2.12.3 Integration of structural funds and associated economic benefits

Romania, through 8 national programmes, benefits from a total funding of EUR 36.7 billion (EUR 30.9 billion from EU). This represents an average of 1.548€/person over the period 2014-2020. The total budget breakdown by fund, combining national and European sources, are¹¹⁵:

FUND	ROMANIA (M€)
EARDF	9,645 (26.3%)
EMFF	223 (0.6%)
ERDF	12,951 (35.3%)
ESF	5,434 (14.8%)
YEI	329 (0.9%)
CF	8,159 (22.2%)
TOTAL (B€)	36.7 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/RO>

It is worth to point that 5,783M€ of Poland are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector, of which 943M€ are from ERDF.

3.2.12.4 Existing measures to foster market uptake

Regional

The *Development Plan of North-West Region 2014-2020*¹¹⁶ has the potential to cover mining and metallurgy sectors as Efficient use of resources and reducing emissions is one of the priorities. The aim of the Regional development plan is to increase the regional economy through a multidimensional and integrated development for reducing intra-regional and interregional disparities and increasing regional living standards.¹¹⁷

National

However, there are relevant policies at the national level. The *Mineral Industry Strategy 2012-2035*¹¹⁸ is announced in 2012 by the Ministry of Economy. The objectives and goals that the Government seeks to achieve are listed below.

- ensuring the sustainable development of Romania's mineral resources.
- the harmonization of the national interest and investment capital while meeting the mentioned sustainability requirements.
- reducing the dependence on imported primary energy resources and raw minerals and improving the transparency of the mineral industry.

The Strategy includes, among other matters, a legal approach to the development of the mining sector. In particular, it proposes amendments to the current legal framework governing mining and mine closure activities, as well as the enactment of new legislation on mineral waters and restructuring of the salt extraction sector. The Strategy also contemplates the restructuring of the National Agency for Mineral Resources and the creation of an independent Mining Authority and policies for development of research and development (R&D) activities in the mining sector. In addition to the Strategy, there are three economic instruments from the Ministry of Economy aim at the mining sector, the Employment and Training Incentives

¹¹⁵ <https://cohesiondata.ec.europa.eu/countries/RO>

¹¹⁶ http://www.nord-vest.ro/wp-content/uploads/2016/09/7r238_PDR_2014_2020.pdf

¹¹⁷ <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/policy-document/nord-vest/development-plan-north-west-region-2014-2020>

¹¹⁸ https://www.min-guide.eu/sites/default/files/project_result/Minerals_Policy_Country_Profile_RO.pdf

Scheme, the Social Development Schemes for Mining Communities and the Small Grants Scheme (micro- projects to improve the welfare of women, youth and children in the mining regions).

3.2.12.5 Identification of industrial strengths and possible symbiosis with RIS3

Thanks to its geographic location, transportation routes to adjacent major markets and industrial production centres in Central Europe/Germany and Turkey are fairly short. Romania is endowed with various natural resources, like oil, gas, gold. Its energy dependence is limited by coal, oil, gas and uranium.

The **National Agency for Mineral Resources**¹¹⁹ supports those interested in opportunities in the mining and oil sectors in our country.

Romanian Cluster Association (CLUSTERO)¹²⁰ is the representative body of Romanian clusters and the main platform of cooperation, exchange of information and support towards the development of the national cluster landscape based on innovation and internationalization. Currently the Romanian Cluster Association focuses on 3 main challenges faced by the Romanian clusters:

- Enhancing innovation and internationalization of cluster members.
- Supporting excellence of the cluster management.
- Fostering international exchange of experience and participation to join initiatives and projects.

3.2.12.6 Conclusions

To summarise, metallurgy is part of the North-West, where Maramures is located, RIS3 priorities. Therefore, if the RIS3 priority, new materials and products, covers metallurgy, is reflected in the *Development Plan of North-West Region 2014-2020* other regional policies, it should have access to the Romanian ESIF programme (There is no EU funding programme directly at regional level in Romania.). At the national level, mining and metallurgy are not covered by the Romanian RIS3. Regarding relevant policies at national level, there are the *Mineral Industry Strategy 2012-2035*, the Employment and Training Incentives Scheme (economic instrument), the Social Development Schemes for Mining Communities (economic instrument) and the Small Grants Scheme (economic instrument).

¹¹⁹ <http://www.namr.ro/presentation/technical-competency/>

¹²⁰ www.clustero.eu

3.2.13 North Karelia, Finland

3.2.13.1 Brief overview of the region and its RIS3¹²¹

North Karelia is one of the 19 regions in which Finland is divided. It has a surface of 21,586 km² and a population of 164,085 inhabitants (2017, source: EUROSTAT). The region has 3 sub-regions and 13 municipalities. The capital city is Joensuu (76,288 inh.).

Sources: http://www.stat.fi/index_en.html
<http://www.pohjois-karjala.fi/web/english/north-karelia>



Figure 19. Map of North Karelia and location within Finland.

Regional RIS3

The table below presents the S3 priorities of North Karelia (**NUTS 3: FI1D3**). Mining is part of the S3 priority in North Karelia. It is covered by the S3 priority: Technologies and Materials.

PRIORITY	DESCRIPTION
Technology and materials	• Technology and materials (photonics, mining, broadband issues).
Forest based bioeconomy	• Forest based bioeconomy (and renewable energies).

Reference: S3 Platform, last updated 13/09/2019

Mining and metallurgy are part of the RIS3 priority¹²² under the priority “**Technology and materials**”, consisting of six region’s areas of expertise. Mining and metallurgy are presented by the extractive industry processing expertise. Extractive industry processing expertise refers to the analytics and processing expertise that serve the stone and extractive sector. The foreseen industrial renewal in the traditionally strong metal cluster and machine and equipment manufacturing industry is in the direction of utilisation of e.g. automation, robotics and machine sight applications as well as other technologies.

3.2.13.2 National RIS3

There is **no** RIS3 at the national level.

3.2.13.3 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy¹²³

The discovery of the copper deposit in Outokumpu in 1910 has provided a basis for the Finnish mining industry. The ore gave rise to two publicly quoted companies, **Outokumpu Oyj** and **Outotec Oyj**, and created several thousand jobs in the mining technology industry. The Institute of Geology has a mineral technology research laboratory in Outokumpu. The town is also home to **Outotec Turula Oy** and **Firetec Oy**, both experts in the metal industry that deliver technical equipment to the mining sector.

¹²¹ http://www.stat.fi/index_en.html; <http://www.pohjois-karjala.fi/web/english/north-karelia>

¹²² <http://www.pohjois-karjala.fi/documents/33565/34607/North+Karelia%27s+Choices+for+Smart+Specialisation+2021.pdf/477c4365-1a6b-c172-7f30-e63b3b52d284?version=1.0> and another RIS3 document used as supplement information source http://s3platform.jrc.ec.europa.eu/documents/20182/231925/FI_Pohjois_Karjala_RIS3_Final.pdf/7df2c35f-1154-4dac-869f-c03e806f1e4f

¹²³ http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160584/SectorReports_1_2018_MiningSector.pdf

The Swedish mining company **Endomines Oy** has invested 20 million euros in establishing the **Pampalo Gold mine** in Ilomantsi, in the Karelian Gold Line; now the mine produces 800–900 kilos of gold per year, and it is expected to continue its profitable business for many years to come. The **Kylylahti Copper Oy** mine focuses on quarrying, crushing, and enriching copper and cobalt. The Vuonos factory of **Mondo Minerals B.V.**, Finnish branch, quarries the talcum and exports it abroad via the deep-water channel.

Finally, mining of soapstone in North Karelia has facilitated the formation of the largest expertise cluster of heat reserving fireplace manufacturers in Europe.

MINE	OWNER	MINERAL	START
Pampalo	Endomines AB	Au	2011
Kylylahti	Boliden AB	Cu-Co-Ni-Zn	2011
Pehmytviiki	Mondo Minerals AB	Talc-ni	
Horsmanaho	Mondo Minerals AB	Talc-Ni	

3.2.13.4 Integration of structural funds and associated economic benefits

Finland, through 6 national programmes, benefits from a total funding of EUR 8.43 billion (EUR 3.8 billion from EU). This represents an average of 690 € per person from the EU budget over the period 2014-2020. The total budget breakdown by fund, combining national and European sources¹²⁴, are:

FUND	FINLAND (M€)
EARDF	5,673 (67.3%)
EMFF	141 (1.7%)
ERDF	1,583 (18.8%)
ESF	1,036 (12.3%)
TOTAL (B€)	8.43 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/FI>

It is worth to point that EUR 1,907 million of the total ERDF of Finland are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector.

3.2.13.5 Existing measures to foster market uptake

Regional

There is no relevant policy found at the regional level, even the North Karelian strategic group of extractive industry, integrated by specialists on such industry and related activities (funding, education, research, etc.), is preparing a Regional Strategic Program of Extractive Industry in North Karelia.

National

At the national level, there are two key policies relevant to mining and metallurgy sectors, the ***Making Finland a leader in the sustainable extractive industry – Action plan*** (2013) and the ***Finland's Mineral Strategy***. The Action plan includes measures to be taken by the industry to obtain society's support for its activities. Proposals for improving the operating conditions for the extractive industry are made with regard to administration, training and infrastructure. In addition, the action plan proposes more active, open exchange of information and experiences, along with ongoing dialogue regarding the action plan's implementation and development

¹²⁴ <https://cohesiondata.ec.europa.eu/countries/FI>

within the industry. The Finland's Mineral Strategy proposes a **Vision 2050** where Finland is a global leader in the sustainable utilisation of mineral resources and the minerals sector is one of the key foundations of the Finnish national economy. The strategic objectives include promoting domestic growth and prosperity solutions for global mineral chain challenges and mitigating environmental impacts. The themes of the action proposals are strengthening mineral policies, securing the supply of raw materials, reducing the environmental impact of the minerals sector and increasing its productivity and strengthening R&D capabilities and expertise.

3.2.13.6 Identification of industrial strengths and possible symbiosis with RIS3

The **Finnish Mining Cluster** consists of more than ten mining related universities and research organizations, more than 200 mining technology and service providers, over 40 mines and ten smelters and steel mills. The **Arctic Smart Mining Cluster (AMIC)** was built to integrate the RDI sector and industrial partners working in the mining industry into a multi-regional cluster in North Karelia and Lapland. AMIC promotes the networking of the cluster members with other mining regions in Europe. RDI partners and regional consulting services collect the regional mining industry know-how into a larger network that enhances the mining sector and improves the partners' chance to participate in international consortia.

3.2.13.7 Conclusions

To summarise, mining and metallurgy are part of the North Karelia RIS3 priority, Technologies and materials. Therefore, if there are programme or regional policies reflecting the RIS3 priority, mining and metallurgy sectors are able to access the Finland ESIF through the regional RIS3. While there is no RIS3 at the national level, funding from the national government is available/possible to the mining and metallurgy sectors through the policies (*Making Finland a leader in the sustainable extractive industry – Action plan* (2013) and the *Finland's Mineral Strategy*).

3.2.14 Saxony, Germany

3.2.14.1 Brief overview of the region and its RIS3

The Free State of Saxony, located in the south-east of Germany, is one of the sixteen federal states. It borders the federal states of Brandenburg, Saxony-Anhalt, Bavaria and Thuringia as well as Poland to the east and the Czech Republic to the south. With 4.081m inhabitants in 2017, accounting for 4.9% of the German population, it is the sixth most populous region in the country. Its surface area is 18,420km² and its population density is 221 inhabitants per km² (Eurostat, 2018). About 30% of its population lives in the three largest cities, namely Dresden, Leipzig, and Chemnitz. The capital city is Dresden. Saxony's economy is characterised by a strong industrial sector specialised in the automobile industry, machine construction, metal production and electrical/microelectronics.¹²⁵



Figure 20. Germany map and location of Saxony region (in yellow).

Regional RIS3

The table presents the S3 priorities of Saxony (NUTS 2: DED). Mining and metallurgy have the potential to be part of the Saxon RIS3 priority, Advanced production technologies.

PRIORITY	DESCRIPTION
ICT and digital communication	• IT infrastructures, e-commerce, e-business, e-government, software development, IT services, etc.
Microelectronics including organic and polymer electronics	• Microelectronics including organic and polymer electronics and semi-conductors.
Photonics	• Photonics.
Nano technology	• Nano technology.
Biotechnology	• Biotechnology.
New materials	• New materials.
Advanced production technologies	• Advanced production technologies.

Reference: S3 Platform, last updated 13/09/2019

Mining and metallurgy have the potential to be part of the Saxony RIS3¹²⁶ priority (technical support priority) “*Advanced production technologies*”. This priority covers production technologies and processes, production facilities and production facilities, including automation, handling technology, measurement and control technology, signal transmission, process monitoring and supplementary services. While mining and metallurgy are not explicitly mentioned in the RIS3 priorities, *raw materials sector is recognised as one of the future fields which is expected to have symbiosis with the key technologies (technical support priorities)* and

¹²⁵ <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/saxony>

¹²⁶ http://innovationsstrategie.sachsen.de/download/Innovationsstrategie_des_Freistaates_Sachsen.pdf

the traditional branches (mechanical engineering, electrical industry, vehicle construction, chemistry, textile industry...etc.). There are also measures recommended to raw materials sector in the areas of improvement of innovation process (product and process innovation) and organisational innovation. However, the funding for raw materials sector is covered by another economic instrument, the Climate change scheme (innovation in green mining) at the state level (regional level).

National RIS3

At the national level, raw material sector used to be one of the RIS3 (*The new high-tech strategy innovations for Germany*) priority (2014)¹²⁷, Sustainable economy and energy, assuring the supply of raw materials. The purpose of this RIS3 priority is to support research which helps to provide the basis for higher resource efficiency, increasing levels of recycling, finding substitutes and countering undesirable development in the resource markets.

In the latest German RIS3 (2018): *Forschung und Innovation für die Menschen: Die Hightech-Strategie 2025*¹²⁸, metallurgy is part of the RIS3 priority, Sustainability, climate protection and energy: for the generations' today and tomorrow. Sustainable business in cycles, one of the missions within the Sustainability, climate protection and energy: for the generations' today and tomorrow, aims to increasing total raw material productivity by 30% by 2030 compared to 2010. Material efficiency is emphasized in the manufacture of products. The government wants to intensively push ahead with the transformation of the traditionally linear economy into a resource-efficient circular economy. Future outlook of **Research and Innovation Initiatives 2018-2021** relevant to raw materials sector are listed below. (The past and current initiatives in raw materials sector are included in Chapter 2.13.6 National Policy Instruments below.)

- With a new framework program FONA, the Government promotes research for sustainability in order to show options for a sustainable way of life and economy. (2020-2025)
- The Government will develop a national research and innovation strategy for resource protection technology together with industry (from 2019).
- The resource-efficient circular economy research concept promotes innovative solutions for the recycling of products and the further development of digital technologies for the circular economy (2018-2023).

3.2.14.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

Saxony is a mining state¹²⁹. Lignite is extracted in three open-cast mines, and nearly 300 small and medium enterprises produce aggregates, industrial minerals and hard rock. Mining enjoys a solid public reputation thanks to its centuries-old history and the ever-growing wealth brought to Saxony as a result.

¹²⁷ The new high tech strategy innovations for Germany, 2014
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=5&ved=2ahUKEwiRnrV5rJPfAhWGsaQKHRfDDOIQFjAEegQIBxAC&url=https%3A%2F%2Fwww.research-in-germany.org%2Fdam%2Fjcr%3A8d61ee98-26bd-4606-a21d-1b97b17ca611%2FHTS_Broschuere_eng&usg=AOvVaw008uT_SDE9IMhZUBakKT0Q

¹²⁸ Forschung und Innovation für die Menschen: Die Hightech-Strategie 2025, 2018 <https://www.hightech-strategie.de/files/HTS2025.pdf>

¹²⁹ The preparatory documents: MIREU regional background information for SWOT analysis – Saxony by GKZ Freiberg and Saxon Raw Material Strategy, 2017

Saxony is a land rich in raw materials but at comparably rather small-scale deposits/occurrences except a number of tin and lithium deposits which are actually under investigation. Most income is generated by aggregate mining: Solid rock, sand, gravel. Traditionally, mining of earths and caoline supply an innovative technical ceramics and china industry. The first European china has been invented in 1710 in Saxony. With regard to ore and spar mineralisations most of the shallow deposits have been mined over a long mining period stretching from the medieval times to 1990. Most of these deposits are now depleted or mining economically not viable. Investigations to valorise the substantial occurrences of close to surface low grade ore and deep seated potentially high-grade ore are now subject to R&D and extensive data exploration. Actually, investigations are focussing commodities indium, tungsten, tin, fluorite, lithium, gallium, molybdenum, copper and silver. The Figure below indicates the location of the Saxon raw material deposits on the map.

Most of these ore and spar deposits in Saxony are located in the Ore Mountains, Vogtland or distinct distribution areas. The rest of the deposits can be found near Schleife and Weisswasser in Lusatia (North Sudeten Basin), north Leipzig (Delitzsch Granodiorite Massif) and the central Saxon Hills (Granulite Mountains). Due to the increase in global market prices, the exploration of ore and spar, particularly tin, tungsten, zinc, lithium, fluorite and barite, including substantial CRM by-products re-started in 2005 and led to the re-opening of a fluorspar mine in 2015. Another mining project – in the cross-border region to the Czech Republic - focusing on lithium is already in the phase of feasibility and the permitting procedures have also started at the end of 2017 while further projects are planned.

Saxony is still one of the true metallurgy regions in EU. Pyro- and hydrometallurgical works are closely associated to metal mining by history up to present times. Today the smelters are entirely operated with scrap, though backward integration is a raising subject to concerns in scrap supply. The main works are **Nickelhütte Aue GmbH** (Co, Cu, Ni), **Befesa** (Zn), **Muldenhütten** (Pb) and **Feinhütte Halsbrücke GmbH** (Sn); the latter one out of only four remaining tin-smelters in Europe.

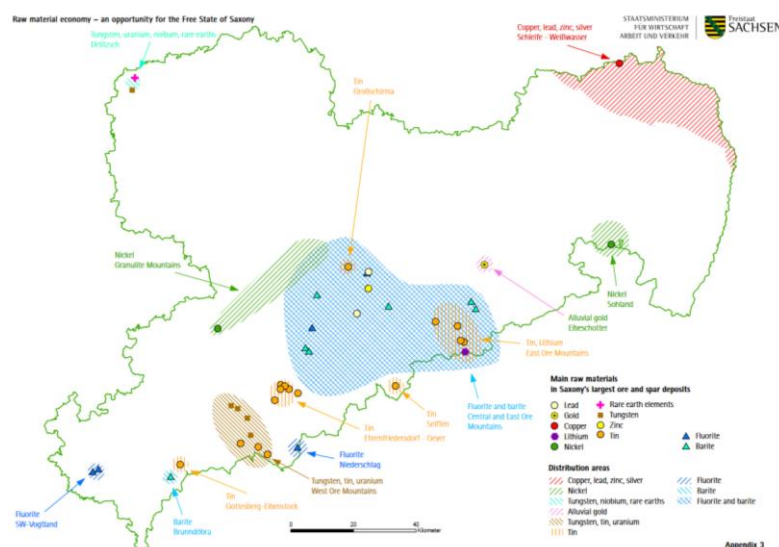


Figure 21. Main raw materials in Saxony's largest ore and spar deposits.

SMELTERS	DESCRIPTION & COMMODITIES
Nickelhütter Aue GmbH¹³⁰	<ul style="list-style-type: none"> • Main commodities Co, Cu and Ni. • Offering clients, a "recycling loop" for waste materials containing Ni, Co, Cu, Mo, V and W. • Pyrometallurgical process.
Feinhütte Halsbrücke GmbH¹³¹	<ul style="list-style-type: none"> • Sn and Pb. • Pyrometallurgical process.

¹³⁰ <http://www.nickelhuetten.com/index.asp>

¹³¹ Feinhütte Halsbrücke GmbH cited 07 12, 2018 <https://www.feinhuetten.de>

SMELTERS	DESCRIPTION & COMMODITIES
Befesa Zinc Freiberg GmbH ¹³²	<ul style="list-style-type: none"> • Zn (one out of only four remaining tin-smelters in Europe). • Pyrometallurgical process.
Muldenhütten ¹³³	<ul style="list-style-type: none"> • Pb • Pyrometallurgical process. • The third largest lead smelter in Germany. • Employing 155 staff to process about 55,000 tonnes of lead and lead alloys, including tin and antimony alloys. • Secondary lead smelter with integrated incinerator for hazardous wastes and polypropylene extrusion plant.

3.2.14.3 Integration of structural funds and associated economic benefits

As the basis for industrial production processes and innovations, a reliable, sustainable and transparent supply of raw materials for industry plays an important role in development of future technologies. Germany's hightech sector requires a range of industrially strategic raw materials. Research helps provide the basis for using such resources – which are finite and often difficult to obtain – more efficiently, for increasing levels of recycling of such resources, for finding substitutes, where possible, that are more easily available and for countering undesirable developments in resource markets. This is why the Federal Government, working through its programme **“Economically Strategic Raw Materials for the High-tech Location Germany”**, is promoting research and development throughout the value creation chain for non-energy-related mineral resources.

With a new measure, **“r+Impetus – Innovative technologies for resource efficiency – impetus for industrial resource efficiency”** (“r+Impuls – Innovative Technologien für Ressourceneffizienz – Impuls für industrielle Ressourceneffizienz”), the Federal Government is providing targeted R&D impetus for overcoming obstacles in development and dissemination of industrial efficiency technologies in resource-intensive production areas. This effort promises to provide competitive advantages for German industry, and it will help to further sever the links between a) economic growth and b) resource consumption and environmental impacts. The BMBF accordingly supports research and development in this area, for example through funding R&D projects with industry participation in the r2 and r3 funding priorities (see Table below) or through funding of the Helmholtz Institute Freiberg for Resource Technology (founded in 2011).

PROGRAMME	DESCRIPTION
r2 – Innovative Technologies for Resource Efficiency – Resource-Intensive Production Processes	The focus of r2 is on resource-dependent industries with high use of raw materials, because great leverage can be achieved here to increase raw material productivity, for example in the metal and steel industry or in the chemical, ceramic and construction materials industries.
r3 – Innovative Technologies for Resource Efficiency – Strategic Metals and Minerals	As part of r3, collaborative projects between industry and science are supported with the aim of achieving advances in efficiency in resources utilisation. The focus is on increasing raw material efficiency, recycling and the substitution of scarce raw materials of strategic economic importance.
r4 – Innovative technologies for resource efficiency – Research	The aim of the funding measure r4 is to develop economically strategic mineral primary and secondary raw materials in Germany and to secure the high-tech location - technologically innovative and environmentally friendly.

¹³² Befesa Zinc Freiberg GmbH contacting page cited 07 12, 2018 <http://www.befesa-steel.com/web/de/encuentranos/detalle/Befesa-Zinc-Freiberg-GmbH/>

¹³³ Muldenhütten Homepage cited 07 12, 2018 <https://ecobatgroup.com/ecobatgroup-en/facilities/de/mru/index.php>

PROGRAMME	DESCRIPTION
on the provision of strategic economic raw materials ¹³⁴	
r + Impuls - impulses for industrial resource efficiency ¹³⁵	The funding guideline "r + Impuls - Impulses for Industrial Resource Efficiency" is a concretization of the Federal Government's High-Tech Strategy 2020 in the field of "Sustainable Management and Energy". Priority topics include resource-efficient circular economy, recycling of used products and their components as well as the recycling of valuable recyclables fractions from waste streams; recycling and substitution of raw materials of strategic importance for key technologies and high-tech applications.

Germany, through 47 national programmes, benefits from a total funding of EUR 44.7 billion (EUR 27.9 billion from EU). This represents an average of 345 € per person from the EU budget over the period 2014-2020. The total budget breakdown by fund, combining national and European sources are:

FUND	GERMANY (M€)
EARDF	14,121 (31.6%)
EMFF	286 (0.6%)
ERDF	17,783 (39.8%)
ESF	12,539 (28.1%)
TOTAL (B€)	44.67 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/DE>

It is worth to point that 4,775M€ of Germany are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector, of which 1,114M€ are from ERDF.

3.2.14.4 Existing measures to foster market uptake

Regional

The *Saxon Raw Material Strategy*¹³⁶ is the state policy (regional policy) aims at the raw materials sector. The objectives cover different aspects, the framework conditions for mining local raw materials, secondary raw materials, Saxon internal networking of raw material economy stakeholders, international co-operations, research, training of skilled specialists and awareness of raw materials. The Saxon Raw Material Strategy is financed by the state government budget and provides funding for actions in line with that strategy.

In the field of secondary raw materials, and in relation to reclaiming rare earths, in Saxony a critical initial step has been taken with initiatives such as the "Life Cycle Strategies" innovation forum in Freiberg and the research activities performed by the Helmholtz Institute of Resource Technology, Freiberg. Saxon companies can be supported in their efforts to develop new, highly effective recovery and treatment technologies and associated specific machinery, systems and equipment, including in co-operation with university or non-university research institutes, as part of Saxony's technology funding programme.

On the other hand, Saxony supports the current return to ore and spar mining. Exploring deposit sites anywhere always involves financial expense and risk without guarantee of success. The

¹³⁴ r4 – Innovative technologies for resource efficiency – Research on the provision of strategic economic raw materials cited on 09 12, 2018 <https://www.fona.de/de/r4-innovative-technologien-fuer-ressourceneffizienz-forschung-zur-bereitstellung-wirtschaftsstrategischer-rohstoffe-16664.html>

¹³⁵ r + Impuls - impulses for industrial resource efficiency cited on 09 12, 2018 <https://www.fona.de/de/r-impuls-18039.html>

¹³⁶ <https://publikationen.sachsen.de/bdb/artikel/29796/documents/43389>

decision to carry out such a project must only ever be made in an entrepreneurial spirit, in keeping with the global market conditions. Although European regulations do not allow aid programmes aimed at funding the establishment of operational facilities, the Free State of Saxony is one of the world's best explored regions from a geological and geophysical perspective. In this respect, it can provide data and services which spare investors the need to engage in tedious, cost-intensive exploration work. With optimised permit and approval processes, it offers legal security over the long term.

National

The market-based principle in force states that the purpose of the economy is to supply industry with raw materials; the State must, however, set the requisite framework conditions for this, including an effective research infrastructure. In accordance with this principle, in 2007 the Federal Government developed elements of a raw materials strategy based on an intensive dialogue between the commercial and political sectors.¹³⁷ The ***German Government's raw materials strategy: Safeguarding a sustainable supply of non-energy mineral resources for Germany***¹³⁸ was announced in 2010. The general framework support (for the private sector) focuses on raw materials policy, support for research (ex. raw material efficiency, recycling and raw materials in the value chain: improving raw materials processing capacity and materials efficiency) and a joined-up international raw materials policy. In particular, the German Government is raising awareness amongst the German regional governments that the interests of raw materials sector should be taken into accounts in terms of spatial planning, regional planning and authorisation procedure when exploiting (exploration and extraction) domestic raw materials. The German Government's raw materials strategy also promotes vocational trainings for foreign skilled workers and managers in the raw materials sector.

To help assure the supply of raw materials, the Federal Government is supporting further expansion of the spatial data infrastructure in Germany for provision of standardised spatial data. The German Mineral Resources Agency (DERA), sited within the Federal Institute for Geosciences and Natural Resources (BGR), is developing a process for resource monitoring that will make it possible to recognise potential risks in resource markets at early stages.

The other series of national programme can be traced back to 2002 when the German Federal Government determined the National Sustainability Strategy "***Perspectives for Germany***"¹³⁹. One of the strategy's aims is to double raw materials productivity, measured against 1994 levels, in Germany by 2020 via a sustainable raw materials economy. This should decouple economic growth from raw material consumption. However, while Germany is heading to the desired direction, the progress is too slow. Therefore, the Government had decided that only through so-called "leaps in efficiency" can the goal of the sustainability strategy still be achieved.

¹³⁷ https://www.fona.de/mediathek/pdf/Strategische_Rohstoffe_EN.pdf

¹³⁸ <https://ec.europa.eu/growth/tools-databases/eip-raw-materials/en/system/files/ged/43%20raw-materials-strategy.pdf>

¹³⁹ <https://www.bundesregierung.de/resource/blob/998220/354630/3c4a42c0e125a732407d16b5420d7c6e/perspektives-for-germany-langfassung-data.pdf?download=1>

3.2.14.5 Identification of industrial strengths and possible symbiosis with RIS3

Since Saxon RIS3 does not include mining and/or metallurgy as part of its priorities, the clusters and bodies listed here are taken from the *Saxon Raw Material Strategy*¹⁴⁰. There are three important regional networks in raw material sector mentioned by the Saxon raw material strategy.

- **Geokompetenzzentrum Freiberg e.V (GKZ).**¹⁴¹: Administrative, industry and academic combined non-profit network organisation for mining and metallurgy (minerals/raw materials). Business Fields along the Entire Value Chain of Raw Materials. Member structure 165 members (2015). High accumulation of mining related business (of mainly SME type), e.g. Mining, Processing, Smelting, Recycling, Manufacturing and Consulting.
- SMEs in Lignite Mining (**LMBV**) and Uranium Production and Revitalisation (**WISMUT**)
- Smelter (Sn, Zn, Ni, Co, Cu,...scrap)
- **Universities and Research Institutes:** TU Bergakademie Freiberg, Business Schools, Vocational Training and Helmholtz Institute Freiberg. Geological Survey, Supreme Mining Authority and Mining Archive
- **Freiberger Interessengemeinschaft der Recycling- und Entsorgungsunternehmen e.V. (FIRE e.V.):** Network of recycling and disposal companies
- **LIBESA:** Saxon battery network with producers and the raw material suppliers

In this respect, the *Saxon Raw Material Strategy* mention Saxony as a hub of the raw material economy. The traditional networking between stakeholders of the raw material economy has always been a key foundation and source of scientific and technical progress in Saxon raw material economy. This networking must ensure individual stakeholders are able to benefit from it, and must also encourage innovative developments in the industry:

- By helping expand and pool existing networks, such as the GKZ Freiberg e. V., FIRE e. V., LIBESA etc.
- By further developing economic and scientific capacities and expertise in Saxony's raw material economy, particularly in Freiberg and Dresden,
- By systematically marketing Saxony as a hub of the raw material economy, and
- By creating framework conditions which encourage additional stakeholders to contribute their potential to existing structures.

3.2.14.6 Conclusions

To summarise, raw materials sector is not explicitly mentioned in the Saxon RIS3 but has the potential to be covered by the RIS3 priority: Advanced production technology. Hence, it might have access to the regional ERDF/RSF if relevant regional policy instruments are announced. Additionally, the *Saxon Raw Material Strategy* (2017) provides raw materials sector an access to the funding offered by the state government. At the national level, metallurgy is part of the RIS3 priority, Sustainability, climate protection and energy: for the generations' today and

¹⁴⁰https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwiZt5KQp47fAhVJPsAKHZZbCyQQFjAAegQICRAC&url=https%3A%2F%2Fpublikationen.sachsen.de%2Fbdb%2Fartikel%2F29774%2Fdocuments%2F43489&usg=AOvVaw1MaH-9aM5A_oDbYI_VeVeP

¹⁴¹ <https://gkz-ev.de>

tomorrow. It should be possible to finance through the national ESIF programme if it is reflected in national policy instruments. The other potential source of funding at the national level is through the R&D programmes (Innovative technologies for resource efficiency) of the Federal Ministry of Education and Research German (FONA) aiming at achieving the goal of doubling raw materials productivity, measured against 1994 levels, in Germany by 2020 via a sustainable raw materials economy.

3.2.15 Sterea Ellada (Continental Greece), Greece

3.2.15.1 Brief overview of the region and its RIS3

The Region of Sterea Ellada (Central Greece) with a total area of 15,549.31 km² and a population of 555,761 inhabitants (2017), is located at the heart of Greece where 5.2% of the country's population is concentrated. It is one of the thirteen first-level administrative regional authorities of Greece and is the second largest administrative region in Greece. It shares borders with Thessalia to the north, the Ionian Sea to the west and Attica to the south. It is on the Aegean Sea to the east, and extends until the bay of Evia to the south and the Corinthian gulf on the north. The region's capital is Lamia (population: 52.000 inhabitants).



Figure 22. Sterea Ellada (Central Greece) and location within Greece.

Regional RIS3

The table below presents the S3 priorities of Sterea Ellada (NUTS 2: EL24). Mining and metallurgy can be seen in the S3 priorities: Metals and materials and Metals and their industrial processing.

PRIORITY	DESCRIPTION
Metals and materials	Metals and materials
Agrifood and aquaculture	Emphasis will be given to outward-oriented activities, regional identification/branding, traditional products/techniques coupled with modern quality management/certification processes, regional clusters, links with 'experience' -oriented tourism and sustainability, biodiversity, product differentiation, logistics and efficiency.
'Experience' industry and tourism	Emphasis will be given to product differentiation, promoting 'experience'-tourism (moving beyond the sun and sea approach), expanding value chains and alternative, targeted tourism service (ecotourism, agritourism, spa/wellbeing tourism, etc.), use of ICTs and infrastructure enhancement.
Metals and their industrial processing	Emphasis will be given to laboratory infrastructure for testing, control, improvement and industrial processing of materials, towards new products, and the exploitation of emerging complementarities and new uses, reduced environmental impact, cross-regional networking and clusters.
Green innovation and renewable sources of energy	Emphasis will be given to innovations reducing environmental footprints, recycling towards creating new intermediate inputs, waste management and processing enhancing resource efficiency and use of renewables.

Metallurgy is represented by two of the Sterea Ellada RIS3 priorities, **Metals and materials** and **Metals and their industrial processing**. The description of the RIS3 priority, Metals and their industrial processing, is “Emphasis will be given to laboratory infrastructure for testing, control, improvement, and industrial processing of materials, towards new products, and the exploitation of emerging complementarities and new uses, reduced environmental impact, cross-regional networking and clusters”. Metal and other metallic products are to be supported by other three horizontal priorities, clean/green technologies, ICT and human capital. In order to achieve the abovementioned priorities, a four-step approach was adapted for improving the innovation skills of the local businesses. The four-step approach consists of awareness, development of innovation skills via consultation and training, innovation development projects and innovation implementation funding.¹⁴²

There is no regional policy relevant to raw materials sector.

National RIS3

In Greece national RIS3, raw materials sector is covered by the priority “Materials and constructions”. This priority covers advanced materials, materials for construction and chemicals and specialty polymers. However, mining and metallurgy are not mentioned.

Regarding policies relevant to raw materials sector at national level, there is no official policy or strategy. The *National policy for the (strategic planning and) exploitation of mineral resources*¹⁴³ is a declaration of intentions, therefore, an unofficial document¹⁴⁴. The National policy has three axes, to promote and reveal mineral resources and assign their exploitation through international tenders in order to maximize the benefits for the national economy, to valorise the mineral resources through rational exploitation processes and apply the principles of sustainable development and to ensure significant offsets for the local society and socially fair allocation in conformity with the relevant national revenue.

3.2.15.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

Region of Sterea Ellada is traditionally one of the strongest mining regions of Greece holding the largest deposit of bauxite in the Europe. In addition, the region has significant deposits of mineral raw materials, such nickel, magnesite and chromite, which contributed to the creation of dynamic mining sites. There are strong mining companies active in the region with mining sites and minerals processing factories. Some of the large companies are Aluminium of Greece (AoG) as a mining and primary aluminium production and specialization in red mud (aluminium mining waste) valorization into marketable products and Larco Nickel Mining, one of the dominant mining sites in Europe in nickel production.

(The following data have been included in the document: “The Mining/metallurgical industry of Greece. Commodity review for years 2013-2014” by Peter G. Tzeferis, Ministry of Environment and Energy)

¹⁴² European Commission> Growth> Regional Innovation Monitor Plus (2015) Research and Innovation Smart Specialisation Strategy (RIS3) of Sterea Ellada. Cited on 09 10, 2018 <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/policy-document/research-and-innovation-smart-specialisation-strategy-ris3-sterrea-ellada>

¹⁴³ National policy for the (strategic planning and) exploitation of mineral resources, 2012 http://www.sme.gr/EPAOP_SME_Aggliko.pdf

¹⁴⁴ Min-guide Minerals Policy Country Profile – Greece https://www.min-guide.eu/sites/default/files/project_result/Minerals_Policy_Country_Profile_GR.pdf

Bauxite, Alumina and Aluminum.

For aluminium (Al), the production by Aluminium SA - the largest integrated producer of aluminum and alumina in the European Union- remained at the same level as in 2013 (about 170 thousand tn) absorbing more than 75% of Greek production of bauxite ore. Since August 2014, the group "Mytilineos" changed the name ALUMINIUM SA and restored the historical name "Aluminum of Greece" in a symbolic move that coincides with the emergence as the largest vertically integrated producer of aluminum and alumina in the European Union. The industrial complex of Aluminum of Greece is one of Europe's most vertically integrated production plants and the largest of its kind in SE Europe. The complex, located in the coastal area of Agios Nikolaos, in the Prefecture of Viotia, is strategically positioned in the centre of the mountainous region defined by Mount (Mt) Helikon, Mt Parnassus and Mt Giona – Greece's major bauxite deposits zone.

Infrastructures also include the nearby port, which allows direct access to sea transport and offers flexibility. Intra-EU exports increased to 106.8 thousand tons Al (from 100.9 thousand for 2013) with a sales value of 198.3 million € (versus 179.6 million. € for 2013) while exports to third countries increased significantly to 5.5 thousand tons Al (compared to 2.4 thousand tn for 2013) value of 10 million €. Note that the company's exports, which is the only one in Greece that produces primary aluminum, cover 80-90% of total group ("Mytilineos") sales. The production of alumina hydrate returned to the high levels of 2011 which was instrumental in the diversion of non-metallurgical uses. For 2014, sales amounted 131 thousand tn with a corresponding value of 32.2 million. €.

Alumina is the industrial product derived from bauxite ore and is used to produce primary cast aluminium, as well as other non-metallurgical products (abrasives and insulating materials, refractory materials, detergents, pharmaceuticals and substances used in the treatment of water). Alumina, which Aluminum of Greece extracts from bauxite using the Bayer method, may be hydrated or calcined (anhydrous), depending on the degree to which it has been processed. Calcined alumina, also known as metallurgical grade alumina, is obtained by baking hydrated alumina, in order to remove the quantities of water contained in it.

Bauxite

Greek bauxite is considered as a product of lateritic weathering of limestone rocks and is of the monohydrate type (diaspor 70%, boehmite 30%). Bauxite is the basic raw material for the production of alumina and aluminium. Greece is a leading bauxite producer in the EU, with the major bauxite deposits located in central Greece within the Parnassos-Ghiona geotectonic zone and on Evia Island.

The total domestic production of bauxite for 2014 (1.8 million tn) remained at the same high level as in 2013 (1.85 million tn) covering the demand for both metallurgical use (domestic aluminum production) and other uses of Al in the steel industry, cement industry, etc. A significant proportion of 422 thousand tn (about 22%) were exported to the international market for other –non-metallurgical –use. Specifically, the leading bauxite producer and trading company European Bauxite SA (used to be a subsidiary of S&B Industrial Minerals SA), produced 970 thousand tn of bauxite, the Delphi Distomon SA produced 633 thousand tn and the Elmin SA 269 thousand tn of bauxite. It is noteworthy that early in 2015 and after absorption of S&B Industrial Minerals by Imerys, the European Bauxite SA (bauxite “sector” of S&B) was absorbed by the French group KERNEOS SA, which at present time controls the Greek bauxite sector.

Nickel. Nickeliferous laterites

Greece is the only EU country with extensive but low-grade nickel laterites. They mainly occur as limonitic laterites and, to a lesser extent, as serpentinitic laterites. The Greek laterites are exploited by the nickel producing company LARCO GMMAE, which is the most important metallurgical company in producing Fe-Ni alloy in Greece. The company mines the domestic deposits of Agios Ioannis, Evia and those in Kastoria. Laterite mineral resources exceed 250 million tonnes which at today's prices equals many billion euros. The company also owns a private port that can accommodate vessels up to 150,000 tn in size and has tens of thousands of hectares of land in its portfolio, including a small town where the majority of its workers reside. There are five operational surface mines at Evia. The mines have modern surface earthmoving equipment, two ore grinding units, two ore beneficiation units, separation using heavy media and one magnetic separator, a homogenization yard and ship loading installations. Transportation of ore from the grinding unit to the enrichment and homogenization installations is by an integral 7.5 km conveyor belt system, which also takes advantage of the altitude difference to produce electrical energy. Annual production is 1.2 to 1.5 million tonnes of ore. Average nickel concentration is 1%-1.03%.

The smelting plant is located in Larymna. The basic production line consists of 4 rotary kilns, 5 electrical furnaces and 2 OBM-type converters, with a capacity of 50 tons of metal each. There are also secondary installations, such as 2 units for the production of oxygen and nitrogen, grinding units, and magnetic separation units. The plant operates 24 hours a day, 365 days a year, producing high-purity, low-carbon ferronickel granules, used exclusively in stainless steel production. The low Ni concentrations in these ores in combination with the Ni frequently changing prices, has as result the continuous research of the LARCO company for the positioning of new exploitable ores as well as the optimization of the mineral processing methods. Terna Magnesite SA (TERNA MAG, the GEK Terna) is a recently established mining company which took over the old "Biomagn" in North Evia and aims at exploiting the old magnesite deposits of Gerorema and Kakkavos and the further utilization for production of magnesium compounds on the premises of Mantoudi furnace old installations after modernization. In 2013, the production of magnesite plant Gerorema amounted 23.6 thousand tn of raw magnesite while at the same time the company began underground mining from the site Plakarias-Mourtitsa. In 2014, magnesite production amounted 86.3 thousand tn (enrichment product) and for the first year there was a production of 9.3 thousand tn of caustic magnesia. Already, the company's facilities in North Evia employed a total of 100 employees. In early future plans is to develop a new mining center in Kakkavos with open pit magnesite ore exploitation and function enrichment plant.

3.2.15.3 Integration of structural funds and associated economic benefits

Greece, through 20 national programmes, benefits from a total funding of EUR 26.14 billion (EUR 21.4 billion from EU). This represents an average of 1,959 € per person from the EU budget over the period 2014-2020. The total budget breakdown by fund, combining national and European sources, are¹⁴⁵:

FUND	GREECE (M€)
EARDF	5,196 (19.9%)
EMFF	521 (2.0%)
ERDF	10,971 (42.0%)

¹⁴⁵ <https://cohesiondata.ec.europa.eu/countries/GR#>

ESF	5,039 (19.3%)
CF	3,481 (14.7%)
YEI	574 (2.2%)
TOTAL (B€)	26.14 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/GR>

It is worth to point that 5,486 M€ of Greece are addressed to Environment Protection&Resource Efficiency, somehow related with the mining sector, of which 1,624 M€ are from ERDF.

3.2.15.4 Existing measures to foster market uptake

Regional

For the programming period 2014-2010¹⁴⁶, the respective Regional Operational Programme of Sterea Ellada¹⁴⁷ aims to contribute to the strategic vision of the region to achieve a balanced economic and social development of the region by improving the entrepreneurial and investment environment while respecting the environment and the citizen. Priorities set by the region include support to technological and innovative entrepreneurship, based on the investment opportunities identified by the regional smart specialisation strategy, adaptability of the workforce to the development requirements of the region, sustainable development and re-organisation of the industrial zones, energy efficiency and the sustainability of energy supply to the region.

The region has thus designed its policy on RTDI for the period 2014-2020 following the methodology of Smart Specialisation Strategy (RIS3). The RIS3 vertical priorities are:

- Agri-food;
- Experience industry; and
- Metal and other metallic products

and will be supported by other three horizontal priorities:

- Clean - Green technologies;
- ICT; and
- Human capital.

National

The National Growth Strategy of Greece¹⁴⁸ adopted in May 2018 talks about the “National Energy and Climate Plan”. It will include a range of interventions with a short to medium-term impact. About mineral raw materials and energy minerals contemplates several measures:

- Planning of a Special Spatial Plan for mineral raw materials.
- Restarting of quarrying and mining activity, with a balance between the public interest and private sector, through transparent and competitive procedures.
- New international tendering procedures for the exploitation/exploration of hydrocarbon offshore areas.

With regards to upcoming strategic and mid-term “green” priorities, talks about establishment of regional markets for secondary raw materials.

3.2.15.5 Identification of industrial strengths and possible symbiosis with RIS3

Despite past efforts to develop regional innovation strategies (RIS, RIS+, RISE), the region still has a weak innovation system, a lack of intermediary organisations to support business innovation and a small share of specialised human resources. The most significant challenge for Sterea Ellada is the establishment and strengthening of mechanisms for collaboration with

¹⁴⁶ <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/region-sterrea-ellada>

¹⁴⁷ <https://www.espa.gr/en/Pages/staticOPStereaEllada.aspx>

¹⁴⁸ <http://www.mindev.gov.gr/greece-a-growth-strategy-for-the-future/>

R&I stakeholders. Currently, the region host the **Technological Educational Institute of Sterea Ellada**¹⁴⁹. Technological Educational Institutes (TEI) are public law entities which belong in higher education. Concerning its educational role, TEI of Sterea Ellada is constituted of the following four schools (15 departments) which delimit its activities range to the School of Technological Applications among others and and supervises the Center for Technological Research of Central Greece, a developing Research Center with 7 sectors of technological frontier research.

Materials Industrial Research & Technology Centre (MIRTEC) S.A.¹⁵⁰ is the Greek multidisciplinary multi-technological centre of laboratory testing and certification of industrial and consumer products, materials, facilities and management systems. MIRTEC closely cooperates with European and National Centres for Research and Technology, Institutions, Universities and Research Bodies and is actively involved in the European Network of Organisations for developing knowledge and technology transfer. One of the technological fields of high expertise include is metallic materials. **The Federation of Sterea Ellada Industries**¹⁵¹ takes part of the Hellenic Federation of Enterprises.

At national level is the **Institute of Geology and Mineral Exploration (IGME)**, authorized by the State to explore the natural earth resources, is the major geological research organization in Greece, based in Athens with 6 regional Departments. It is employing 200 personnel and regulated by the Ministry of Environment. It has co-ordinated and participated in several competitive and other European and National projects, and is providing the required Geological, Hydrogeological, Geochemical, Geophysical data. The **School of Mining & Metallurgical Engineering** is part of the National Technical University of Athens – Sterea Ellada (NTUA) and is one of the institutions of REMIX Partner Regions.

The Sterea Ellada region does not have previous experience of implementing cluster policies, nor does the first 2014-20 strategy document make any reference to clusters as a tool for regional development. The 2014-20 strategy document does refer, however, to the need for specialisation and actions it will take towards the development of specific sectors. Emerging clusters in mining and metallurgy: Mining of Metal Ores (mining of non-ferrous metal, ores), Manufacture of other non-metallic mineral products (manufacture of cement, lime and plaster, man¹⁵²ufacture of articles of concrete, plaster and cement), Manufacture of Basic Metals (manufacture of basic precious and non-ferrous metals), Manufacture of fabricated metal products (manufacture of structural metal products).

3.2.15.6 Conclusions

To summarise, metallurgy should be able to access the Sterea Ellada regional ERDF/ESF if regional policies and/or programmes reflect the RIS3 priorities. Raw materials sector is covered by the Greece RIS3 but mining and metallurgy are not mentioned. Hence, it is unlikely for mining and metallurgy sectors to access the national ESIF. Moreover, as the *National policy for the (strategic planning and) exploitation of mineral resources* is a declaration of intentions instead of an official policy, the funding situation for both mining and metallurgy sectors remains unclear.

¹⁴⁹<https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/organisation/technological-educational-institute-tei-sterea-ellada>

¹⁵⁰<https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/organisation/kentriki-ellada/materials-industrial-research-technology-center-mirtec-sa>

¹⁵¹<http://www.sbst.gr/>

3.2.16 Styria, Austria

3.2.16.1 Brief overview of the region and its RIS3

Styria is given its name “the Green Heart of Austria” owing to its landscape: Almost 60% of the region’s over 16,000 km² are carpeted in lush forest.

Graz is Styria’s capital and the second largest city in Austria. Only Vienna, Austria’s capital and one of the nine federal provinces, outnumbers Graz and all other provinces in terms of inhabitants. Austria lies at the heart of Europe, and Styria is in the southeast of the country sharing border with Slovenia and the Austrian federal states of Upper Austria, Lower Austria, Salzburg, Burgenland and Carinthia. Over 1,240,000 people call Styria their home, of which 280,000 have moved to Styria’s capital Graz. The biggest economic sector in Styria is the services industry, which accounts for 66.8% of the entire economically active population. In 2016, the Styrians generated a gross regional product of 44,283m euros. With an R&D rate of 5.16%, Styria is not just positioned at the forefront of all Austrian federal provinces, but also amongst the best across Europe.



Figure 23 Austria map and location of Styria region

Regional RIS3

Mining and metallurgy are not part of the Styria RIS3¹⁵³. Raw materials sector is also not mentioned in the regional development strategies (*The Strategy of the Province of Styria for the Promotion of Science and Research*¹⁵⁴ and the *Economic and Tourism Strategy Styria 2025*¹⁵⁵). The table below presents the S3 priorities of Styria (NUTS 2: AT22).

PRIORITY	DESCRIPTION
Mobility	<ul style="list-style-type: none"> Automotive sector, autonomous driving, Rail Systems and Aerospace, Smart production
Green Technology	<ul style="list-style-type: none"> Combine the development of technology with the efficient and sustainable use of natural resources (particular emphasis on the use of wood as a renewable raw material and its value chain); and with advances in the areas of “Green Energy”, “Green Resources” and “Green Buildings”.
Health and Food Technology	<ul style="list-style-type: none"> Innovation focus on the areas of Health and Food following demographic trends. Health Technology: strengthening the region’s position and capacities within the area of health-Technology, focusing on engineering and bioscience advancements. Food Technology: increase innovative capacity in food Technology, quality and safety as well as food-specific services.

Reference: S3 Platform, last updated 13/09/2019

¹⁵³ <https://rio.jrc.ec.europa.eu/en/file/8162/download?token=LAiuGxkH;>

https://www.verwaltung.steiermark.at/cms/dokumente/11685083_74838386/473a5387/Wirtschaftsstrategie2025_EN.pdf

¹⁵⁴ <http://www.wissenschaft.steiermark.at/>

¹⁵⁵ http://www.wirtschaft.steiermark.at/cms/dokumente/10430090_12858597/b89a9de2/Wirtschafts-%20und%20Tourismusstrategie_03062016.pdf

National RIS3

In the context of the Austrian RIS3, mining, metallurgy and/or raw materials are not covered by any of the priority.

PRIORITY	DESCRIPTION
Service Innovations and Tourism	
Quality of life	<ul style="list-style-type: none"> Securing the quality of life in view of demographic change (incl. urbanization, mobility and migration).
Bioeconomy and Sustainability	
Material sciences and intelligent manufacturing	<ul style="list-style-type: none"> Material sciences and intelligent manufacturing.
Information and communication technologies	<ul style="list-style-type: none"> Embedded systems, micro-electronics, visual computing, semantic systems, quantum informatics and opto-electronics.
Intellectual, social and cultural sciences	<ul style="list-style-type: none"> Social innovation.
Climate change	<ul style="list-style-type: none"> Rational innovation.
Life Sciences	

Reference: S3 Platform, last updated 13/09/2019

3.2.16.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy RIS3

- VA Erzberg GmbH : last large iron ore mine in Central Europe. 230 employees. Extracted rock per year: 12 mio tons; annual fine ore production: 3 mio tons
- Graphite mine Kaisersberg (Grafitbergbau Kaisersberg)
- STYROMAG : Magnesite open-cast mine in Wald am Schoberpass
- Voestalpine : steel plant in Leoben, approx. 2.500 employees; in the Mur-Mürz valley (40 km east and west) further steel industry related plants with approx. 10.000 employees.
- There are also various minor quarries for locally used construction materials.

All are well accepted in the public – due to the history (deep “roots”, strong identification); Erzberg is largest employer in the town of Eisenerz; Voestalpine the major employer in Leoben (important not only because of the number of jobs, but because of high wages which support other branches of regional economy as well.)

3.2.16.3 Integration of structural funds and associated economic benefits

Austria, through 4 national programmes, benefits from a total funding of EUR 10.66 billion (EUR 4.9 billion from EU). This represents an average of 579€ per person from the EU budget over the period 2014-2020. The total budget breakdown by fund, combining national and European sources, are¹⁵⁶:

FUND	AUSTRIA (M€)
EARDF	7,697 (72.2%)
ERDF	2,073 (19.4%)
ESF	875 (8.2%)
TOTAL (B€)	10.66 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/AT>

¹⁵⁶ <https://cohesiondata.ec.europa.eu/countries/AT>

It is worth to point that 2,493 M€ of Austria are addressed to Environment Protection & Resource Efficiency, somehow related with the mining sector, of which 9.7 M€ are from ERDF.

3.2.16.4 Existing measures to foster market uptake

Regional

Erzberg is an important and active partner in regional development and an important brand for regional tourism (Ambassador of the region). Erzberg is a member of the LEADER programme steering committee and of regional tourist associations. The LEADER programme 2014-2020, as part of the EAFRD support/funding program "Austrian Rural Development Program 2014-2020", is a support/funding programme for local rural development. The Local development strategy 2014-2020 of the local action group Steirische Eisenstraße was developed under the LEADER programme 2014-2020. In the strategy, Steirische Eisenstraße defines itself on the development of new materials as well as the use of new raw material sources in recyclables and a new understanding of service in the future with its positioning both internally and externally as the "raw materials and materials region of Austria". In addition to the strategic position: high-tech materials of the future, the other strategic position: high feeling - lifestyle of the future of Steirische Eisenstraße refers to the "soft" location factors and the quality of life in the region. Both "Adventure Erzberg" and "Tunnel research centre"¹⁵⁷ have used LEADER programme for starting activities, for instance, feasibility study and touristic investments.¹⁵⁸

- **Tunnel research centre**¹⁵⁹: The Montanuniversität Leoben operates with the centre on the mountain on the Styrian Erzberg a Europe-wide unique and independent research infrastructure for the construction and operation of underground facilities. Research institutions, companies and organizations can conduct real-world research, testing and training for operators and users of road and rail infrastructures, as well as aerodynamic issues, safety in underground mining and operation, and material development.
 - The underground facility provides for two parallel road tunnels and two parallel railway tunnels as well as a test tunnel, enabling research, development, training and training under realistic 1: 1 scale underground conditions. By the end of 2018, the two railway tunnels and the road (ex. Motorway) tunnels will be completed. 2019 should be transferred to full operation.
 - The centre on the mountain offers
 - Excellent research and development: From international research institutions, students and companies to research topics relating to the safety, construction and operation of underground facilities such as tunnels, subway systems, mining facilities, power plants or deep drilling rigs of the petroleum industry.
 - On-job education/training
 - Task forces under real tunnel and operational conditions
 - Deployment strategies and testing of evacuation scenarios
 - Test procedures with automated fire-fighting systems

¹⁵⁷ <http://zab.unileoben.ac.at>

¹⁵⁸ <http://www.landesentwicklung.steiermark.at/cms/ziel/141980347/DE/> and Presentation from VESTE at the second MIREU SLO workshop

¹⁵⁹ <http://zab.unileoben.ac.at>

- Training of operating and maintenance personnel on topics such as safety in construction and operation of underground facilities, optimized
- Handling of maintenance processes or material and equipment optimization
- Training of users of road and rail infrastructure

National

Regarding raw materials policies at the national level, the Austrian Government had announced the *Austrian Mineral Strategy*¹⁶⁰ and the *Austrian Mineral Resource Plan*¹⁶¹. The priority objective of the *Austrian Mineral Strategy* is to ensure and to improve the supply of the Austrian economy with minerals and commodities. The Strategy is based on three pillars, 1) securing minerals supply from domestic resources (realisation of the *Austrian Mineral Resources Plan*), 2) Securing minerals supply from non-EU countries (raw materials partnerships) and 3) Promoting resources efficiency (substitution, recycling, development of new methods with reduced minerals input). The main purpose of the first pillar of the *Austrian Mineral Strategy*, *Austrian Mineral Resources Plan*, is to identify mineral occurrences using innovative, objective and system analytical methods. Those mineral occurrences, proved as worth to be protected because of quality, quantity and not coinciding with “no-go” or conflict zones in land-use had been handed over to the competent authorities of the provinces to declare them as raw material safeguarding areas in land use planning.¹⁶²

3.2.16.5 Identification of industrial strengths and possible symbiosis with RIS3

As mining and metallurgy are not part of the Styria RIS3, the information regarding clusters and bodies in mining and metallurgy sectors are provided by the preparatory documents: MIREU regional background information for SWOT analysis – Styria by VESTE.

- FLSmith GmbH in Leoben (former Sandvik)¹⁶³: market-leading supplier of engineering, equipment and service solutions to customers in the global mining and cement industries.
- ÖSTU Stettin in Leoben¹⁶⁴: construct the necessary infrastructure and carry out all preparatory work for the mining companies.
- RHI Magnesita¹⁶⁵: R&D center in Leoben:
- Metallurgic Recycling¹⁶⁶: Mayer Entsorgung / St. Michael, Primaras (Eisenerz)

More than half of technical university researchers in Austria work and teach in Styria. The ratio is even higher for essential, technological core competences: 75% of R&D personnel for metallurgy and materials sciences and 58% for technical chemistry or other interdisciplinary, technical sciences are apportioned to Styria.

The University of Leoben in Austria is the country's university for mining, metallurgy and materials. It was founded in Vordernberg, Styria, Austria's mining region and then was relocated to nearby Leoben. The University of Leoben is a member of TU Austria, an

¹⁶⁰ <https://www.bmnt.gv.at/english/Energy---Mining/Mining/The-Austrian-Minerals-Strategy.html>

¹⁶¹ <https://www.en.bmdw.gv.at/Energy/Seiten/TheAustrianMineralResourcesPlan.aspx>

¹⁶² https://www.min-guide.eu/sites/default/files/project_result/Minerals_Policy_Country_Profile_AT.pdf

¹⁶³ www.flsmidth.com/

¹⁶⁴ <http://www.oestu-stettin.at/index.php?id=15&L=1&cat=14>

¹⁶⁵ <https://www.rhimagnesita.com/about/research-development/>

¹⁶⁶ <http://www.mayer-entsorgung.at/>

association of three Austrian universities of technology and offers education and conducts research in the fields of mining, metallurgy and materials science.

The organization of the mining and geological service is realized by the Ministry of Commerce, Industry and Crafts, in which there are the administration of the mining industry and the geological service. The administration of the mining industry has one of the regional offices in the city of Graz.

3.2.16.6 Conclusions

To summarise, mining, metallurgy and raw materials are neither part of the regional nor part of the national RIS3. Therefore, they are not able to access the Austrian ERDF (For the 2014-2020 support period, Austria has reorganised its structural funds administration, shifting responsibilities up to the national level.) through RIS3. While there is no regional policy relevant to raw materials sector, the local government is able to access to the state co-funding through the LEADER programme for local rural development by the Local development strategy 2014-2020 of the local action group Steirische Eisenstraße. The *Austrian Mineral Strategy* and the *Austrian Mineral Resource Plan* are the national policies in the raw materials sector which offer the support/funding from the central government.

3.2.17 Västerbotten, Sweden

3.2.17.1 Brief overview of the region and its RIS3

Västerbotten is one of the 21 provinces in which Sweden is divided. Basic data are:

- Surface: 55,401 Km²
- Population: 268,465 (end of 2017)
- Density: 4.6 inh/Km²
- Organization: 15 municipalities
- Capital: Umeå (109,390 inhabitants.)



Figure 24. Västerbotten region and location within Sweden.

Regional RIS3

The table presents the S3 priorities of Västerbotten (**NUTS 3: SE331**). Mining and metallurgy is covered by the S3 priority, Technology and service development for industry.

PRIORITY	DESCRIPTION
Sustainable energy and environmental technology	<ul style="list-style-type: none"> • Sustainable energy and environmental technology.
Digital service sector for smart regions	<ul style="list-style-type: none"> • Digital service sectors for smart regions, e-g- e-health and telemedicine.
Life science	<ul style="list-style-type: none"> • Life science.
Innovations in healthcare	<ul style="list-style-type: none"> • Innovations in healthcare.

Experience based and creative industries	<ul style="list-style-type: none"> • Experience based and creative industries.
Testing activities	<ul style="list-style-type: none"> • Testing activities.
Technology and services development for industry	<ul style="list-style-type: none"> • Technology and service development for industry.

Reference: S3 Platform, last updated 13/09/2019

Mining and metallurgy are part of the Västerbotten RIS3 priority “**Technology and service development for industry**” related to forestry and wood technology, mining and mineral technology (including recycling), digital technology, industrial design, forestry, plant and forest biotechnology and process engineering.

National RIS3

According to the information from the RIS3 Platform, mining and metallurgy are also covered by the Sweden national RIS3¹⁶⁷ priorities, “Mining and metal extraction” and “Metallic materials”.

PRIORITY	DESCRIPTION
New bio-based materials, products and services	<ul style="list-style-type: none"> • New bio-based materials, products and services.
Internet of things	<ul style="list-style-type: none"> • Internet of things.
ICT – electric components systems	<ul style="list-style-type: none"> • ICT – electric components systems.
Graphene – industrial use	<ul style="list-style-type: none"> • Graphene – industrial use.
Innovair – aeronautics	<ul style="list-style-type: none"> • Innovair – aeronautics.
Endemic diseases	<ul style="list-style-type: none"> • Endemic diseases.
Production 2030 – advanced manufacturing	<ul style="list-style-type: none"> • Production 2030 – advanced manufacturing.
➔ Metallic materials	<ul style="list-style-type: none"> • Metallic materials.
➔ Lightweight – materials and constructions	<ul style="list-style-type: none"> • Lightweight – materials and constructions.
➔ ICT and automation for industrial processes	<ul style="list-style-type: none"> • ICT and automation for industrial processes.
➔ Mining and metal extraction	<ul style="list-style-type: none"> • Mining and metal extraction.

Reference: S3 Platform, last updated 13/09/2019

3.2.17.2 Identification and summary of thematic priorities/objectives in the fields of raw materials/mining/metallurgy

Nowadays there are 15 metal mines in production in Sweden, and 5 of them are located in Västerbotten:

MINE	OWNER	OWNER	START
Björkdalsgruvan	Björkdalsgruvan AB	Au-Cu-Ag	1989
Kankbergsgruvan	Boliden Mineral AB	Pb-Au-Cu-Ag-Zn	2012
Kristineberg	Boliden Mineral AB	Pb-Au-Cu-Ag-Zn	1940
Maurliden	Boliden Mineral AB	Pb-Au-Cu-Ag-Zn	2000
Renström	Boliden Mineral AB	Pb-Au-Cu-Ag-Zn	1948

3.2.17.3 Integration of structural funds and associated economic benefits

Sweden, through 13 national programmes, benefits from ESIF funding of EUR 3.62 billion from EU and a total of EUR 7.1 billion. This represents an average of 378 euro per person from the EU budget over the period 2014-2020. The breakdown of the total budget by fund for 2014-2020 is:

¹⁶⁷ <https://www.regeringen.se/contentassets/98919a0ca0f1427491a3eef22a7d177c/en-nationell-strategi-for-hallbar-regional-tillvaxt-och-attraaktionskraft-20152020.pdf>

FUND	SWEDEN (M€)
EARDF	3,458 (48.7%)
EMFF	173 (2.4%)
ERDF	1,896 (26.7%)
ESF	1,439 (20.3%)
YEI	132 (1.9%)
TOTAL	7.10 (100%)

Source: <https://cohesiondata.ec.europa.eu/countries/SE>

Västerbotten is a county included in the National Area of Upper Norrland (NUT 2 SE08). In terms of ESIF, the EC points only ERDF (421,646,628 €). There is not any budget addressed to Environment Protection & Resource Efficiency in the ERDF, either at the national or the Upper Norrland level.

3.2.17.4 Existing measures to foster market uptake

Regional

Mining is part of the *Regional development strategy for Västerbotten county 2014-2020*¹⁶⁸. It is included in one of the six core sub-strategies, the Location-based business development. The priority area of the Location-based business development is on adding values to the resources and developing resource-efficient technologies. Another regional strategy in mineral sector is the *Regional strategy for an innovative and sustainable development of the mineral sector in Västerbotten 2025*¹⁶⁹.

National

The *Sweden's Mineral Strategy*¹⁷⁰: *For sustainable use of Sweden's mineral resources that creates growth throughout the country* is the mineral policy at the national level. The Strategy identifies five strategic objectives listed below.

- A mining and minerals industry in harmony with the environment, cultural values and other business activities
- Dialogue and cooperation to promote innovation and growth
- Framework conditions and infrastructure for competitiveness and growth
- An innovative mining and minerals industry with an excellent knowledge base
- An internationally renowned, active and attractive mining and minerals industry

Under the five strategic objectives, there are eleven action areas with identified goals and measures. The action areas include, Greater resource efficiency, Better dialogue and synergy with other industries, Mining communities with attractive natural and cultural environments, Promotion of societal development and regional growth, Clearer distribution of responsibility and better flow of information among actors in the industry, A clearer and more effective regulatory framework, Infrastructure investments for growth in the mining industry, Research and innovation that create growth and competitiveness, Skills supply that meets the needs of the industry and the regions, A good supply of capital and promotion of investment, and Greater participation in the international arena.

¹⁶⁸ <http://regionvasterbotten.se/wp-content/uploads/2014/10/RUS-English-version.pdf>

¹⁶⁹ Presentation by RVN at the second MIREU SLO workshop

¹⁷⁰ <https://www.government.se/contentassets/78bb6c6324bf43158d7c153ebf2a4611/swedens-minerals-strategy.-for-sustainable-use-of-swedens-mineral-resources-that-creates-growth-throughout-the-country-complete-version>

3.2.17.5 Identification of industrial strengths and possible symbiosis with RIS3

As set out in the Regional Development Strategy for Västerbotten County and in accordance with Västerbotten's sub-strategy "Structures for innovation" builds and strengthens structures that contribute to society's ability for renewal, world-leading innovations with high knowledge content and new and emerging growth companies in the county. Priority is given to initiatives that strengthen the innovative impact within the county's designated focus areas.

Västerbotten County hosts three universities: Umeå University, the Swedish University of Agricultural Sciences, Luleå University's engineering faculty in Skellefteå, and many innovative firms, clusters and networks. The county's knowledge-intensive environments are important engines and nodes that strengthen the county's global competitiveness and capacity for innovation. The county is able to create excellence in research and innovation through the interaction between research, innovation and education. Strong innovative settings and industries have been built from the county's resources and skills.

To strengthen the county's capacity for innovation they establish clusters, networks and cluster alliances. These alliances form a single portal to "society and universities" for all of the business-driven clusters in the region. Major investments are currently being made in the county in such areas as the mining industry, vehicle testing, renewable energy and tourism. Developing the population's skills, creativity and innovation and sustainably exploiting the region's resources will be key factors if they are to benefit from globalisation.

Historically, entrepreneurship based on natural resources has been of great importance for the county's development. In recent years, major investments have been made in industries like mining and wind power. Targeted initiatives aimed at increasing the proportion of women working in natural resource-based industries are important given that men are over-represented in all these industries. A measure is to develop businesses based on smarter and more sustainable new products, production techniques and methods within the forestry, timber, farming, mining and minerals, and energy industries and related industrial production.

3.2.17.6 Conclusions

To summarise, mining and metallurgy are part of the Västerbotten RIS3 and the Sweden RIS3. Hence, mining and metallurgy sectors should have the access to both the regional ERDF and the national ESIF there are reflected in policy instruments and/or programmes. For instance, the regional policies *Regional development strategy for Västerbotten county 2014-2020* and the *Regional strategy for an innovative and sustainable development of the mineral sector in Västerbotten 2025*, and the national policy, the *Sweden's Mineral Strategy*.

4 SWOT ANALYSIS AND BENCHMARKING ON RIS3 STRATEGIES

4.1 Introduction

In this chapter, of an analytic character, a SWOT analysis is performed on the regional RIS3 in those aspects related to mining and metallurgy, and on those external factors associated with this sector (mining resources, downstream processing industries and services, social concerns, workforce, policies, associations, funding capabilities, etc.). The SWOT analysis is accompanied by a benchmarking to identify complementarities between the different RIS3 strategies and create a SWOT model. In addition, a short review of EU/UN raw materials' policies complements the regional perspective of the role of mining and metallurgy in the RIS3. Finally, a guidance document compiles the main findings of the benchmarking and raw materials policies.

4.2 SWOT Analysis on RIS3 Strategies

According to the description of Task 5.2 in the Annex 1 (Part A) of the MIREU project, the purpose of this task is: *conduct a SWOT analysis on Smart Specialization Strategies and benchmarking of the regions involved; performance of a SWOT analysis on RIS3, ESF, EFRD capabilities, target markets and EU priorities as well as on associated development and transformation-oriented policies (green economy, research, consultancy, technology and creative services) for mining and metallurgy regions at the regional level.*

This Task 5.2, together with Task 5.1, matches the first objective of Work package 5: *to review RIS3 Smart Specialization Strategies of the MIREU regions concerning their assets in economic aid programmes, measures that foster market uptake and replication of innovative solutions, and strategies focusing on economic transition.*

In view of the above, the SWOT analysis was planned as a way to identify different factors to have into account to achieve the most suitable integration of mining and metallurgy (M&M) in the Smart Specialization Strategy RIS3, in line with the existent development policies at regional/national level, and enabling access to funds to foster the sector according to their capabilities or limitations.

Some of these factors have been identified by means of an internal analysis of the current consideration of M&M in the RIS3. These factors have been classified as strengths and weaknesses. In this approach, the internal analysis reflects the extent to which M&M is currently integrated in the RIS3, considering those aspects covered by the RIS3 as strengths and, in principle, those that are not considered as weaknesses.

Some others have been identified by performing an external analysis (out of the RIS3) of the political, economic, social and technological framework, covering mining resources and markets, downstream processing industries and services, social and environmental concerns, workforce, policies at different levels, associations, funding capabilities, etc. These factors have been classified as opportunities and threats, in the sense that they could reinforce/justify (opportunities) or hamper (threats) a greater presence of M&M in the RIS3, and could orientate about the subjects on which the RIS3 should put the focus.

In short, the internal analysis reflects what is about mining and metallurgy in the RIS3, and the external points to those aspects that should be considered to improve the presence of the sector in such strategy.

As the internal analysis depends on the presence of mining & metallurgy sector in the RIS3, a first group of regions in which these sector is specifically addressed have been selected to perform a complete SWOT analysis. These regions are:

- Alentejo (Portugal)
- Andalucía (Spain)
- Castilla y León (Spain)
- Kosice (Slovakia)
- Lapland (Finland)
- Lower Silesia (Poland)
- North Karelia (Finland)
- Saxony (Germany)
- Västerbotten (Sweden)

In this case, SWOTs have been carried out by the Task partners: SIEMCALSA, ICAMCyL, GKZ, NOVA ID and NTUA.

On the other hand, the remaining MIREU regions have been invited to participate voluntarily, according their interest in this question, by performing the external analysis. Four regions have participated in this analysis:

- Aragón (Spain)
- Sterea Ellada (Greece)
- Styria (Austria), although focused on the Upper region of the federal state

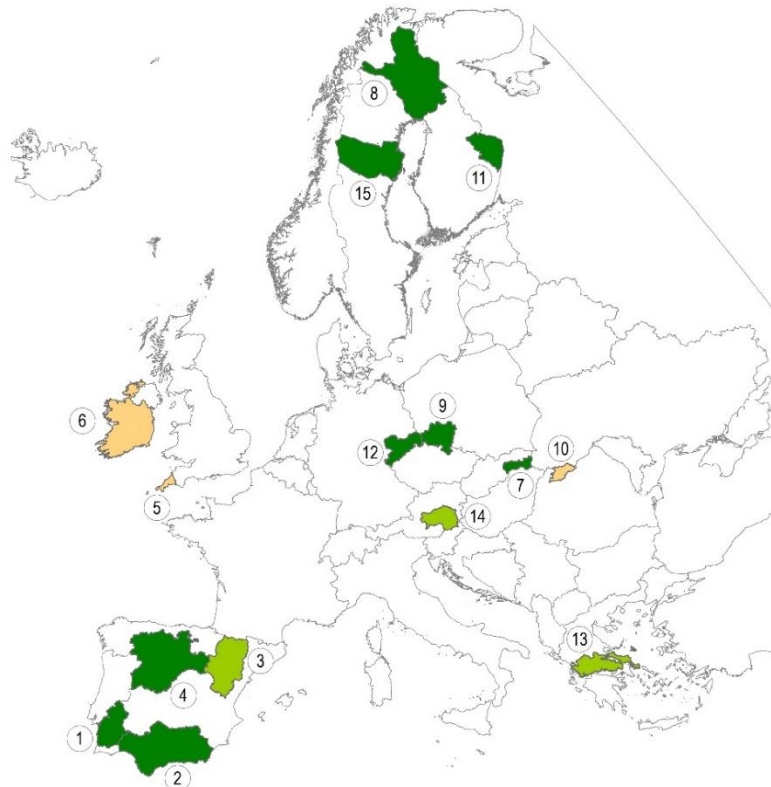
Thus, the SWOT analysis, either complete or only the external part, have been performed in 12 out of the 15 MIREU regions. These 12 regions are highlighted in the following map:

Figure 25. MIREU regions and SWOT:

dark green, complete SWOT; light green, external analysis; light brown, not analysed.

Regions are:

- 1) Alentejo
- 2) Andalucía
- 3) Aragón
- 4) Castilla y León
- 5) Cornwall
- 6) Ireland
- 7) Kosice
- 8) Lapland
- 9) Lower Silesia
- 10) Maramures
- 11) North Karelia
- 12) Saxony
- 13) Sterea Ellada
- 14) Upper Styria
- 15) Västerbotten.



4.2.1 Alentejo (Portugal)

The S3 priorities of Alentejo (NUTS 2: PT18) are described as follows:

- 3. Food & forestry. Add value to the territorial and climatic conditions of the region, strengthening links between the agricultural and food processing industries, integrating and coordinating value chains, making links with culture and tourism, explore market opportunities and technologies for precision agriculture, advanced production systems with a focus on electronics, sensors and ICT solutions as well as new control methods of production.
- TP2. Mineral, Natural and Environmental Resources. Add value to the geological resources and natural environment of the region, supporting the growth and clustering of innovative economic activities and strategic diversification from extraction industries, promoting the emergence of activities related to design and new construction materials, sustainable production and exploration, recycling, energy, marine bio technologies, while promoting the natural and cultural heritage. Includes circular economy.
- TP3. Heritage, Cultural and Creative Industry and Services for Tourism. Add value to the natural and cultural heritage of the region through links with cultural and creative industries, with the objective of increasing the cultural and creative profile of Alentejo. Supporting the expansion of tourism services and their links with priority areas related to food and the environment.
- TP4. Critical technologies, Energy and Smart Mobility. Critical technologies for network management and IT security / interactive systems, applied to the fields of energy and smart mobility.
- TP5. Social Economy - technologies and services. Steer scientific and entrepreneurial competencies to create new technological solutions and ways of working that can respond to societal challenges.

After a review of the content of the RIS3 in relation to the support to the Mining and Metallurgy (M&M) sector, several strengths and weaknesses have been identified:

- STRENGTHS (Alentejo)

1. Thematic priority 2 (TP2) of the RIS3 includes mineral raw materials as one of its five areas of action, considering the following aspects: Promotion of mineral exploitation and resources exploration, research and innovation in the industrial sector.
2. TP2, is also focused on technological transfer, including: Strengthen the Regional Technology Transfer System, reinforcing cooperation between Universities, Research Centres, Business Associations and Companies, in order to consolidate R&D and Innovation systems in this area and promote excellence and innovation, in a logical of intelligent specialization.
3. TP2 emphasis the need to create new companies and attract new players to the territory that promote the strengthening of the business structure around the valorisation of these territorial resources. This aspect is central to the rational and maintenance of this domain as a regional priority.
4. RIS3 Alentejo, in TP2 addresses recycling/recovery of waste produced in the extractive industry and processing of natural stone, with its use as raw material for other industries. This also contributes to the promotion of circular economy.

5. The reference to the mineral resources clustering in Alentejo RIS3 may contribute to the economic development of local economies and strengthen the value chain.
6. RIS3 Alentejo specifies new mining I/D related to environmental issues.

From what was described above exploration, exploitation, value chain and waste use stages of the mining life cycle are addressed in Alentejo's RIS3.

- WEAKNESSES (Alentejo)

1. RIS3 presents insufficient mapping in terms of knowledge and communication transfer.
2. Insufficient consolidation of the RIS3 governance system.
3. Insufficient regional monitoring of RIS3 implementation.
4. RIS3 does not establish environmental management strategies to recover mining legacy.
5. RIS3 has no reference to techniques to increase the efficiency of processes in M&M.
6. Mining heritage is missing in Alentejo RIS3 although it could be included in the TP3.

Regarding to its political, economic, social and technological context of the M&M sector in Alentejo, several opportunities and threats have been considered:

- OPPORTUNITIES (Alentejo)

1. Economic relevance of the stock of mineral resources present in the Iberian Pyrite Belt (copper, zinc and silver).
2. Several international companies showed interest in the Portuguese potential ¹⁷¹ .
3. Presence in the region of important institutions able to promote research and development in the M&M.
4. Participation of the regional stakeholders in international projects in M&M such as MIREU, EXPLORA, Int-MeT.
5. Planed revision of RIS3 in 2019 and great interest by the local regional authority in M&M activities.
6. Growth of the international metals market and strengthening the exploration and exploitation of new deposits and process innovation.
7. Use of the prestige image associated to the use of stone, from a perspective of sustainability, considering the environmental, geological and safety aspects, aiming to market gains associated with innovation in design and marketing.
8. R&D could be further enhanced, although cooperation between universities and mining companies is well developed in the Alentejo region.
9. Geological and mining heritage recovery has been focus on the old mines in Alentejo region, associated with the Iberian Pyrite Belt.
10. Intertwining of sectors, like wine, dairy/meat products, tourism and mining routes ¹⁷² .

¹⁷¹ Adapted from <http://www.dgeg.gov.pt/default.aspx?cn=733382528253AAAAAAAAAAAAA>

¹⁷² Retrieved from CCDR-Alentejo Swot - Mineral Resources in the Region of Alentejo

11. Residues/debris could be used as secondary raw material.
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Opportunities mentioned underline the great potential of Alentejo for M&M. These are related to the economic relevance of the geological stock, the interest of international companies in the Portuguese ores but also with the creation of a new centre in Alentejo CEGMA - Centre for Geological and Mining Studies of Alentejo in 2018 by The National Laboratory of Energy and Geology (LNEG). The later may represent a sign that public bodies are aware of geologic potential of the region. CEGMA has an important role on supporting business activities and research in the region. Also, in these context, CEGMA as has ongoing projects in the region with other stakeholders that contribute to the implementation of RIS3 TP2.

- THREATS (Alentejo)

1. Long run trends of world commodity prices and volatility.
2. Social media report that communities across the country have generally unfavourable impression of mining and believe that the industry will have negative impacts the environment.
3. Limited communication with the local communities and weak linkage with SLO: websites of mining companies are extremely poor: lack of data and information on the activity and its relation with the public.
4. The presence of high quality natural protected values makes imperative the compatibilization of environmental and industrial related.
5. Regression of regional demography allied to the low capacity of attraction and fixation population.
7. High degree of environmental accumulated passive of mining residues which constitute environmental hazard.
8. Low incorporation of the value chain in Mining.
9. Limited conditions to link mining with the local communities, tourism or culture due to safety and health issues.
10. No origin related marketing value (despite being the Iberian Piritic Belt)

Treats pointed to RIS3 Alentejo are mainly related to social issues, communication and raising awareness on the mining potential and benefits for communities and businesses. Also regarding land use planning, the inconsistency between the different planning instruments may create obstacles for future exploration and exploitation in the region.

4.2.2 Andalucía (Spain)

Andalucía RIS3 was approved on December 2012. This version of the RIS3 has eight thematic priorities:

- TP1. Mobility and logistics.
- TP2. Advanced industry linked to transport.
- TP3. Territorial-based endogenous resources.
- TP4. Tourism, culture and leisure.
- TP5. Health and social welfare.
- TP6. Agroindustry and healthy food.
- TP7. Renewable energies, energy efficiency and sustainable construction.
- TP8. ICT and the digital economy.

The Thematic Priorities (TP) develop action lines. Mining and metallurgy are specifically addressed in TP3. The actions planned are:

- L31. Research and innovation in the management of natural resources and cultural heritage.
- L32. New processes and products for the use of agricultural resources.
- L33. Integrated mining in the territory.
- L34. Innovation for the adaptation of territories to climate change.
- L35. Maintaining the sustained flow of ecosystem services.

After a review of the content of the RIS3 regarding to the support to the Mining and Metallurgy (M&M) sector, several strengths and weaknesses have been identified:

- STRENGTHS (Andalucía)

7. Thematic priority 3 (TP3) of the RIS3 includes integrated mining in the territory, considering the following aspects:
<ul style="list-style-type: none"> - The great variety of deposits of mineral raw materials. - The resurgence of metal mining driven by increasing demand for metals in the global market. - The evolution of technologies for extraction and processing to add value to new materials, use of dumps, tourism in mining and industrial archaeology. - The recovery of areas degraded by mining, spills, etc.
8. In the challenges of the TP3 has been considered:
<ul style="list-style-type: none"> - To promote research, experimentation, demonstration, technology transfer and international research infrastructures projects in the field of biodiversity and in the management and sustainable use of natural and heritage resources. - To create the conditions for optimizing the use of endogenous resources, in a context of conservation of territorial capital and conservation of cultural heritage. - To take advantage of existing mining resources to carry out research, development, experimentation and innovation projects applicable to companies.
9. Advanced innovative technologies in the current exploitation processes and quite good in exploration.
10. High quality and excellent valuation in the international market of mining products (e.g. metal mining, ornamental rock...).
11. Presence in the sector of mining companies, including multinationals of great importance, with possibilities of diversification and expansion.

12. Thematic priority 3 (TP3) of the RIS3 considers research and innovation on the management of natural resources and cultural heritage to be one of its lines of action.

- WEAKNESSES (Andalucía)

1. Nothing is said about the access to mineral resources from the administrative point of view (land use planning, mining cadastre management) in the RIS3.
2. The integration of mining activity in the socioeconomic framework (social acceptance issues) is not addressed.
3. There is a low degree of industrial development in sectors of transformation of mineral raw materials in which Andalusia is one of the main European producers and exporters (e.g. plaster).

In relation to point 1, although a specific area of action is focused on natural heritage in TP4, mineral resources are not considered as such in the Spanish land use plans; furthermore, mining projects are weighed down by an administrative management slow and complex in excess. Third point is about a real problem for a number of projects with social. In addition, there is a high degree of territorial overlap between the potentially useful mining areas and the area protected by environmental and territorial criteria.

On the other hand, regarding to the political, economic, social and technological framework of the mining and metallurgical sector in Andalucía, several opportunities and threats have been considered in relation to a greater presence of M&M in the RIS3:

- OPPORTUNITIES (Andalucía)

<p>1. The structure of the mining sector in Andalucía has 480 exploitations:</p> <ul style="list-style-type: none"> - Aggregates: 363 exploitations. - Natural stone: 73 exploitations. - Industrial minerals: 37 exploitations. - Energetic minerals: 2 exploitations. - Metallic mining: 5 exploitations. <p>In addition, several smelters: hydrometallurgy industries and a pyrometallurgy process plant.</p>
2. Mining potential, especially interesting for several EU raw materials like gold, silver, iron (includes pyrite), copper, lead and zinc, aluminum, antimony, tin, manganese, nickel, platinum and platinoids, rare earths, and wolfram among others.
3. Increase in exports between Europe and Latin America which reinforces the geostrategic value of Andalusia, especially with the increase in the load capacity of transport elements.
4. Capacity of the processing sector to attract foreign investment.
5. Importance of the raw material processing sector in the field of aggregates, ornamental rocks and industrial minerals.
6. Conferences, congresses, lectures, communication and awareness actions, press publications, publication of guides, reports, studies, fairs related to the mining or processing sector are included in the Andalusia 2020 Mining Strategy to improve the social image and importance of mining at a socio-economic level.

7. The Andalucía regional administration promotes the development of the M&M sector by means of several plans and strategies: <ul style="list-style-type: none"> - <i>Andalucía Mining Strategy 2020</i>.¹⁷³ - <i>Andalucía Industrial Strategy 2020</i>.¹⁷⁴ - <i>The Andalucía Plan for Research and Innovations PAIDI 2020</i>.¹⁷⁵
8. Participation of the regional administration in different nets and platforms such as MIREU, GEO_FPI, INFACIT and S3P Industry.
9. Business associations at national and regional level (AMINER, AFA, AEMA, CONFEDER, COMINROC, etc.)
10. The company Cobre Las Cruces (CLC) has decided to join the National Pact for a Circular Economy 2018-2020. In this sense, CLC actively participates in two ambitious European research projects (H2020) in the management of waste derived from mining activity: NEMO and Remine-Water.
11. Universities with Mining engineering and Geology faculties (Huelva, Jaén, Granada, Cartagena, Córdoba).
12. Increase and reorientation of European policies and programs in the field of M&M and R&D&I, with strong support and improvement of the financing of the sector.
13. As ore mining and metallurgy sectors are part of the Andalucía RIS3 priorities and elaborated further through the Andalucía Mining Strategy 2020, they have the potential to access the ERDF and/or ESF at the regional level through the regional ESIF program. In addition to the Andalucía Mining Strategy 2020, mining and metallurgy are also part of the other regional policy, the Andalucía Industrial Strategy 2020 (EIA 2020).

• THREATS (Andalucía)

1. Higher costs due to additional efforts to reduce environmental impacts of the M&M.
2. High competition from mineral raw materials from emerging markets (metallic minerals sub-sector).
3. Scarce interrelation between the extraction sector and the transformation industrial sector.
4. Bad social image of extractive mining activity.
5. Lack of knowledge of the socio-economic importance of mining.
6. Conflict with other tourism-based economic models on a local scale.
7. Deficit of centres for the generation and application of knowledge.

¹⁷³ The Mining Strategy of Andalucía 2020:

http://www.juntadeandalucia.es/economia/innovacion/cienciayempleo/pam/Pormian.action?sessionId=BA1BCB94C1FF56CE86C1A732C32D46FE?request_locale=en

¹⁷⁴ Andalucía Industrial Strategy 2020:

http://estrategiaindustrialdeandalucia.org/wp-content/uploads/2017/01/6c1114_3a6891ea308141ccbf4471f3655d9e83.pdf

¹⁷⁵ The Andalusian Plan for Research and Innovation PAIDI 2020:

<https://www.paidi2020.es/wp-content/uploads/PAIDI2020.pdf>

8. The medium to long term ageing of the population which will have a significant impact on the labour market.
9. Very little integration of mine planning into spatial planning policies.

4.2.3 Aragón (Spain)

As there is any specific mention to mining and metallurgy in the Aragón's RIS3, an external analysis have been conducted to identify opportunities and threats.

- OPPORTUNITIES (Aragón)

1. Strong mining tradition in the region.
2. Important deposits not only of coal but also of other non-metallic minerals such as alabaster and clay, being Aragón one of the market leaders in clay extraction.
3. Lack of real alternatives to mining and electricity production, due to the fact that nowadays is not possible to supply the demand by the use of renewable energies.
4. Good social acceptance
5. Depopulation of rural areas makes that the interest in promoting endogenous resources and in the creation and maintenance of job positions increases
6. Project MUGA (sylvinite extraction) being developed between Aragon and Navarra
7. Existence of national associations which give support to mining activity
8. Mining is present in educational programmes (excavations and drilling technician)

- THREATS (Aragón)

1. Mines closure
2. Lack of public awareness of the necessity of using and exploiting mineral resources to meet the energy demand
3. Current policies are focused on the use of renewable resources, tending to constrict mining activity
4. European funds aimed at facilitating the transition towards renewable energies
5. Educational bias, since negative aspects of mining are accented
6. Currently no public funds are allocated to the mining sector and there are not legislative measures which support the sector

4.2.4 Castilla y León (Spain)

The *Regional Research and Innovation Strategy for Smart Specialisation (RIS3) of Castilla y León 2014-2020* was approved on April 2014 and was updated in October 2018 after a mid-term assessment¹⁷⁶. The current version of the RIS3 has 6 strategic objectives, 5 thematic priorities and 7 flagship initiatives.

Strategic objectives (SO) are:

- SO1. Reinforce a more competitive and sustainable economic model through business innovation and the efficient use of resources.
- SO2. Move towards scientific and technological leadership in certain fields of potential for regional specialisation, setting up a more attractive science and technology system.
- SO3. Improve the internationalisation and the outward looking of the regional innovation system.
- SO4. Promote multidisciplinary collaboration between generators of knowledge and knowledge transfer.
- SO5 Promote talent and creativity in all social and economic areas.
- SO6 Turn ICT into tools enabling change and innovation, social and territorial cohesion, economic growth, rural development and job creation.

In principle, all of them are somehow related to mining or metallurgy, although specially the SO1. These specific objectives have correspondence with the original 6 programmes (inherited from the 2014 version), which outline in detail the initiatives and actions that will be developed to achieve the objectives.

Thematic Priorities (TP) develop the actions displayed in the before mentioned programmes. The RIS3 Thematic Priorities are:

- TP1. Agro-food as a catalyst for the extension of the innovation on the territory.
- TP2. Manufacturing and processing technologies, especially in transport sectors, such as the automotive and aeronautics, making materials and components the key to leadership and sustainability.
- TP3. Application of knowledge and technology to Health and Social Care, Demographic Change and Well-being, for the improvement of the quality of life of citizens.
- TP4. Natural heritage, cultural heritage and the Spanish language, and endogenous resources as basis of the sustainability of the territory.
- TP5. R&D in Information and Communication Technologies, Energy and Sustainability, for the regional global competitiveness on the basis of the transversal nature of technologies and knowledge.

Mining and metallurgy are specifically addressed in TP4 and TP5.

TP4 includes 5 areas of action: Cultural heritage, Culture and Spanish language, Natural heritage, Forest Management, and Mineral raw materials; in the latter case, actions planned are:

- Development of mining and metallurgical techniques to increase the efficiency of processes
- Use and promotion of waste

¹⁷⁶ <https://www.redtcue.es/biblioteca/normativa/politicas-de-apoyo-a-la-i-d-i-en-castilla-y-leon/ris3-estrategia-regional-de-investigacion-e-innovacion-para-una-especializacion-inteligente-de-castilla-y-leon-2014-2020/364-resumen-ejecutivo-actualizacion-ris3-vdef-bresol/file>

- Development and competitive products from indigenous mineral raw materials (natural stone and others)

TP5 includes 3 areas of action: ICT, Energy, and Technologies for sustainability; in the latter case, actions planned are, among others:

- Industrial environment (eco-design, eco-toxicity, efficiency in RM, recycling, etc.)
- Recycling and recovery industry

Flagship initiatives have been introduced in the mid-term evaluation of the RIS3 and are conceived as commitments capable of impacting on a number of thematic priorities and strategic objectives. For each one of these initiatives, instruments, programmes for implementation, organizational structure, beneficiaries and funds are defined. Flagship initiatives (FI) are:

- FI1. Circular bio-economy
- FI2. Knowledge and competitiveness
- FI3. Social and healthcare innovation
- FI4. Cybersecurity
- FI5. Industry 4.0
- FI6. Stairway to excellence
- FI7. Connected schools

TP4 is directly tackled in FI1 and TP5 is directly/indirectly tackled in FI1, FI2, FI4, FI5 and FI6.. In these flagship initiatives there are several specific actions that could be related with mining and metallurgy:

- Identification of new activities linked to the production, transformation and marketing of new resources and products (FI1)
- Knowledge transfer voucher (FI2)
- Sectoral plans of action to support the implementation of the technological solutions required (FI5)
- Funding of strategic disruptive technological projects (FI5)

From this review, and regarding to a possible support to the Mining and Metallurgy (M&M) sector, several strengths and weaknesses have been identified in the RIS3. On the other hand, regarding to the political, economic, social and technological framework of M&M in Castilla y León, several opportunities and threats that could foster or hamper a greater presence of M&M in the RIS3 have been considered.

- STRENGTHS (Castilla y León)

1. Thematic Priority 4 (TP4) of the RIS3 includes Mineral raw materials as one of its five areas of action, considering the following aspects:
<ul style="list-style-type: none"> - Development of mining and metallurgical techniques to increase the efficiency of processes - Use and promotion of waste - Development of competitive products from indigenous mineral raw materials (natural stone and others)
2. Still in TP4, other area of action is focused on cultural heritage, including:
<ul style="list-style-type: none"> - Analysis, recognition, prevention and dissemination of the economic value of cultural heritage

3. Thematic Priority 5 has an area of action dedicated to technologies for sustainability that includes Industrial environment (efficiency in raw materials, among others) and Recycling and recovery industry.
4. Several flagships initiatives (FI1, 2, 4, 5 and 6) matches TP4 and TP5 and contains specific actions connected with M&M: <ul style="list-style-type: none"> - Knowledge transfer voucher (FI2) - Sectoral plans of action to support the implementation of the technological solutions required (FI5) - Funding of strategic disruptive technological projects (FI5)
5. Flagship initiatives have a defined scheme of programmes for implementation, organisational structure, beneficiaries and funds.

Regarding to the mining life cycle, TP4 and 5 cover: mining exploitation, metallurgy, value chain, use of wastes, efficiency and recycling. Furthermore, mining heritage could be assumed as included in the second area of action, even though is not specifically mentioned. It is worth to stand out that Mineral RM's area of action was included after the mid-term assessment carried out in 2017, because in the original 2014 RIS3 version practically nothing was said about mining; that means a positive change and hopefully could set the basis for a strong presence of M&M in future RIS3 updates.

- WEAKNESSES (Castilla y León)

1. Anything is planned in relation to the mining exploration phase in the RIS3.
2. Nothing is said about an efficient access to mineral resources from the administrative point of view (land use planning, mining cadastre management).
3. The integration of mining activity in the socioeconomic framework (social acceptance issues) is not addressed.
4. Mining and metallurgy are included in some Thematic Priorities' actions but there is any budget or specific plan to develop them. Any flagship initiative addresses specifically M&M.
5. The most defined commitments, in terms of organisation and funding, are the Flagship Initiatives, whose specific actions can impact in one or several TPs; however, some specific actions are defined in a vague way.

The first point means a lack of support in the RIS3 to explore the mining potential, basic activity to develop mining exploitations and related industries. In relation to point 2 and 3, RIS3 does not tackle the access to resources in terms of efficient management of permitting processes, land use planning and social acceptance, that represent general concerns for the whole mining sector. Finally, points 4 and 5 refers to the internal operability of the RIS3 actions.

- OPPORTUNITIES (Castilla y León)

1. A long mining tradition, especially in coal areas (practically inactive nowadays) in the North and western areas activity in metallic. 16 old mining sites have become into touristic centres, some of them as museums.
2. A strong mining sector with two active W mines (Los Santos and Barruecopardo), two glauconite exploitations (Belorado and Cerezo del Río Tirón), one magnesite mine (Borobia) and more than 400 active exploitations of aggregates, industrial

minerals (K-feldspar, silica, etc.) and ornamental stone, highlighting a remarkable roofing slate sector ¹⁷⁷ . Mining projects in advanced stages for Sn-W, Fe, Pb-Zn and U could be in operation in a medium term.
3. An interesting mining potential, especially for several EU critical raw materials: W, Nb, Ta, Sb, Barite, Co, F, Magnesite, Graphite, Silicon and V, but also for Talc, copper, gold, etc. The prospective Iberian Variscan Massif outcrops along the N, W and S borders of Castilla y León. There are around 60 exploration permits for metallic and industrial minerals.
4. Industries directly related with mineral raw materials (plants of cement, concrete, silicon carbide, absorbent products, glass, ceramics), apart from the specific facilities linked to exploitation centres. There is also a company recycling aluminium
5. Universities with faculties of Geology (Univ. Salamanca), Mining engineering (Univ. León) and Industrial engineering (Univ. Valladolid). Univ. Burgos develops RDI activities through the International Research Center in Critical Raw Materials for Advanced Industrial Technologies (ICCRAM) ¹⁷⁸
6. Highly skilled workers and specialists, mainly through the Santa Bárbara Foundation, focused on training for mining (including a school-mine), public construction, renewable energy and environment ¹⁷⁹
7. General social acceptance of mining and metallurgy with a positive trend with the promotion of SLO
8. Concern in the administration about the depopulation of the rural area and interest in promoting endogenous resources as a way to keep people there
9. The CyL regional administration promotes the development of the M&M sector by means of several plans and strategies: <ul style="list-style-type: none"> - <i>Master plan for industrial promotion (2017-2020)</i>¹⁸⁰: one of its 5 competitiveness axis is focused on the use of endogenous resources, among them the mining potential, considering mining as one of the main industrial pillars of the regional economy; proposed measures include value enhancement of new deposits (some others are done, like the approval of the Mineral Resources Strategy or the reconciliation of mining and environmental protection). - <i>Mineral resources strategy of Castilla y León (2017-2020)</i>¹⁸¹: addressed objectives cover administration (improve efficiency), mining sector (improve competitiveness to develop mining potential) and society (improve integration of mining in society and territory), to achieve by means 33 actions. - <i>Plan for the economic revitalization of mining municipalities (2016-2020)</i>¹⁸²: with the focus on those municipalities affected by the end of the coal mining, this plan includes, among others, measures to promote new activities linked to mining - Recent legislative initiatives to make compatible mining and urban protection or ensure the recovery of mining areas

¹⁷⁷ https://energia.gob.es/mineria/Estadistica/DatosBibliotecaConsumer/2017/Estadistica_Minera_%20anual_2017.pdf

¹⁷⁸ <https://www.ubu.es/icram/international-research-center-critical-raw-materials-advanced-industrial-technologies-icram>
¹⁷⁹ <http://www.fsbarbara.com/home.html>

¹⁸⁰ https://economia.jcyl.es/web/jcyl/Economia/es/Plantilla100Detalle/1284250105595/_/1284733947485/Comunicacion

¹⁸¹ https://energia.jcyl.es/web/jcyl/Energia/es/Plantilla100/1284750663713/Programa/_/

¹⁸² https://energia.jcyl.es/web/jcyl/Energia/es/Plantilla100/1284701326344/Programa/_/

<p>10. The CyL regional administration promotes the development of the M&M sector through specific entities:</p> <ul style="list-style-type: none"> - SIEMCALSA (Mining exploration and exploitation society of CyL)¹⁸³, focused on the mining exploration - ICAMCyL (International centre of advanced materials and raw materials)¹⁸⁴, focused on RDI activities - Fundación Santa Bárbara, with specific activity in training, RDI and revitalisation of coal mining municipalities - ICE (Institute for Business Competitiveness of CyL)¹⁸⁵, promoting and managing funds for R&D activities
<p>11. Mining vocation of the regional administration, as evidenced by its participation in different nets and platforms such as:</p> <ul style="list-style-type: none"> - MIREU, through the General Directorate of Energy and Mines, SIEMCALSA and ICAMCyL - REMIX, through the Institute of Business Competitiveness (ICE) - ESMIMET, through the General Directorate of Energy and Mines, SIEMCALSA and the School of Mining Engineers (Univ. León) - S3P Industry's platforms: Advanced materials for batteries (lead by ICAMCyL) and Mining industry and global value chains (through ICAMCyL)
<p>12. Business associations at national and regional level:</p> <ul style="list-style-type: none"> - CONFEDEM (National Confederation of Mining and Metallurgy Companies)¹⁸⁶, with 30 partners including companies, laboratories, regional associations, technological centres, etc. - COMINROC (national Confederation of Extractive Industries of Industrial Minerals and Rocks)¹⁸⁷ groups 10 sectoral associations at the national level, covering industrial minerals, ornamental stones and aggregates - At the regional there are associations of producers of ornamental stone (PINACAL), roofing slate (APICAL, APROPICAL) and aggregates (AFARCYL)
<p>13. Clusters and working groups:</p> <ul style="list-style-type: none"> - Iberian Sustainable Mining Cluster (ISMC-IBERIA MINE)¹⁸⁸, based in CYL (managed by ICAMCYL), with almost 40 enterprises and institutions covering the whole mining life cycle and related activities - The Raw Materials Working Group (managed by the ICE) promotes networking between companies, administration, academia and technological centres, and fosters participation of regional entities in international programs and nets (e.g. H2020, EIP Raw Materials Operational Groups, ERAMIN)
<p>14. Mining and metallurgy activities could have access to ERDF and ESF through:</p> <ul style="list-style-type: none"> - Centre for the Technologic Industrial Development (CDTI)¹⁸⁹, at the national scale - <i>Castilla y León ERDF and ESF Operational Programmes 2014-2020</i>¹⁹⁰

¹⁸³ <http://www.siemcalsa.com/>

¹⁸⁴ <https://www.icamcyl.com/>

¹⁸⁵ <http://www.jcyl.es/web/jcyl/Portada/es/Plantilla100Directorio/1248366924958/0/1142233486201/DirectorioPadre>

¹⁸⁶ <http://confedem.com/>

¹⁸⁷ <http://www.cominroc.es/index.html>

¹⁸⁸ <https://www.icamcyl.com/en/iberian-sustainable-mining-cluster-ismc>

¹⁸⁹ <https://www.cdti.es/>

¹⁹⁰ <https://hacienda.jcyl.es/web/jcyl/Hacienda/es/Plantilla100/1284403420841/1246993414328/>

- Specific funds for municipalities affected by the coal mining closure

Summarizing, the first four points show the activity and potential of the mining and metallurgy sector (M&M); especially remarkable is the presence of a mining potential of interest to the EU (point 3). Points 5 and 6 show the capabilities for training. Points 7 and 8 talk about the social concerns, pointing the general lack of social rejection to the mining activity that can be, on the other hand, a way to foster the economy in depopulated areas. Point 9 refers to several aligned plans/strategies related with M&M, connected with RIS3 and capable to drive funds to its planned actions; it is worth to say that there is a little lack of synchrony of the Master Plan with the RIS3, as the Plan was defined in harmony with RIS3 previous to the update. The regional administration promotes mining exploration and RDI activities (point 10) and participates in European projects (point 11), defining itself as a Mining Region in the European scene and promoting from different angles the mining and metallurgical activity; this commitment is coherent with a greater integration of the M&M sector in the RIS3. (In Spain, competences in mining issues are transferred to regions, there is not general policies at the national level). Points 12 and 13 show technical and organizational capabilities of the M&M sector, which can serve of support to any initiative related with the mining development. Finally, point 14 highlight the regional/national capability to manage funds.

- THREATS (Castilla y León)

1. Administrative management of M&M projects becoming longer and more complex, (EIA, lot of permits) hampering the development of new mining projects
2. Growing and varied environmental protection (Parks, Natura2000, etc.) hampering or making difficult extractive activities. Land use planning policies linked to this protection are based upon a concept of natural resources that excludes mineral resources, tackling mining as an activity to be restricted or avoided
3. Preferent promotion of rural economic activities that potentially could be in conflict with mining (e.g. rural tourism)
4. Negative effects of non-rehabilitated old mines on the public opinion
5. In some areas, local communities perceive mining as an aggressive activity for the environment, driving to social acceptance problems
6. In general, there is a lack of social awareness about the need of mineral raw materials to keep the modern way of life
7. Biassed primary education, highlighting negative aspects of mining above the positive ones
8. Lack of internal demand of mineral raw materials from the regional industrial sector, value chain not well developed
9. Costly electricity could have negative influence on possible new facilities for processing mineral products
10. Coal mines and related thermal powers plants have been recently closed

The first point refers to the administrative management of the mining activity, ever more complex, that delays or prevents the potential development of M&M in the region. Second and third points talk about the preference from a part of the administration of other kinds of economic activities in rural areas. Points 4 to 7 are about the perception of the mining in the society as something undesirable, forgetting the need of mineral raw materials; this opinion

could have negative influences in later RIS3 updates. Finally, points 8 to 10 give an idea of the low impact of mining in the regional industry, even more after the recent closure of all the thermal power plants in the region, and some negative aspects that companies must face in setting up new industries.

4.2.5 Kosice (Slovakia)

Kosice RIS3 was approved on 2015¹⁹¹. According to the strategy of smart specialization among the areas of economic specialization of Kosice counties include:

- Automotive and engineering.
- Information and communication products and services.
- Production and processing of iron and steel.

The prospective areas of specialization of the Kosice Region include:

- Automation, robotics and digital technologies.
- Processing and recovery of light metals and their alloys.
- Creative industry.

Areas of specialization in terms of available scientific and research capacities include:

- Material research and nanotechnology.
- Information and communication technologies.
- Biomedicine and biotechnology.
- Sustainable energy and energy.

After a review of the content of the RIS3 in relation to the support to the Mining and Metallurgy (M&M) sector, strengths have been identified:

- **STRENGTHS (Kosice)**

1. Metallurgy belongs to the RIS3 priority, advance manufacturing/ robotics, automation, material engineering / new materials, in Kosice. The regional government recognised metallurgy as one of the core industries of heavy industry, which has a strong position in the regional economy.
2. In the Slovakia national RIS3, metallurgy is included in the chapter of “Areas of economic specialisation” based on traditional sectors, due to its contribution to increasing domestic value-added products through improving production process.
3. In the Slovakia national RIS3, increasing the value of domestic raw material base is one of the “Prospective areas of specialisation”. Development trends selected based on relation to raw materials sector are: <ul style="list-style-type: none"> - smart production system. - smart technologies for the intelligent management of smart products consumption.

¹⁹¹ Košice RIS3, 2015

https://web.vucke.sk/files/dokumenty/pub/regionalny_rozvoj/phsr/2015/prilohy/priloha_7_regionalna_inovacna_strategia_kosickeho_kraja_2013_2020.pdf

- support of the smart technologies in the field of raw materials processing in regions of their occurrence.

In Kosice RIS3 we can see the potential research areas in metallurgy:

- evaluation of structure and properties of ferrous and non-ferrous materials, powder metallurgy, corrosion and corrosion protection of metals, bearing steel,
- physical metallurgy, material degradation, modern material technology,
- heat treatment processes - measurement, regulation, automation, modelling and optimization,
- quality assessment of heat treatment,
- manufacture, application and recycling of refractory materials,
- chemical processing of mineral raw materials for the production of ceramic materials,
- steel metallurgy, steel metallurgy and continuous casting, casting metallurgy, iron archaeometallurgy,
- modern foundry technology, casting steel, molding mixtures.

Development trends selected based on relation to metallurgy in the Slovakia national RIS3 are:

- to develop of production processes in industry focusing on better use of available resources, greater use of recycling materials and environment-friendly materials through the R&D&i development.
- to develop of technological investment units, particularly in the field of metallurgy, engineering, energy and integrated industrial equipment, with respect to the application and use of light metals and advanced materials in the manufacture of transport and construction facility to reduce overall weight and contribute to the green economy (development and application usage of composite materials).
- to use of ICT and robotics in the production processes.

The weaknesses identified in the mining and metallurgy sector (M&M) contained in RIS3 are as follows:

- WEAKNESSES (Kosice)

1. In Kosice, metallurgy is recognised one of the main factors of development in industry which has the potential for strengthening of export (i.e. strong export position in metallurgical and electrical industries). Therefore, it should be covered by the strategic objectives of Kosice, strengthen of productivity and competitiveness of key and promising sectors of industry and services, putting stress on their export performance and innovation of products, processes and services.
2. There are policy instruments like Strategy, plan or programme that reflecting the regional and/or national RIS3 priorities. Metallurgy sector should have access to the Slovak ESIF through both the regional RIS3 and the national RIS3.
3. There is no mention of relevant mining and metallurgy clusters or bodies in the Kosice RIS3.
4. Lack of support for the exploration of the mining potential, basic activity for developing mining exploitations and related industries in the RIS3.
5. Nothing is said about the access to mineral resources from the administrative point of view (land use planning, mining cadastre management).
6. The integration of mining activity in the socioeconomic framework (social acceptance issues) is not addressed

On the other hand, regarding to the political, economic, social and technological framework of the mining and metallurgical sector in Kosice, opportunities and threats have been considered in relation to the M&M:

- OPPORTUNITIES (Kosice)

1. There are mining exploitation of non-energy raw materials - extraction and processing of iron and non-ferrous ores like barite and siderite ores. Also, magnesite and coal.
2. The metallurgical industry is considered to be one of the most important in Kosice. Industry is clearly dominated by metallurgy that participates by 60% in industrial production of the region and accounts for 50% of its exports.
3. Kosice recognises iron and steel metallurgy - black metallurgy and metallurgy of non-ferrous metals - coloured metallurgy. Non-ferrous metal metallurgy mainly produces copper, lead, zinc, tin and their alloys. The metallurgy of light metals mainly produces aluminium and its alloys.
4. Potential for the development of production of new products with higher added value based on renewable and non-metalliferous raw materials.
5. Strong export position in metallurgical industry with an advantageous geographic position for the flow of goods and services to EU member countries (border region, external border of EU, good transport connections to Hungary and Romania), transport routes crossing the region in the east-west and north-south directions.
6. Kosice has the potential research in the area of chemical processing of mineral raw materials for the production of ceramic materials.
7. From the point of view of regional/national plans and activities related with M&M, there is the following: - <i>The National Regional Development Strategy of the Slovak Republic</i> ¹⁹²
8. At regional/national level there are relevant M&M clusters or bodies: - EIT Raw-Materials HUB Regional Center Kosice. - Association of Mining Guilds of Slovakia. - Slovak Mining Chamber. - Association of Metallurgy, Mining Industry and Geology of the Slovak Republic.
9. Participation of the regional administration in different nets and projects such as MIREU and European technology Platform on Sustainable Mineral Resources ¹⁹³
10. Universities with Mining engineering and Geology faculties (Technical University of Kosice, University of P. J. Safarik in Kosice)
11. There is financial support from the national government to the metallurgy sector due to the National Regional Development Strategy of the Slovak Republic.
12. Each region is free to compete for innovation policy schemes launched by the central government and supported by the ESIF.

¹⁹² National Regional Development Strategy of the Slovak Republic:

https://trimis.ec.europa.eu/sites/default/files/project/documents/national_regional_development_strategy.pdf

¹⁹³ Source: http://www.etpsmr.org/?post_causes=technical-university-of-kosice

- THREATS (Kosice)

1. Due to the language barrier, it is unclear if there is any regional policy relevant to mining and metallurgy.
2. Kosice focus on mining the reserved magnesite deposit on the Bankov locality in a deep way, for the processing and refining of magnesite, the production of concentrates, magnesite clinkers, spinels and calcins, refractories also ceased its activity. Bankov is currently closed mine.
3. No reference to social concerns like social acceptance of M&M.
4. Changing population structure with increasing share of population with insufficient quality of education and low professional skills.
5. Deteriorating composition and quality of graduates in the educational process. Missing graduates especially in technical and natural sciences.
6. Persisting brain-drain abroad.
7. In Košice self-governing region several important mining companies have been closed since 90s.
8. There is no individual regional EU funding programme in Slovakia.

4.2.6 Lapland (Finland)

Lapland RIS3 was approved on November 2013, and updated in 2018 with a new version valid until 2022: "The Strategic Priorities for International and Smart Specialisation 2018–2022". The current thematic priorities in Lapland are:

- TP1. Advanced Arctic business – foundation for the growth. Leading spearheads for international business and foundation for smart specialisation in Lapland can be divided into four strategic themes: Arctic circular economy; Arctic sustainable tourism; Growth in business by increasing the refining of natural resources; New emerging industries.
- TP2. Arctic expertise, renewal and innovations strengthening the growth and international business activities. Strategic themes: Arctic innovation platforms, education solutions and internationality.
- TP3. Regional ecosystem as the base for internationalisation: a renewing regional ecosystem, clustering and international networks.

In addition, the document "Smart Specialisation Strategy 2019-2023" for East & North Finland regions identifies a fourth cross-cutting thematic priority including Innovative activities, Digital technology, Low-carbon solutions and Energy-efficiency.

After a review of the content of the RIS3 in relation to the Mining and Metallurgy (M&M) sector, a SWOT analysis has been performed identifying the following strengths, weaknesses opportunities and threats regarding the political, economic, social and technological framework of the mining and metallurgical sector in Lapland:

- STRENGTHS (Lapland)

1. Thematic priority 1 (TP1) of the RIS3 includes mining and metal industries as one of the three economic backbones of Lapland underlying the emerging Arctic business. The new industries will emerge with the support of four strategic business lines including "Arctic circular economy"; "Growth in business by increasing the refining of natural resources" and "Emerging industries as new platforms for business".
2. An entire value chain is emerging within the Lapland's battery industry, starting with the mining companies and ending with the recycling and reuse of the metals.
3. One of the thematic strengths in smart specialisation is sustainable mining.

Lapland is the beacon of the Arctic region, where growth and well-being are based on the sustainable refining of natural resources and conditions.

- WEAKNESSES (Lapland)

1. Mining exploration phase are not properly addressed in the RIS3.
2. Anything is planned in relation to the mining exploitation phase in the RIS3.
3. There is no mention to metallurgy in the RIS3.
4. There is no mention to mining heritage in the RIS3.
5. Nothing is said about the access to mineral resources from the administrative point of view (land use planning, mining cadastre management).
6. The integration of mining activities in the socio-economic framework (social acceptance issues) is not addressed.

- OPPORTUNITIES (Lapland)

1. Several exploration projects currently undergoing, including the Sakatti project (AngloAmerican, Cu-Ni-Pd) or the Rompas project (Mawson Resources, Au-U).
2. Four mining exploitations, including the Kevitsa mine (Boliden, Ni); Pahtavaara mine (Lapland Goldminers, Au) and Kittilä mine (Agnico Eagle Mines Ltd., Au).
3. Mining potential, especially interesting for EU critical raw materials ¹⁹⁴ .
4. It has begun with small scale processing of bog iron and grown through larger scale mining operations to become a globally acknowledged and diverse provider of mining equipment and processing technologies. The volume of waste rocks from mining activity or the excavation of natural stones is expected to increase in the future.
5. Increased demand for raw materials in Europe is encouraging the opening of new mines and reactivation of old mine projects, involving additional infrastructure and promoting the creation of new employment opportunities.
6. General social acceptance of M&M. The Lapland Government actively promotes mining activity, and local communities generally tend to have a positive view of new mining projects.
7. Rovaniemi is the administrative centre of Lapland and an important regional centre of public governance for mining in Finland.
8. The regional government of Lapland and the national government of Finland promote the development of the M&M sector by means of several plans and strategies: “Finland’s Minerals Strategy”; “Industrial Strategy of Lapland 2030” ¹⁹⁵ and “Making Finland a leader in the sustainable extractive industry – Action plan (2013)” ¹⁹⁶ .
9. Participation of the Regional Council of Lapland and partners of the Arctic Industry and Circular Economy Cluster ¹⁹⁷ , namely GTK, LUKE and Lapland UAS in different projects and platforms such as MIREU, NEXT and MINLAND (H2020), REMIX (Interreg Europe) and S3P on “Mining Industry” will generate additional opportunities for the mining and metallurgy sectors.
10. Kemi-Tornio’s circular economy innovation platform is the world’s northernmost hub of bio-, mining -, metal industry and services.
11. Digipolis-Kemi Technology Park, in operation since 1993, is Lapland's largest technology centre and home to over 50 companies and organisations and approximately 500 employees.
12. Universities with Mining Engineering and Geology faculties (Lapland University, Lapland University of Applied Sciences) can support the training of the next generation of skilled workers for the mining and metallurgy sectors. A large demand

¹⁹⁴ Finland’s Mineral Strategy, 2010 <https://ec.europa.eu/growth/tools-databases/eip-raw-materials/en/system/files/ged/42%20FinlandsMineralsStrategy.pdf>

¹⁹⁵ Industrial Strategy of Lapland 2030

http://www.lappi.fi/lapinliitto/c/document_library/get_file?folderId=21301&name=DLFE-13077.pdf

¹⁹⁶ Making Finland a leader in the sustainable extractive industry – Action plan, 2013 <https://tem.fi/documents/1410877/3437254/Making+Finland+a+leader+in+the+sustainable+extractive+industry+04072013.pdf>

¹⁹⁷ Arctic Industry and Circular Economy cluster <https://arcticsmartness.eu/artic-industry/>

for highly qualified and skilled workers and specialists is anticipated in the coming years.
13. Management of R&D&I funds at the regional level in Lapland by means of Digipolis ¹⁹⁸ .

- THREATS (Lapland)

1. Volatility in the demand for mineral resources.
2. Deposits are of lower grade or are located at greater depth.
3. Extractive operations are limited by competing forms and land use and access.
4. Permitting procedures becoming more complex, and processes becoming longer.
5. Increasingly difficult to recruit expert consultants and skilled labour.
6. New exploration and beneficiation technologies must be developed.
7. Water and energy consumption must be decreased.
8. Emissions and waste need to be minimised.
9. Automation in the mining industry must be encouraged.
10. Use of rehabilitated sites after mine closure needs to be promoted.
11. Lack of reconciliation of natural values with the interest of various industries and safeguarding Sámi culture so they don't collide with the environmental friendliness, social responsibility and acceptability of the extractive industry's operation.
12. Finnish ownership must be promoted.

¹⁹⁸ <https://www.digipolis.fi/en/>

4.2.7 Lower Silesia (Poland)

The basic tools used for effective innovation management in Lower Silesia are the Regional Innovation Strategy (RIS). The process of creating RIS began in 2005. Since then, the Regional Innovation Strategy was reviewed twice, first in 2011 when the second edition of RIS was implemented and then in 2015, when the Smart Specializations were introduced with the inclusion of a document: "Strategic Framework for the smart specialization of Lower Silesia" (2015).

Strategic objectives:

1. Strengthening of innovative skills and attitudes, which are of key significance for the knowledge based economy
2. Increased chance for the success of innovative business projects
3. Increase of innovative potential of Lower Silesia region scientific institutions
4. Development of cooperation in the economy in the innovation area

Areas of smart specialisations:

- Chemical and pharmaceutical industry (biomaterials, genetic engineering, nanocarriers, drug delivery systems)
- Spatial mobility (auto parts, airplane and components for aviation production)
- High quality food (biotechnology, bioactive food components and prevention of lifestyle diseases, food technology, biomedical preparations)
- Natural and secondary raw materials (photonic technologies, nanotechnology, measurement technology, raw materials as functional additives for composites, polymers, advance waste recovery technologies, sensors in the control systems of technological processes of extraction)
- Machines and equipment manufacturing, materials processing technology (nanotechnology, polymers, material technologies for equipment used in extreme conditions)
- Information and Communication Technologies (ICT) (programming, mobile applications, internet of things)

Smart Specialization Natural and secondary raw materials includes the following subareas:

5. Technologies of the acquisition, processing and utilization of useful minerals
 - a. technologies of the acquisition of new products from the main mineral
 - b. integrated systems for monitoring the threats in the environment of the mining plants
 - c. technologies of the acquisition, treatment and use of ordinary, thermal and mineral waters
 - d. technologies of the acquisition and processing, and the use of wood, vegetable raw materials in the innovative products
 - e. new treatment and spa services on the basis of the use of the natural resources.
 6. Technologies for the recovery of useful materials, recycling and disposal of waste.
 7. Advanced materials:
 - a. new characters of raw materials (powders, microstructures, nanostructures, amorphs, others)
 - b. composites
 - c. smart materials
 - d. materials for industrial applications
 - e. design and development of the production technology of the functional materials.
-

The analysis of the environment and documentation indicates that RIS3 in Lower Silesia - developed in 2011, in addition to updates made in the past, must be seriously reviewed and possibly changed. The macroeconomic situation and the condition of mining in Lower Silesia have changed considerably since 2011.

Additional factors affecting the change in the environment in which mining operates are: legislative changes as well as national and EU policy constantly increasing requirements for environmental protection (growing investment and operational costs), introduction of mineral tax in Poland (2012), documents: European Innovation Partnership in the field of resources, Strategic Implementation Plan (September 2013) and published assumptions regarding the state's raw materials policy (2018).

Currently, after the implementation of the new "Development Strategy of the Lower Silesian Voivodeship 2030" and impact of different external factors (including feedback from REMIX project), the need to review and update the Regional Innovation Strategy has come. Work on the Regional Innovation Strategy of the Lower Silesian Voivodeship for the next period is expected to be initiated in the mid of 2019. Completion of the works is planned for the 2020.

After a review of the content of the RIS3 regarding in relation to the support to the Mining and Metallurgy (M&M) sector, several strengths and weaknesses have been identified:

- STRENGTHS (Lower Silesia)

1. Access to rich natural resources (including unique in the country and Europe)
2. Strong traditions in the area of acquiring and exploiting mineral resources (local know-how)
3. Attractiveness of the region as a place to live for professionals
4. Proximity of western and southern Polish border
5. European funds from the current budgetary perspective
6. Business environment institutions and industrial parks operating in the region
7. Good educational results in the field of geological sciences, metallurgy and chemistry

- WEAKNESSES (Lower Silesia)

1. Lack of processing in the field of natural resources, dominance of companies in the field of raw material extraction
2. No scientific facilities for the certain sub-areas of the smart specialisation
3. Inadequate promotion
4. Unfriendly administrative procedures (their length) and legal instability
5. Location of a part of deposits in protected or built-up areas
6. Insufficient transport infrastructure in terms of local roads
7. Low level of innovativeness and expenditures on R & D, especially in small enterprises
8. Low awareness and poor protection of intellectual property developed in scientific units and companies

- | |
|---|
| 9. Lack of long-term planning in mining and implementation of multi-annual strategies enshrined in regional plans and national policies, taking into account development scenarios depending on the market situation. |
|---|

- OPPORTUNITIES (Lower Silesia)

1. Program for the reindustrialization of Poland and the Region
2. Joining the Coal regions in transition platform
3. Exploration, acquisition and use of rare earth metals
4. Search for substitutes for critical materials
5. Supply of waste containing valuable elements due to the increase in the amount of waste collected selectively
6. Strong player effect - KGHM Polska Miedź S.A. - using the global position of KGHM for the internationalization of SMEs in non-European markets
7. Diversified activities of KGHM
8. Development of health resorts based on regional thermal and therapeutic waters
9. International cooperation, including cross-border with Saxony and the Czech Republic
10. Use of energy, ceramic, post-mining and post-industrial waste base
11. Growing demand for innovative products / services, including new applications of traditional raw materials.
12. Increase in the wealth of the society
13. Development of environmentally friendly technologies
14. Development of electromobility which will generate additional demand for raw materials, including copper;
15. Development of the chemical industry and building materials (clayey materials) that can strongly stimulate the development of the mining sector.
16. Strong consolidation of the research and development environment

- THREATS (Lower Silesia)

1. Depletion of resources
2. Changeability of the economy - fluctuations of raw material prices on global markets
3. Cost increase (labor costs, mining costs)
4. High investment and social costs of starting operations in the industry (including the opening of new mines)
5. Long time from the decision to locate a new mine to start commercial extraction

6. Low social acceptance for new initiatives related to mining activities (including: for the exploration of new deposits, location of mining infrastructure facilities, mining waste management)
7. High costs of introducing innovations to the market
8. Variable and incomprehensible legal conditions
9. Moving business to other countries or regions
10. Competition of companies using imported mineral resources - (mainly from China)
11. Highly qualified professionals leaving to other labor markets
12. Lack of scenarios for the development of the region after the closure of the exploitation of copper, lignite and other deposits (risk of disturbances in the "second Walbrzych" scenario)

Sources:

- "Strategic Framework for Intelligent Specializations of Lower Silesia" (2015)
- "Diagnosis and development trends of the Lower Silesian smart specialization on natural and secondary raw materials" developed by Ekovert Łukasz Szkudlarek for Marshal Office of Lower Silesia (2017).
- Presentation of Jarosław Osiadacz, REMIX regional stakeholders group meeting, Wrocław, 09.11.2018
- "Recommendations for RIS3 updating" developed by Jarosław Osiadacz (2019)

4.2.8 North Karelia (Finland)

North Karelia's smart specialisation strategy is focused on two priorities¹⁹⁹:

- Forest based bioeconomy
- Technology and materials

After a review of the content of the RIS3 regarding to the support to the Mining and Metallurgy (M&M) sector, several strengths and weaknesses have been identified. On the other hand, regarding to the political, economic, social and technological framework of the mining and metallurgical sector in North Karelia, several opportunities and threats that could justify or hamper a greater presence of M&M in the RIS3 have been considered.

- STRENGTHS (North Karelia)

1. "Technology and materials" priority includes 6 areas of expertise and one of them is "Extractive industry processing expertise (analytics and processing expertise that serves the stone and extractive sector)"
2. M&M could benefit from actions conducted in other areas of expertise, such as "Machinery and engineering workshop solutions" and "Chemistry-related materials expertise"
3. It is highlighted the importance of expertise and RDI activity, both valuable for mining and metallurgy, from: <ul style="list-style-type: none"> - the technology industry (53% of all RDI activities are conducted in this sector) - University of Eastern Finland, Karelia Univ. of Applied Sciences and the N Karelia Municipal Education and Training Consortium, complementing the expertise of business - engineering workshops and metal companies, featuring strong expertise for technologies and materials
4. Some indicators for smart specialisation delivery, such as turnover and export of companies or those related with RDI, fit properly with measurable outputs or investments of mining/metallurgical companies

All these strengths have been extracted from the Smart Specialisation in North Karelia²⁰⁰. Mining and metallurgy are directly included in the RIS3, specifically the analytics and processing expertise for the stone and extractive sector in relation to processing activities. RIS3 remarks as well the importance of industry, academia and engineering workshops featuring expertise and RDI activities that can positively influence the M&M sector. All that reflect that M&M is embedded in a wide industrial/technological sector that is tackled by the RIS3.

- WEAKNESSES (North Karelia)

1. Regarding to the mining life cycle, it seems that the before mentioned priority does not cover the stage of mining exploration

¹⁹⁹http://s3platform.jrc.ec.europa.eu/map?p_p_id=captargmap_WAR_CapTargMapportlet&_captargmap_WAR_CapTargMapportlet_non-eu-country=true&_captargmap_WAR_CapTargMapportlet_non-eu-region=true&_captargmap_WAR_CapTargMapportlet_regionids=313

²⁰⁰http://s3platform.jrc.ec.europa.eu/documents/20182/0/North_Karelia_Smart_Specialisation.pdf/24c3511c-4b48-470c-a7be-ccf777a52763

2. Likewise, nothing is said in the S3 about the potential valorisation of the mining heritage

It seems that the 2nd priority, Technology and Materials, could cover exploitation, processing, wastes use and value chain; however, nothing seems addressed to promotion mining exploration activities nor to enhance the mining heritage.

- OPPORTUNITIES (North Karelia)

1. A strong mining sector, with important mines at Ilomantsi (Pampalo Au mine), Polvijärvi (Kylylahti Cu-Zn-Au-Ni-Co mine) and Outokumpu (Talc-Ni). In addition there are talc and industrial/building stone quarries ²⁰¹
2. Advanced exploration projects for Co-Ni-Cu (Hautalampi project) ²⁰² , Cu-Zn (Hammaslahti project) and Cu (Outokumpu) ²⁰³ , among others
3. Important mining potential for Au in the Karelian gold line, and for Ag, Zn, Pb, Talc, etc. (op. cit.). North Karelia is found in the very prospective Fennoscandian Shield
4. FinnCobalt projects to produce cobalt and nickel chemicals for the electric car industry from concentrates from Hautalampi project ²⁰⁴
5. Notable soapstone processing industry
6. Technology companies manufacturing technical equipment for the mining sector (Outotec Oyj, Firotec Oy)
7. Active research on engineering and natural resources carried out at the Karelia University of Applied Sciences ²⁰⁵ . Studies on social license to operate at the University of Eastern Finland (UEF) ²⁰⁶
8. Training for mining at: - North Karelia Municipal Education and Training Consortium ²⁰⁷ - Vocational education & Training Organisation Riveria ²⁰⁸
9. Social license and political willingness in relation to mining and metallurgy
10. At the national level, there are two key policies promoting mining: - <i>Making Finland a leader in the sustainable extractive industry – Action Plan 2013</i> , an initiative of the Finnish government addressed to the extractive industry as a source of opportunities, and includes 35 measures to obtain society's support, improve the operating conditions and exchange information and experiences ²⁰⁹ - <i>Finland's Mineral Strategy</i> , with 12 action proposals related to four distinct themes: strengthening minerals policies, securing the supply of RM, reducing the

²⁰¹ <https://www.oecd.org/cfe/regional-policy/Natural-resources-and-rural-development-RistoPoutiainen.pdf>

²⁰² <https://www.finncobalt.com/>

²⁰³ <https://drive.google.com/file/d/1MVm2G5cmR4ql8INJISiZH-eDSnG1OXMa/view>

²⁰⁴ <https://www.finncobalt.com/>

²⁰⁵ <https://karelia.fi/en/>

²⁰⁶ <https://www.uef.fi/en/etusivu>

²⁰⁷ http://atb23.net/ficheiros/file/Documentos/2016-17/north_karelia_colleges_joensuu.pdf

²⁰⁸ <http://www.globaleducationparkfinland.fi/learning-institutions/riveria>

²⁰⁹ <https://tem.fi/documents/1410877/3437254/Making+Finland+a+leader+in+the+sustainable+extractive+industry+04072013.pdf>

environmental impact and increase productivity, and strengthening R&D capabilities and expertise ²¹⁰
<p>11. At the national level, there are several associations related with mining:</p> <ul style="list-style-type: none"> - Finnish Mining Association (FinnMin, with 40 members with more than 10,000 employees)²¹¹ - Finnish Mining Cluster (more than 200 mining technology and service providers, over 40 mines, 10 smelters and steel mills, 10 mining related universities)²¹² - Arctic Smart Mining Cluster (AMIC, in N Karelia and Lapland)
<p>12. At the regional level, <i>North Karelia's Regional Strategic Programme 2018-21 (POKAT2021)</i>²¹³ includes, within the Growth from renewal focus area, Stone processing and mining with development areas focused on the update geological data, development of a hub of operational education, expansion and sustainability of mining production and improving public image of mining</p>
<p>13. At the regional level, North Karelian Strategic Group, composed by specialists of extractive industry and related (funding, education, research, etc.), is now preparing a <i>Regional Strategic Program of Extractive Industry in North Karelia</i>²¹⁴</p>
<p>14. Active business and projects management through Business Joensuu Oy²¹⁵</p>
<p>15. Outokumpu's example as a former mining hub (closed 30 years ago) attracting expertise, industries and even tourism until today. Nowadays, Outokumpu Mining Camp²¹⁶ includes an Industrial Park, Old Mine heritage centre, GTK's mineral laboratory and test factory Mintec, UEF and training centres, and hosts the FinnCobalt mine project (prev. cit.)</p>
<p>16. N Karelia is experienced in Entrepreneurial Discovery Process (EDP)²¹⁷</p>
<p>17. Mining vocation of the regional administration (through Business Joensuu Oy), as evidenced by its participation in different nets and platforms such as:</p> <ul style="list-style-type: none"> - MIREU - REMIX - OECD Mining Regions and Cities Project²¹⁸ (Outokumpu as a case study) - Specialisation Platform (S3P) for Industrial Modernisation, Mining industry and global value chains²¹⁹, recently promoted by Business Joensuu Oy and focused on the alignment and upscaling of smart specialisation investments
<p>18. RDI activities could be implemented with the help of EU's structural funds and separate funding</p>

²¹⁰ http://projects.gtk.fi/minerals_strategy/index.html

²¹¹ <https://www.kaivosteollisuus.fi/en/finnmin-finnish-mining-association>

²¹² <http://www.miningfinland.com/community>

²¹³ <http://www.pohjois-karjala.fi/documents/33565/34607/POKAT+2021+Summary.pdf/80583d66-9e7b-d4f6-8e90-3dc0a4552dac?version=1.0>

²¹⁴ JOSEK Ltd. (2017): Status report of Joensuu Regional Development Company JOSEK Ltd. REMIX Interreg project

²¹⁵ <https://www.businessjoensuu.fi/>

²¹⁶ OUTOKUMPU Mining Case Study. Preliminary reflections (March 2019). OECD Better policies for better lives. Presentation in the 9th REMIX Peer-Review Meeting

²¹⁷ <http://s3platform.jrc.ec.europa.eu/-/peer-exchange-and-learning-pxl-workshop-on-the-entrepreneurial-discovery-process-edp-?inheritRedirect=true>

²¹⁸ <https://www.oecd.org/regional/mining-regions-project.htm>

²¹⁹ <http://s3platform.jrc.ec.europa.eu/mining-industry>

19. Possibilities for funding through the Business Finland (Finnish innovation funding, trade, investment, and travel promotion organization)²²⁰

Summarizing, points 1 to 3 show the strong importance of mining in North Karelia and the potential to develop new projects in the future. Points 4 to 6 reflect the importance of the downstream and related companies, which make up together with the mining industry the strong productive body addressed in the second RIS3's priority and could maybe justify a greater integration of mining in such strategy. North Karelia has, in addition, educational facilities (points 7 and 8) and there is not a social opposition that could hamper mining and industrial development (point 9).

On the other hand, points 10 to 13 show different plans or strategies at the national and regional level that recognize the importance of the extractive industry and suggest measures to boost the sector. North Karelia's RIS3 supports the mining industry in line with these policies, although does not cover all the questions tackled in them. There are as well several national and regional nets (associations, clusters) that support the implementation of such policies. Furthermore, North Karelia has important assets such as Outokumpu Mining Camp and Business Joensuu (points 14 to 17), that help to implement RIS3 policies and integrate the regional mining scope into a European framework throughout the mentioned EU projects.

Finally, points 18 and 19 show opportunities for funding both at the European and national level.

- THREATS (North Karelia)

- | |
|---|
| 1. Finland's mining policy lacks a territorial approach (does not articulate the role of sub-national governments) |
| 2. Mining cluster activity within the region is weak and N Karelia does not have a clear marketing strategy on mining |

Treats have been extracted from an OECD analysis on the Outokumpu mining area (see reference in 14th opportunity). In summary, threats can be related with the implementation at the regional level of national policies or cluster activities.

²²⁰ <https://www.businessfinland.fi/en/do-business-with-finland/home/>

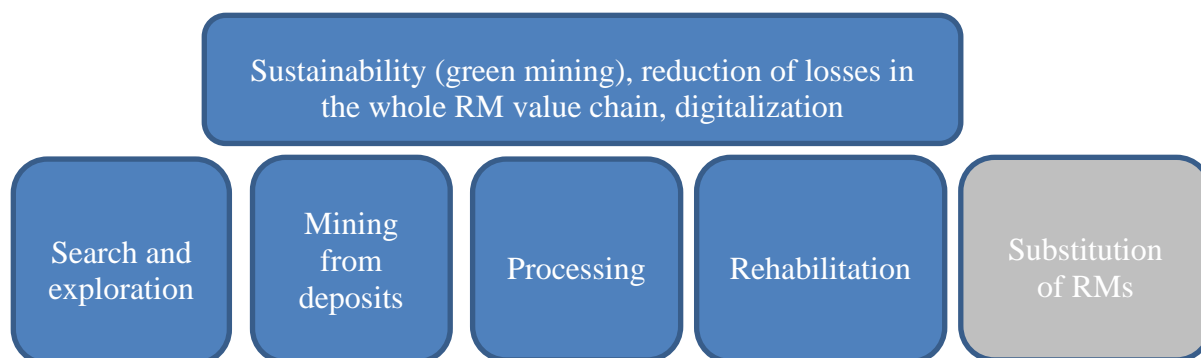
4.2.9 Saxony (Germany)

Mining and metallurgy are not explicitly named as one of the Saxon RIS3 priorities in the Innovation Strategy of Freestate Saxony (2013)²²¹. However, mining and metallurgy could possibly be covered by the current Saxon RIS3 priority (i.e. technical support priority): Advanced production technologies. Advanced production technologies covers production technologies and processes, production facilities and production facilities, including automation, handling technology, measurement and control technology, signal transmission, process monitoring and supplementary services.

While mining and metallurgy are not explicitly mentioned in the RIS3 priorities, raw materials sector is recognised as one of the future fields which is expected to have symbiosis with the key technologies (i.e. technical support priorities) and the traditional branches (e.g. mechanical engineering, electrical industry, vehicle construction, chemistry, textile industry...etc.). There are also measures recommended to raw materials sector in the areas of improvement of innovation process (product and process innovation) and organisational innovation.

In the latest update of the draft of the Innovation Strategy of Freestate Saxony (2019), future fields derived from the global trends in the Innovation Strategy 2013 are now regarded as intelligent specialisations (i.e. RIS3 priorities). At the same time, the previous RIS3 priorities in the Innovation Strategy 2013 (i.e. KETs: microelectronics, software and web technologies, advanced production technologies, new materials, photovoltaics, nanotechnologies and biotechnologies.) are viewed as one intelligent specialisation (i.e. RIS3 priority), Key technologies, along with the other future fields. Special focus will be on the subject areas that are located at the interfaces of future fields.

The focus of future field: Raw materials is placed on strengthening the innovative strength along the entire raw material chain, taking safety, cost-effectiveness and sustainability into account. This applies equally to the extraction of domestic raw material deposits as well as to the extraction of raw materials through recycling. In addition, all relevant raw material geological data for ores and spars in Saxony should be digitalised in the future and available for administration, industry and science. This will strengthen Saxony as a business location and support mining investors in re-evaluating and developing old mining areas and exploring new deposits of raw materials. In order to solve the tasks in the sub-areas (extraction, processing as well as efficiency and substitution), interdisciplinary applications or basic researches as well as the fast use of the results by the companies are absolutely necessary. The innovation fields and the descriptions of the future field: Raw materials are shown in the following figure and the bullet points.



²²¹ Saxony RIS3, 2013

http://innovationsstrategie.sachsen.de/download/Innovationsstrategie_des_Freistaates_Sachsen.pdf

- The exploration, mining/extraction and processing of indigenous raw materials requires innovative processes that enable better exploitation, especially of small and geologically complex deposits.
- One challenge of processing is the complex material utilisation of all primary and secondary raw materials with the focus on the comprehensive extraction of economically relevant secondary components. This also includes the processing of finely and finely intergrown, complex primary raw materials and waste fractions with complex material compositions.
- An important challenge and at the same time a promising field of innovation is the issue of raw material efficiency in all stages of value creation and the targeted substitution of raw materials. The implementation of this extended producer responsibility as far as possible is an important instrument for the further development of the Saxon circular economy to a resource-saving material economy.

Although according to the draft, raw material sector is selected as one of the RIS3 priorities in the next edition of Innovation Strategy of Freestate Saxony, there is still rooms for improvement regarding the content. For instance, the description of innovation fields is rather general. Furthermore, the strength of many local research institutes (e.g. Helmholtz Institute Freiberg for Resource Technology and Technical University of Freiberg) and the regional government-backed networking organisation for raw materials industry (GKZ Freiberg) were not taken into consideration. The draft only mentions the Knowledge and Innovation Community (KIC) Raw Materials centre in Freiberg as a link to the European RM community. Since the time period for public consultation is not closed until next month (June 2019), GKZ Freiberg together with the other institutes from raw material sector in Saxony are going to present our recommendations to the responsible authority.

After a review of the content of the RIS3 in relation to the support to the Mining and Metallurgy (M&M) sector, several strengths and weaknesses have been identified:

- STRENGTHS (Saxony)

1. The draft (2019) of the next edition of Innovation Strategy of Freestate Saxony selects Raw Materials as one of the future fields (i.e. RIS3 priorities)
2. The draft (2019): Covering the whole RM value chain (exploration, extraction, processing, and recycling) <ul style="list-style-type: none"> - Innovative processes - Increasing resource efficiency - Digitalisation
3. The draft (2019): Promoting applying research results in industry

- WEAKNESSES (Saxony)

1. No inter-ministerial coordination of strategies and implementation programmes)
2. Strategies have no timeline and roadmap nor a budget allocated
3. Description in the draft Innovation Strategy of Freestate Saxony (2019) is rather unspecific (public hearing set for 190617)
4. The draft (2019): Without considering the existing local strength in the RM sector concerning mid- and downstream operations and not pointing out Saxony's metallurgical industrie and research in resource efficiency and CE

5. Indicating the difficulties in transferring research results to industrial implementation but no supporting action mentioned

• OPPORTUNITIES (Saxony)

<p>1. Mining activities:</p> <ul style="list-style-type: none"> - There are three permitted metal mining operations with main commodities including tin, tungsten, copper and lithium and 21 exploration permits issued since 2011. - Industrial minerals: Strong industrial open pit and underground mining for caoline, fluorspar/baryte, marble fitting niche markets and closing value chains - Lignite is extracted in three open-cast mines but subject to political closure. (However, lignite mining is expected to last until 2038 and non-combustive, material use of lignite is foreseen and subject to industrial entrepreneurship as well as R&I) - Aggregates: 300 small and medium enterprises produce aggregates, industrial minerals and hard rock, with a growing number engaged in recycling and new materials.
<p>2. Mining potential: Saxony has world-class mineral resources of lithium, tin, tungsten, zinc, copper, including by-products such as Indium, and supplies demand of fluorite and barite from own resources.</p>
<p>3. RM processing industries within the region:</p> <ul style="list-style-type: none"> - Currently, the smelters are entirely operated with scrap, though backward integration is a raising subject to concerns in scrap supply. The main works are Nickelhütte Aue GmbH²²² (Co, Cu, Ni), Befesa (Zn), Muldenhütten (Pb) and Feinhütte Halsbrücke GmbH²²³ (Sn, Pb). - Potential of developing circular value chain - Highly specialised closed value chains in fluorspar (down to HF production), tin (with own smelter, one out of four remaining Sn, Pb-smelters in Europe), potential industrial value for Lithium - Innovative recycling industry (pyro- and hydrometallurgy)
<p>4. Social concerns:</p> <ul style="list-style-type: none"> - Relatively high social acceptance of mining due to centuries-old mining history of the region - Raising raw material awareness is one of the guidelines in the Saxon Raw Materials Strategy targeting the education system and promoting M&M history (e.g. exhibitions in museum) with continuous support from the government (e.g. financial supports)
<p>5. Regional M&M administrative infrastructure:</p> <ul style="list-style-type: none"> - Intact raw materials related administrative infrastructure (mining agency, mining archive, geological survey)
<p>6. Regional/national plans relevant to M&M:</p> <ul style="list-style-type: none"> - Saxony is the focal point of German raw materials research and support infrastructure - The German Government's Raw Materials Strategy, Safeguarding and Sustainable Supply of Non-energy Mineral Resources for Germany (2010)²²⁴

²²² Nickelhütter Aue GmbH, <http://www.nickelhuette.com/index.asp>

²²³ Feinhütte Halsbrücke GmbH, <https://www.feinhuettede>

²²⁴ <https://ec.europa.eu/growth/tools-databases/eip-raw-materials/en/system/files/ged/43%20raw-materials-strategy.pdf>

- Saxon Raw Material Strategy (revision 2017, original 2013) ²²⁵
7. Regional activities relevant to M&M: <ul style="list-style-type: none"> - Cross-regional Interreg project MineLife between the Saxon Mining Office, Polish Mining Office and Marshal's Office of the Lower Silesian Voivodeship - Interreg project REMIX Smart and green mining in EU - MIREU – Mining and Metallurgy Regions of EU
8. Regional education <ul style="list-style-type: none"> - Raising raw materials awareness is one of the guidelines in the Saxon Raw Materials Strategy with continuous support from the government (e.g. financial supports) - Training school: Berufliches Schulzentrum für Technik und Wirtschaft “Julius Weisbach” (BSZ Freiberg) - Including a permanent raw materials exhibition into the four Industry Museums in preparation of the Saxon State Exhibition “Industry” in 2020
9. Regional research institute: Saxony has a density of universities exceeding the German average and has also a strong presence of non-university research institutions and industrial research facilities (Helmholtz, Leibniz, Fraunhofer, Max-Planck etc.). Sub-bullet points are research institutes particularly relevant to M&M (they also participate in the EU funded projects.). <ul style="list-style-type: none"> - Freiberg University of Mining and Technology - Helmholtz Institute Freiberg for Resource Technology
10. Regional networking institute and activities: <ul style="list-style-type: none"> - Well established regional network settings and international and national clustering (GKZ, GERRI, EIT Raw Materials) - GKZ Freiberg connecting regional administrative, industry and academic along the RM value chain (165 members (mostly SMEs) in 2015). GKZ also networks at the European level by participating in the EU initiatives and the EU funded projects.
11. Relevant funding opportunities: <ul style="list-style-type: none"> - National/R&D&I: FONA r4 funding programme for innovation technologies for resource efficiency – research on the provision of Economic Raw Materials - National/SME innovation: KMU innovativ – raw materials efficiency - National/R&D&I: R+ Impuls – impulse for industrial raw materials efficiency - Regional: ERDF Prevention of risks associated with old mines
12. Society: <ul style="list-style-type: none"> - Saxony shows the highest participation in both, SME and academic research, in all European and German grant programmes targeting raw materials economy and CE
13. Freiberg TerraMineralia – world largest public and academic mineral collection

• THREATS (Saxony)

1. RM processing industries: difficulty in acquiring processible input materials
2. Social concerns:

²²⁵https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=2ahUKEwim2uX4laziAhXLKewKHUjWAFQFjABegQIARAC&url=https%3A%2F%2Fpublikationen.sachsen.de%2Fbdb%2Fartikel%2F29774%2Fdocuments%2F43489&usq=AOvVaw1MaH-9aM5A_oDbYI_VeVeP

- Debates between visitor mines/cultural mining heritage and re-opening mines
- Regarded as one of the least popular industries in Germany ²²⁶
3. Administrative management of M&M projects becoming longer and more complex
4. National/Regional plans relevant to M&M subjected to political debates (i.e. coalition government) or public debates (e.g. fracking)
5. The Saxon Raw Materials Strategy is supported by a single ministry, the Ministry for Economic Affairs, Labour and Transport
6. Employment in M&M
- Low unemployment rate in Germany: M&M industries have to compete with other industries for skilled personnel
- Sliding number of students studying in the RM sector
7. Lack of skilled labor force in terms new mining operations start
8. Huge burden for a successful social and infrastructural transition of the present lignite mining regions

4.2.10 Sterea Ellada (Greece)

As there is any specific mention to mining and metallurgy in the Sterea Ellada's RIS3, an external analysis has been conducted to identify opportunities and threats.

- OPPORTUNITIES (S. Ellada)

1. Important Mining Deposits of Bauxite, Magnesite, Nickel.
2. Important metallurgy and processing plants (including recycling plants)
3. Good transportation options (by sea, good road network, railway)
4. Close proximity to Athens (the biggest logistics center in Greece is Athens)
5. Close proximity with Attiki and other Regions with significant universities and Schools related to raw materials
6. Willingness to promote technology and innovation (according to the current version of ROP of Sterea Ellada).
7. Willingness to support and restructure the Regional economy industrial production (according to the current version of ROP of Sterea Ellada).
8. Intention to improve the strategic/ competitiveness status and make the Region attractive for new investments (according to the current version of ROP of Sterea Ellada).
9. Intention to produce new knowledge in the local production system (according to the current version of ROP of Sterea Ellada).

²²⁶ Messung der Industrieakzeptanz in Deutschland from the German Federal Ministry for Economic affairs and Energy
<https://www.iit-berlin.de/de/projekte/messung-der-industrieakzeptanz-in-deutschland>

10. Promotion of environmental technologies and low carbon economy (according to the current version of ROP of Sterea Ellada).
11. Intention to improve transportation infrastructure (according to the current version of ROP of Sterea Ellada).
12. Intention to promote actions for vocational training (according to the current version of ROP of Sterea Ellada).
13. Intention to promote Inter-Regional collaboration and synergies (according to the current version of ROP of Sterea Ellada).
14. Promotion of new Regional land use planning (according to the current version of ROP of Sterea Ellada).
15. Elaboration of a new National Special Spatial Plan for Raw Materials
16. Intention to include the Region in European, national and International networks of collaboration and exchange (according to the current version of ROP of Sterea Ellada).

- THREATS (S. Ellada)

1. Neutral to negative social acceptance
2. Lack of public awareness of the necessity of using and exploiting mineral resources to meet the energy demand
3. Severe Environmental problems (not yet solved) attributed to metal processing activities.
4. Intention to promote natural conservation (according to the current version of ROP of Sterea Ellada). Many of the deposits are located in close proximity to such areas.
5. The Region has not financially promoted up to now actions related to the Raw Material Sector
6. The Region has significant agricultural and fishery activities that are antagonistic to mining and metallurgical projects
7. The Region has significant cultural heritage monuments (archaeological sites) that are located in close proximity to mineral deposits
8. The Region has also significant touristic activity in close proximity to mining and metallurgical projects

4.2.11 Upper Styria (Austria)

As there is any specific mention to mining and metallurgy in the Upper Styria's RIS3, an external analysis has been conducted to identify opportunities and threats.

- OPPORTUNITIES (U. Styria)

1. A long mining & metallurgic tradition. "Styrian Iron Route" + adjacent "Mur-Mürz valley" are Austria's cradle of industrialization (going back many centuries). The "costumes of the miners" were also accepted as UNESCO intangible heritage.
2. An important mining sector with the Erzberg mine being the last iron ore mine in Central Europe + some minor mines (Graphite etc.).
3. Prosperous industries directly related with ore (besides others the world's most modern steel plant is currently built in Kapfenberg); well developed value chain ore → metallurgic industry
4. Mining university of Leoben is one the most reputable mining universities in the world; new technical college for raw materials in Leoben – R&D can trigger the mining/metallurgy sector
5. Highly skilled workers in metallurgy
6. General social acceptance of mining and metallurgy – the iron mine Erzberg is called the "bread giver" for the region; mining & especially the metallurgic industry are the economical base of the region and well accepted
7. Concern in the administration about the depopulation of the rural area (the population of Upper Styria has been decreasing for decades): active interest in promoting endogenous resources as a way to keep people there + efforts to attract potential work force
8. Regional development strategy (NUTS III) backs the further development of the region's metallurgic industrial core competences + the
9. Efforts to raise awareness about the need of mineral raw materials to keep the modern way of life (e.g. exhibition "raw materials are our future" in Leoben and Kapfenberg; tours at Erzberg mine etc.)
10. Primary education highlights metallurgic (+mining) topics, trying to raise interest in technical jobs
11. Mining and metallurgy activities could have access to ERDF funding

- THREATS (U. Styria)

1. The main Erzberg mine will be exhausted at appr. 2050
2. Preferent promotion of rural economic activities that potentially could be in conflict with mining (e.g. rural tourism)
3. High environmental regulations in Austria can restrict new activities especially in the metallurgy and recycling sector
4. In some areas, local communities perceive metallurgy as an aggressive activity for the environment, driving to social acceptance problems (e.g. Alumelt recycling plant in

Eisenerz which had to be closed subsequently; protest against erection of Minex Mineral Explorations Ltd in Zeltweg)
5. Still a lack of social awareness about the need of mineral raw materials to keep the modern way of life
6. Apart from iron ore and graphite no other interesting mining potential, especially for several EU critical raw materials:
7. Population of Upper Styria has been decreasing for decades – it's getting harder and harder to find employees in the metallurgic sector
8. No master plans

4.2.12 Västerbotten (Sweden)

The S3 priorities of Västerbotten²²⁷, based on the focus areas defined in the *Regional Innovation Strategy 2014-2020*²²⁸, are:

- Innovations in healthcare
- Life science
- Technology and service development for industry
- Testing activities
- Sustainable energy and environmental technology
- Experience-based and creative industries
- Digital service sectors for smart regions

A new smart specialisation strategy development process started in 2018, although results were not available at the time of writing this report.

After a review of the content of the RIS3 regarding to the support to the Mining and Metallurgy (M&M) sector, several strengths and weaknesses have been identified. On the other hand, regarding to the political, economic, social and technological framework of the mining and metallurgical sector in Västerbotten (and Sweden), several opportunities and threats have been considered in relation to achieve a greater presence of M&M in the RIS3.

- STRENGTHS (Västerbotten)

1. The third priority –Technology and service development for industry-, considers mining and mineral technology (including recycling) as one of development areas.
2. In this priority, the world-leading position of Övre Norrland (Norrboten and Västerbotten) in high-tech process industry in mining and recycling is highlighted
3. In the same priority, great opportunities to further processing of the basic industry's products are pointed based on the regional raw material resources, industry and R&D development expertise. As example, in the development area related to forest and

²²⁷ <http://s3platform.jrc.ec.europa.eu/regions/se331>

²²⁸ http://s3platform.jrc.ec.europa.eu/documents/20182/232763/SE_V%C3%A4sterbotten_RIS3_2014_Final.pdf/7635f61d-eea7-42e6-8024-b8018f5de33f

wood technology, a development (biomass and industrial processes) ranges from forest to finished wood product.
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In sum, mining and metallurgy is one of the areas in which technologies and services have to be developed. This could be applied to the whole mining life cycle, but especially, according to the third point (and the example about forestry), in mining exploitation, metallurgy, value chain and wastes use.

- WEAKNESSES (Västerbotten)

1. Regarding to the mining life cycle, it seems that the before mentioned priority does not cover the stage of mining exploration.
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2. Nothing is said in the S3 about the potential valorisation of the mining heritage.

It is not clear that technology and service developments may be addressed to the exploration of the mining potential of Västerbotten. On the other hand, nothing is said about natural or cultural heritage, the suitable framework in which the mining heritage could be included.

- OPPORTUNITIES (Västerbotten)

1. A long mining tradition: Boliden started 90 years ago when gold was found in Skelleftea area.
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2. A strong mining sector with 5 active metal mines ²²⁹ : the Au-Cu-Ag mine of Björkdalsgruvan, the Au-Te mine of Kankberg and the Zn-Cu-Pb-Au-Ag mines of Kristineberg, Maurliden and Renström ²³⁰ .

3. There are 76 exploration permits covering 116,894 ha (2013) ²³¹ . Mining exploration engages companies from Australia, Canada, USA, and South Africa, among others countries, that are investing in Västerbotten
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4. Västerbotten, as part of the Fennoscandian Shield, has an important mining potential, and there are advanced projects in both Gold and VMS (Vulcanogenetic Massive Sulphides) Trends

5. Processing industries: standing out Rönskär smelter (produces copper, gold, silver, lead, sulphuric acid, zinc clinker and by-products). Northvolt Ett (which will produce 32 GWh of battery capacity per year), is located in Skelleftea according to its long history of mining, process manufacturing and recycling ²³² . Boliden is a high-tech metal company with its own mines and smelters, high productivity based on experience, innovation and advanced technology, high expertise in electronic waste recycling ²³³

6. Competent business environment in the form of subcontractors (around 30 companies providing mining products, engineering, service and software).

7. Innovative environment, as demonstrates Umea being one of the six more innovative European city (J. Niemann, op.cit.)
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²²⁹ <https://www.sgu.se/en/mining-inspectorate/mines/mines-in-sweden/>

²³⁰ <https://vp217.alertir.com/afw/files/press/boliden/201903076646-1.pdf>

²³¹ <http://viavasterbotten.se/wp-content/uploads/2009/11/Mining-in-Sweden-and-V%C3%A4sterbotten111.pdf>

²³² ²³² <https://northvolt.com/production/>

²³³ Niemann, J. (2018): Region Västerbotten presentation at the MIREU 2nd SLO Workshop at Leoben (Austria)

8. Lulea University of Technology, has engineering BSc programmes in Skelleftea, and a wider and a wider offer of mining-related degrees in the neighbouring Norrbotten ²³⁴
9. Social acceptance gained by mining companies (Boliden, LKAB) throughout major environmental investments during long time and re-opening of old mines using new technology (J. Niemann, op.cit.)
10. At a supra-national level, the Northern Sparsely Populated Areas network ²³⁵ encourages the collaboration on joint opportunities as the only way to create sustainable and long-term S3 solutions; the mining potential of the regions involved is highlighted ²³⁶
11. At a supra-national level, the Arctic Stakeholder Forum has identified as one of the main investment priorities the business development and smart specialisation, including mineral and other RM industries; moreover, the Swedish government identifies as investment priority, among others, the support to the the full value chain of mining and mineral and other raw material industry to make it more environmentally sustainable and integrated in circular economy ²³⁷
12. At the national level, one of the 11 Sweden's S3 priorities is: Mining and metal extraction ²³⁸
13. At the national level, there is a key policy promoting mining, the <i>Sweden's Mineral Strategy</i> , with 11 action areas and 19 specific actions to exploit the Sweden's mineral assets in a long-term sustainable way ²³⁹
14. At the NUTS 2 level (Övre Norrland), there is a <i>Regional Strategy for the Innovative and Sustainable Development of the Mining Sector in Norrbotten and Västerbotten</i> , which points out priorities, initiatives and measures in community planning, provision of skills, infrastructure, environment, R&D and competitiveness ²⁴⁰
15. The <i>Regional Development Strategy for Västerbotten County (RDS 214-2020)</i> defines 6 sub-strategies with several priority areas; one of these priorities is Value-added natural resources and resource-efficient technologies, and one of the measures planned in this priority is develop businesses based on smarter and more sustainable new products, production techniques and methods within (among others) mining and minerals and related industrial production ²⁴¹
16. Mining vocation of the regional administration, as evidenced by its participation in different nets and platforms such as MIREU, throughout Region Västerbotten (co-operative body responsible of regional development in the region)
17. At the national level, Mining for Generations is a government (throughout Business Sweden) and industry initiative that promotes Swedish mining industry

²³⁴ <https://www.ltu.se/?l=en>

²³⁵ <http://www.nspa-network.eu/>

²³⁶ <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC114273/online.pdf>

²³⁷ <https://publications.europa.eu/en/publication-detail/-/publication/6a1be3f7-f1ca-11e7-9749-01aa75ed71a1/language-en/format-PDF/source-60752173>

²³⁸ <http://s3platform.jrc.ec.europa.eu/regions/se>

²³⁹ <https://www.government.se/sb/d/574/a/218986>

²⁴⁰ <https://www.lansstyrelsen.se/download/18.2e0f9f621636c8440272846/1526643941779/regional-strategi-f%C3%B6r-h%C3%A5llbar-utveckling-av-mineralsektorn-i-NB-VB-KLAR.pdf>

²⁴¹ <https://regionvasterbotten.se/wp-content/uploads/2014/10/RUS-English-version.pdf>

internationally, aiming to increase collaboration and contacts across borders both between mining companies, technology companies and academia ²⁴²
<p>18. At the national level, there are several associations related with mining:</p> <ul style="list-style-type: none"> - Swedish Association of Mines, Mineral and Metal Producers (SveMin), with 40 companies and more than 13,000 employees²⁴³ - Swedish Mining and Tunnelling Group, with 24 members (extraction, processing, academia, etc.) that supply technology and equipment for mining and underground operations²⁴⁴ - Georange is a non-profit organization (54 members from municipalities, organizations, universities and private companies) that aims to expand the concept of development in the mining and minerals industry²⁴⁵
<p>19. As an Arctic Smartness' project, Arctic Investment Platform (AIP) is a funding cooperation mechanism that aims to turn Northern Sparsely Populated Areas' smart specialisation strategies into actual investments and streamline existing financing instruments²⁴⁶</p>
<p>20. Mining and metallurgy should have access to both the regional ERDF and the national ESIF</p>

Points 1 to 4 show the strong importance of the mining sector in Västerbotten and the potential to continue in such a way in the future. Points 4 and 6 reflect the strength of the downstream or related industries, the importance of the expertise and the net of subcontractor companies related with mining and industry. All these points reflect a virtuous circle, based on the raw materials value chain (mining and processing industries), creating a critical mass in industry, services and R&D, then attracting new related industries (e.g. Northvolt) that, in turn, reinforce the potential for mining and related services; RIS3 should consider the existence of this virtuous circle. Västerbotten has as well an innovative environment (point 7), educational facilities (point 8) and, according to the point 9, there is no a social opposition that could stop mining and associated industrial development.

On the other hand, as it is shown in points 10-15, there is an array of plans or strategies, covering supra-national, national, supra-regional and regional levels, with a common interest in the development of the sustainable mining development. Västerbotten RIS3 is integrated in this alignment of policies so it should reflect initiatives or issues raised in the mentioned documents. Västerbotten defines itself as a mining region in the MIREU project (point 16). Points 17 and 18 show public and private initiatives to promote the mining activity in Sweden.

Finally, points 19 and 20 present opportunities for funding through ERDF and ESIF and with the support of supranational entities.

- THREATS (Västerbotten)

<p>1. Need for infrastructure and transport solutions could hamper the full development of the mining and industry potential</p>
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²⁴² <http://www.miningforgenerations.com/>

²⁴³ <https://www.sveamin.se/>

²⁴⁴ <http://smtg.se/>

²⁴⁵ http://georange.se/pages.aspx?r_id=36090

²⁴⁶ <https://arctic-smartness.eu/arctic-investment-platform/>

2. Full development of mining capacities could be restricted by opposing land use interests: native peoples rights, national parks, archaeological sites, Natura 2000 areas, environmental activism, etc. (J. Niemann, op.cit.)

In sum, threats refer to some needs and restrictions, many times typical of the mining industry, that could restrict the development of mining in the region.

4.3 BENCHMARKING AND SWOT MODEL

4.3.1 Introduction

According to the description of Task 5.2 in the Annex 1 (Part A) of the MIREU project: *the SWOT analysis of participant EU regions will be accompanied by a matchmaking exercise to identify complementarities between the different RIS3 strategies, in order to group them and with the final goal of creating a SWOT model tailored for each region. This model will highlight both strengths and gaps, not only for RIS3 strategies but also with respect to circular economy and resource efficiency policies.*

In view of the above, the work was organised in two phases: in the first one, a benchmarking was performed by comparing and classifying different aspects pointed out by the regions in their respective SWOT/external analysis; as result, four tables have been prepared for strengths, weaknesses, opportunities and threats, grouping into categories the different aspects pointed out by the regions. Then, in a second phase, each region has identified, by comparing with the others, possible gaps or aspects not previously considered in their SWOT analysis; this work has allowed to complete the tables in a greater extent, highlighting the most relevant aspects related to RIS3 strategies, circular economy and resource efficiency policies.

These tables constitute the SWOT model that can be used by each region to analyze the mining and metallurgy sector in order to take into account the most suitable aspects and highlight strengths and gaps, not only in the RIS3 but also in the circular economy and resource efficiency policies.

A summary of the different categories of subjects and aspects described in the benchmarking tables is shown in Table 7.

In a simplified raw materials value chain, and taking into account the production of raw or semi-finished materials as final goal of the mining and metallurgy industries, the first three subjects constitute the core of the sector.

- Mining: produces raw materials for the processing industry or, with minor treatment (aggregates, ornamental stones and some industrial minerals) as final product. Mining can comprise three stages: exploration, extraction and basic treatment, usually into the mining area.
- Processing: comprises the basic industry needed to transform the raw materials into semi-finished (for the final manufacture of goods) or final products. Processing can refer both to primary and secondary raw materials.
- Recycling: refers to the secondary raw materials, such as iron and steel scrap, non-ferrous scrap and other waste streams containing metals (including mining wastes, industrial scraps, ashes, slags and recovered metal scrap from end-of-use products). Recycling also comprises issues the management of wastes and recovery technologies.

Around these three basic subjects, the remainder represent different aspects that can condition the full development of the mining and metallurgy.

In the following paragraphs, these subjects are described as strengths, weaknesses, opportunities and threats according to the benchmarking tables 8, 9, 10 and 11.

Table 7. Subjects and aspects defined in the benchmarking.

SUBJECT	Aspect	S	W	O	T
MINING	Current extractive industries	X		X	X
	Exploration	X	X	X	
	Mining potential			X	X
	Location			X	
	Infrastructures	X		X	X
	Markets			X	X
PROCESSING	Current processing industries			X	
	Technologies and expertise	X			
	Machinery and engineering	X			
	Service providers			X	
	Efficiency and competitiveness		X		
	New products	X		X	
	Downstream industry		X		X
RECYCLING	Waste recovery, recycling	X		X	
	Waters	X			
REHABILITATION	Environment	X	X		X
	Mining heritage	X	X	X	
	Intertwining			X	
SOCIAL ISSUES	Tradition			X	
	Endogenous resources	X		X	
	Activity in RM programmes			X	
	Compatibility with local economy				X
	Social acceptance		X	X	X
	Arising awareness			X	X
ADMINISTRATION	General (industry, development)			X	
	Mineral strategies			X	X
	Related entities			X	
	Mining hubs/centres			X	
	RDI experiences			X	
	Admin in EU mining projects			X	
	Access to res. (land use planning)			X	
	Permitting procedures		X		X
	Taxes		X		
BUSINESS	Companies	X			X
	Supplies				X
	Associations and clusters	X	X	X	X
	Technology/knowledge transfer	X	X		
	Costs				X
SKILLED WORKFORCE	Universities			X	
	Training centers			X	
	Demand and availability			X	X
FUNDING			X	X	X
RIS3 MANAGEMENT	Definition		X		
	Coordination		X		
	Governance system		X		
	Implementation		X		

4.3.2 Strengths

Strengths describe those aspects of the mining and metallurgy sector that are addressed in the regional RIS3. In accordance with the studied RIS3, these aspects could be grouped in the following general subjects.

Mining: is mainly addressed at the stage of extraction and, to a lesser extent, at exploration. The common approach looks for innovative, efficient and/or sustainable processes or technologies. Additionally, actions focused on strategic diversification and on digitalisation of all relevant geological data have been pointed out in some regions (Alentejo, Saxony).

Processing: (including metallurgy) is included in the regional RIS3 with a general focus on technologies or expertise, in some cases with a specific focus on efficiency, and a general interest in the development of new products. Also, actions related with automation and material engineering have been described in some regions (Kosice, N Karelia). Lower Silesia RIS3 has as well specific actions focused on thermal/mineral waters.

Recycling: is tackled in most cases, covering both the promotion of use of wastes and technologies for recycling. In Lapland, recycling activities are included in the broader context of the Arctic Circular Economy.

Table 8. Benchmarking of strengths (1/2). In blue, mining and metallurgy not specifically addressed but possibly covered. Nrs in brackets link with regional SWOT

STRENGTHS		ALENTEJO	ANDALUCÍA	CASTILLA Y LEÓN	KOSICE	LAPLAND
YEAR	RIS3 (LAST UPDATE)	2014 (planned revision in 2019)	2015	2018	2015	2018
RAW MATERIALS LIFE CYCLE	Exploration	X	X			
	Exploitation	X	X	X		X
	Processing, metallurgy		X	X	X	X
	Recycling and recovery	X	X	X		X
	Reinforce value chain		X	X	X	X
MINING	Exploration	Activities related with sustain. exploration (1)	Innovation in exploitation processes (3)			
	Extraction	Strategic diversif. from extraction industries (1)	Innovative technologies for extraction (1, 3) RDI in mining resources (2)	MM tech. to increase efficiency of processes (1)		Sustainable mining (3)
	Digitalisation					
PROCESSING	Technologies and expertise		Technologies for processing (1)	MM tech. to increase efficiency of processes (1) Funding disruptive technological projects (4)	Advanced manufacturing (1)	Increase the refining of natural resources (1)
	Machinery and engineering			Robotics, automation, material engineering (1)		
	New products	Design and new construction materials (1)	Add value to new materials (1)	Develop. of competitive products from CYL's RM (1)	New materials (1)	Value chain based on batteries (2)
	Waters					
RECYCLING	Recycling, recovery	Use wastes (extractive ind. and natural stone) (4)	Use of dumps (1)	Use and promotion of waste (1) Tech. for recycling and recovery industry (3)		Arctic Circular Economy (1)
REHABILITATION	Environment	Mining I/D related to environmental issues (6)	Recovery of areas degraded by mining (1)			
	Mining heritage	As cultural heritage	Tourism in mining and industrial archaeology (1) RDI in cultural heritage (6)	As cultural heritage		
SOCIAL ISSUES			Conditions to optimise use of endog. res. (2)	Mineral RM as endogenous resources (1)		
BUSINESS	New companies / activities	Attract new business to add value to terr. res. (3)				New platforms for business (1)
	Clustering	Strength value chain by clustering min. res. (5)				
	Technology transfer	Strengthen Reg. Techno. Transfer System (2)	Promotion of technol. transfer to manage NatR(2)	Knowledge technological voucher (4)		

Rehabilitation: (of mining areas) is tackled from two points of view: the environmental concerns, with actions to monitor threats and recover affected areas, and the promotion of mining heritage, specifically addressed in Andalucía but likely assumable in other regions as cultural heritage.

Social issues: mining is linked in some regions (e.g. Castilla y León) to the policy of taking advantage of the endogenous resources as basis of the sustainability of the territory; this is a social issue closely related with demographic problems (ageing of population, depopulation) in low population density areas. In Andalucía is also addressed the creation of conditions to optimise the use of these endogenous resources. It is worth to make mention to this perspective as represents a different approach, looking for the use of endogenous resources as a way to keep alive the territory, instead of the before mentioned perspective of increasing the efficiency of processes or developing new products.

Business: in several regions, the RIS3 plans to reinforce the technological transfer to the companies. Furthermore, Alentejo aims to strength the values chain by clustering mining resources. Likewise, in Lapland, the M&M sector could be reinforced by the planned new platforms for business.

Table 8. Benchmarking of strengths (2/2). In blue, mining and metallurgy not specifically addressed but possibly covered. Nrs in brackets link with regional SWOT

STRENGTHS		LOWER SILESIA	NORTH KARELIA	SAXONY	VASTERBOTTEN
YEAR RIS3 (LAST UPDATE)		2015 (planned revision in 2019)	2013	2013 (2019 draft)	2014 (in updating)
RAW MATERIALS LIFE CYCLE	Exploration			X	
	Exploitation		X	X	X
	Processing, metallurgy	X	X	X	X
	Recycling and recovery	X		X	X
MINING	Reinforce value chain	X			
	Exploration			Innovative processes for mining exploration (2)	
	Extraction		Analytics and proc. exp. for extractive sector (1)	Innovative processes for better exploitation (2)	Mining and mineral technology (1)
	Digitalisation			Digitalisation of all relevant RM geol. data (2)	
PROCESSING	Technologies and expertise		Chemistry-related materials expertise (2)	Efficient extraction of 1 st and 2 nd RM (2)	Mining and mineral technology (1)
	Machinery and engineering		Machinery and engin. workshop solutions (2)		
	New products	Technologies to acquire new prod. from mineral (1) Advanced materials (2)			
	Waters	Technologies for thermal / min. waters (1) Treatment and spa services using nat. res. (1)			
RECYCLING	Recycling, recovery	Tech. for recovery, recycling, dispos. waste (1)		Efficient processing of complex waste (2)	Recycling is included in the development area (1)
REHABILITATION	Environment	Systems to monitor threats to env. in mining (1)			
	Mining heritage				
SOCIAL ISSUES					
BUSINESS	New companies / activities				
	Clustering				
	Technology transfer			Promote applying RDI results in industry (3)	

4.3.3 Weaknesses

Weaknesses describe those aspects of mining and metallurgy that, in principle, from the perspective of the partners involved in this work, are missed in the studied regional RIS3. Obviously, a deeper analysis of opportunities and threats, and in comparison with the SWOT analysis carried out in other regions, additional weaknesses could be pointed. The described aspects can be organized in the following subjects.

Mining: regarding to the mining activity, mining exploration is a basic stage missed in the RIS3 of several regions; although there are regions that recognize a lack of alternatives to the current mining (see threats), some others have a strong mining potential (e.g. in the Iberian and Scandinavian peninsulas) and their RIS3 perfectly could promote RDI in mining exploration as an important way to find out new raw materials for the EU industry.

Processing: in the related processing industry, two main aspects have been pointed out as weaknesses: the lack of RDI or technologies to increase efficiency, productivity or competitiveness, and the lack of support to develop downstream industries.

Rehabilitation: some regions have missed strategies to take advantage of the mining heritage in their RIS3. Alentejo has also pointed out the lack of environmental strategies to recover the mining legacy.

Table 9. Benchmarking of weaknesses (1/2). N^{rs} in brackets link with regional SWOT

WEAKNESSES		ALENTEJO	ANDALUCÍA	CASTILLA Y LEÓN	KOSICE	LAPLAND
YEAR OF RIS3 (LAST UPDATE)		2014 (planned revision in 2019)	2015	2018	2015	2018
RAW MATERIALS LIFE CYCLE	Exploration			X	X	X
	Exploitation				X	
	Processing, metallurgy	X				
	Recycling and recovery				X	
	Reinforce value chain	X				X
MINING	Exploration			Nothing about mining exploration (1)	Lack of support for mining exploration (4)	Exploration not addressed in the RIS3 (1)
PROCESSING	Downstream industry		Low development of RM industry-related (3)			
	Efficiency and competitiveness	No reference to tech. to increase efficiency (5)			Productivity in metal. is not covered in RIS3 (1) Competitiveness in metal. is not covered (1)	
REHABILITATION	MM legacy (reclamation)	No environ. strategies to recover mining legacy (4)				
	Heritage	Mining heritage missing but could be in TP1 (6)				
SOCIAL ISSUES	Social acceptance		Integration of MM in society is not addressed (2)	Integration of MM in society is not addressed (3)	Integration of MM in society is not addressed (6)	Social acceptance issues not addressed (6)
ADMINISTRATION	Access to resources		Nothing about efficient access to min. resources	Nothing about efficient access to min. resources	No mention to admin. access to resources (5)	Nothing about access mineral resources (5)
	EU policies					
	Environmental requirements					
	Taxes					
BUSINESS	Knowledge transfer	Insufficient mapping to enable know. transfer and				
	Clustering				No mention to MM clusters or bodies (3)	
FUNDING				No budgets no funds for TPs (4)	Metal. has not access to ESIF through RIS3 (2)	
RIS3 MANAGEMENT	Definition			Vague definition of some Flagship Initiat. (5)		
	Coordination					
	Governance System	Insufficient consolidation (2)				
	Implementation	Insufficient reg. monitorization (3)		No specific plans to implement TPs (4)		

Social issues: some regions have pointed out as weakness the lack of support to integrate mining and metallurgy in the socioeconomic model, overcoming problems of social acceptance.

Administration: the lack of actions to enable an efficient access to resources, overcoming administrative problems related with permitting procedures, has been considered as a weakness in some regions. In addition, as Lower Silesia has pointed (but probably occurs in other regions), there is certain lack of concordance or synchrony between the RIS3 and other policies.

Business: Alentejo and Saxony have remarked the insufficient mapping or support to transfer knowledge to companies. Likewise, Kosice misses a mention to promote mining and metallurgy clusters in their RIS3.

Funding: specific funding for some mining or metallurgy aspects described in the RIS3 also has been missed in some regions.

RIS3 management: finally, some criticism has arisen in several regions about the definition, coordination, governance and implementation of the RIS3. Vague definitions, lack of implementation programs, insufficient monitoring or inadequate promotion are some of the deficiencies pointed out by the regions.

Table 9. Benchmarking of weaknesses (2/2). N^{rs} in brackets link with regional SWOT

WEAKNESSES		LOWER SILESIA	NORTH KARELIA	SAXONY	VASTERBOTTEN
YEAR OF RIS3 (LAST UPDATE)		2015 (planned revision in 2019)	2013	2013 (2019 draft)	2014 (in updating)
RAW MATERIALS LIFE CYCLE	Exploration	X	X		X
	Exploitation	X			
	Processing, metallurgy				
	Recycling and recovery		X		
	Reinforce value chain		X	X	X
MINING	Exploration		Mining exploration is not addressed (1)		Mining exploration is not covered (1)
PROCESSING	Downstream industry			No consideration of downstream/metal ind. (4)	
	Efficiency and competitiveness			No consideration of research in resource eff. (4)	
REHABILITATION	MM legacy (reclamation)				
	Heritage		Nothing about mining heritage (2)		Nothing about mining heritage (2)
SOCIAL ISSUES	Social acceptance				
	Access to resources				
ADMINISTRATION	EU policies	RIS3 defined before EIP-RM, SIP and related (2)			
	Environmental requirements	Legal changes in envirm. protect. not considered (1)			
	Taxes	No mention to mineral tax in Poland (1)			
BUSINESS	Knowledge transfer			No support to transfer research results to ind. (5)	
	Clustering				
FUNDING				No budget allocated (2)	
RIS3 MANAGEMENT	Definition			Description is rather unspecific (3)	
	Coordination			No inter-ministerial coord. of strategies (1)	
	Governance System				
	Implementation	Inadequate promotion (4)		No implementation programmes (1)	
		Unfriendly and long admin. procedures (5)		No timeline and roadmap (2)	
		No scientific facilities for certain sub-areas (3)			

4.3.4 Opportunities

Opportunities are regarded in this work as a way to justify a greater presence of mining and metallurgy in the regional RIS3. Nine subjects of opportunities could be considered regarding to the Table 10.

Mining: the current and potential assets in mining highlighted in all regions represent ongoing or future economic activities in which it is worth to invest in RDI to obtain greater returns. Although the regional mining sector could not be so remarkable, in terms of economy or employment, as others (for example, the automotive industry), mining assets could be quite important when represent a critical part of the productive sector of some materials at the European scale. Market trends point to the need of raw materials for the development of electromobility and low carbon energies, the growth of international metals trade or the supply or substitution of critical raw materials, which require new and innovative mining and metallurgy projects and justify a greater attention from the RIS3.

Processing: assets in the related processing industry are very important in some regions with a well-developed metal industry, such as the North and Central Europe ones and Sterea Ellada, but comprise as well the strong position of some regions as providers of equipment, technology and expertise, as is the case of Lapland, North Karelia and Västerbotten.

Recycling: in addition, most of the regions have recycling industries or availability to supply wastes. Both aspects represent activities in which it is worth to invest in RDI.

Rehabilitation: Mining heritage represent an opportunity to take advantage of the mining sites beyond their end of life, as is already a reality in some regions. The development of environmental technologies is also an opportunity to correct impacts in mining sites.

Table 10 Benchmarking of opportunities (1/4). N^{rs} in brackets link with regional SWOT.

OPPORTUNITIES		ALENTEJO	ANDALUCÍA	ARAGÓN	CASTILLA Y LEÓN	KOSICE	LAPLAND
MINING	Current activity	Economic relevance of Iberian Pyrite Belt (1)	5 metallic exploitations (1)	Strong mining sector, outstanding clay (2)	Strong mining sector (2 W mines) (2)	Exploitations of iron, barite, magnesite, etc. (1)	Four important mines (2 Au, 1 Cr, 1 Polymetallic) (2)
			37 industrial minerals exploitations (1)		Strong roofing slate sector (2)		
			2 energetic minerals exploit. (1)				
			430 expl. of aggregates and natural stone (1)				
	Advanced projects	International comp. interested in potential (2)		Important project (Potash MUGA) (6)	3 advanced projects for U, Fe, Sn-W and Pb-Zn (2)		Exploration projects (Sakatti, Rompas) (1)
	Exploration activities				Around 60 permits for metallics and ind. min. (3)		
	Mining potential		For several CRMs as Sb, rare earths or W (2)		Interesting mining potential (CRM) (3)		Mining potential, especially for EU CRM (3)
	Markets	Growth of international metals market (6)	Increasing exports (3)				Increased RM demand encourages new mines (5)
	Infrastructures				Lithothèque, nat. geological survey		Improved infrastructure related with MM (5)
PROCESSING	Processing industries		Geostrategic value (3)			Strong export position (geography, transports) (5)	
			Important for aggreg., natural st. and ind. min. (5)		Reg. ind. processing RM (cement, glass, etc.) (4)	Important metallurgy (60% of ind. production) (2)	
	New products		Capacity to attract foreign investment (4)			Iron and steel metallurgy (3)	
						Potential for new prods. for renewables and oth. (4)	
	Service providers					Pot. In chemical processing for ceramics (6)	
RECYCLING	Wastes, recycling	Residues could be used as secondary RM (11)	CLC in 2 H2020 projects related to mining waste (10)		1 company recycling Al (4)		Global provider of equipment and technol. (4) Volume of wastes is expected to increase (4)

Social issues: several regions have remarked the mining tradition, in the sense that this activity is already integrated in the regional socio-economics and a support to this sector from the RIS3 can be expected. The concern about depopulation in some regions is seen as a possible trigger to take advantage of endogenous resources, including the mineral ones. The social acceptance of mining and metallurgy means that any support to this sector will be understood and accepted; related with the last one, activities to arise awareness about the need of mining and metallurgy to obtain raw materials are being tackled in some regions (e.g. Saxony, Styria and Andalucía).

Administration: the existence of policies at different levels promoting the mining and metallurgy activity, such as the Mining or Raw Materials Strategies, are seen as opportunities as they could have a reflection or continuity in the regional RIS3. It is remarkable the existence of mining hubs, such as those in Lapland, Lower Silesia, North Karelia or Saxony, and specific entities focused on the research in raw materials since they could represent drivers for investments in this sector. Finally, the participation of the regional administration or related entities in EU projects like MIREU or REMIX brings the opportunity to broaden perspectives and organize funding in a more effective way.

Business: clusters and associations can orientate about the needs and opportunities of RDI in the mining and metallurgy sector, improving the efficiency of possible related RIS3 funding.

Skilled workforce: the existence of universities with mining engineering or geology degrees and training centers focused on raw materials, as well as the related skilled workforce, represent an asset for the mining and metallurgy sector. Furthermore, such institutions could be used as drivers for investments in innovation.

Funding: the access to EU funds, sometimes by means of specific programs or institutions, is seen in most of regions as an opportunity to finance RDI in the mining and metallurgy sector.

Table 10. Benchmarking of opportunities (2/4). N^{rs} in brackets link with regional SWOT

OPPORTUNITIES		LOWER SILESIA	NORTH KARELIA	SAXONY	STEREA ELLADA	UPPER STYRIA	VASTERBOTTEN	
MINING	Current activity	Access to rich natural resources (1)	Strong M sector (3 metallic, industrials) (1)	Three mines (Sn, W, Cu, Li) (1)	Important Ni mining deposits (1)	Strong mining sector, outstanding Fe Erzberg (2)	Strong mining sector (5 active metallic mines) (2)	
				Strong ind. min. mining (Kao, Flu, Bar, etc.) (1)	Important deposits of bauxite and magnesite (1)			
				3 lignite mines and activity lasting u.2038 (1)	Promote technology and innovation (6)			
				300 co. producing aggregates and others (1)				
	Advanced projects	Health resorts based on thermal/therap. waters (14)						
	Exploration activities		3 Advanced explor. projects for metallics (2)					
	Mining potential	Exploration, acquisition and use of rare eraths (9)		21 exploration permits since 2011 (1)			76 explor. permits engaging foreign comp. (3)	
			Important mining pot. (outs. Au and polymet.) (3)	World-class deposits of Li, Sn, W, Zn, Cu, etc. (2)			Important mining pot. (outs. Au and VMS) (4)	
	Markets	Development of electromobility (20)						
		Substitutes for critical materials (10)						
	Growing demand for innovative products (17)							
Infrastructures				Mining agency, mining archive, geol. survey (5)	Good transport options (by sea, road, railway) (3)	Mining university "next door"		
					Improve transportation infrastructure (11)			
Location	Proximity of W and S Polish border (3)				Close to Athens (biggest logistic Greek center) (4)			
PROCESSING	Processing industries	Development of chemical industry (21)	Important processing Co project (FinnCobalt) (4)	Fluorspar value chain, Sn smelter (3)	Important metallurgy plants (2)	Industries and value chain related with ore (3)	Important processing industries (smelters) (5)	
		Development of building materials (21)	Soapstone processing industry (5)	Potential industrial value for lithium (3)	Restructure economy industrial production (7)	Iron and steel metallurgy		
	New products				Magnesite thermal processing			
					New local production system (9)			
	Service providers							
				Tech companies provide equipment for MM (6)			Global provider of mining machinery (Sandvik)	Companies providing products, services, eng. (6)
RECYCLING	Wastes, recycling	Supply of waste with valuable elements (11)		Several smelters operating with scraps (3)	Important recycling plants (2)	Several hightech recycl. SMEs with growth pot.		
		Use of energy, ceramic, minino and ind. waste (16)		Innovative recycling industry (pyro/hydro) (3)		Mining university with special recycl. department		

Table 10. Benchmarking of opportunities (3/4). N^{rs} in brackets link with regional SWOT

OPPORTUNITIES		ALENTEJO	ANDALUCÍA	ARAGÓN	CASTILLA Y LEÓN	KOSICE	LAPLAND
REHABILITATION	Mining heritage	Mining heritage has been focus on old mines (9)			16 touristic mining sites, incl. museums (1)		
	Intertwining sectors	Wine, dairy, tourism and mining routes (10)					
	Environmental issues						
SOCIAL ISSUES	Tradition			Mining tradition (1)	Mining tradition (1)		
	Endogenous resources			Depopul. promoting endogenous resources (5)	Depopul. promoting endogenous resources (8)		
	Activity in RM programmes						
	Social acceptance	Sustainability of stone sector giving prestige (7)		Good social acceptance (4)	General social acceptance (7)		General social acceptance of MM (6)
	Arising awareness		Activities to improve social image (6)		Included in the CYL Min. Resources Strategy		
ADMINISTRATION (SUPRAREG.)	Supranational policies						
	National S3						
	National mineral strategies						Finland's Mineral Strategy (8)
	Subnational policies						Sust. Extract. Industry Action Plan (8)
ADMINISTRATION (REGIONAL)	RIS3 revision	Planned revision of RIS3 in 2019, interest in MM (5)					
	Develop. strategies		Industrial Strategy and Plan for R&D (7)	No alternatives to mining and energy (3)	Regional Industrial Master Plan support MM (9)	Nat/Reg. Development Strategy (7)	Industrial Strategy of Lapland 2030 (8)
	Mineral strategies		Anadaluca Mining Strat., related activities (7)		Regional Min. Strategy and related plans (9)		
	Land use planning						
	Related entities	Institutions promoting R&D in MM (CEGMA) (3)			RDI entities (FSB, SIEMCALSA, ICAMCYL)		Digipolis-Kemi Technology Park (11)
	Mining hubs, mining centres					EIT-RM Hub Regional Center Kosice (8)	Rovaniemi nat. mining governance centre (7)
							Kemi-Tornio hub of mining, metal ind. (10)
	RDI experiences						
	Admon. in mining EU	Regional stakeholders in EU projects (4)	MIREU, GEO-FPI, INFACIT, S3P Industry (8)		Reg. Admon. in EU projects and platforms (11)	Participation in EU projects and platforms (9)	Participation in H2020 projects (9)
BUSINESS (ASSOCIATIONS AND CLUSTERS)	National		CONFEDER. COMINROC, etc. (9)	National associations supporting MM (7)	National assoc./cluster supporting MM (12)		
	Supraregional					MM Chamber and Associations (8)	Suprarreg. Mining Cluster (AMIC)
	Regional		AMINER, AFA, AEMA, etc. (9)		Regional assoc./working group supporting MM (13)		
SKILLED WORKFORCE	Universities	Mining co. and univ. cooperating in R&D (8)	Universities with mining and geology (11)		Universities with mining and geology (5)	Universities with mining and geology (10)	Universities with mining and geology (12)
	Training centers			Training for mining (8)	Training for mining (Sta. Bárbara Foundation) (6)		
	Employment						Large demand for highly qualified workers (12)
FUNDING	Types		ESIF (13)		ERDF and ESF (14)		
	Supranational		Improvement of financing of MM (12)				
	National				MM access to EU funds (CDTI) (14)	Financial support to metallurgy (Dev. Strat.) (11)	
	Regional				MM access to EU funds (ICE, Op. Plans) (14)	Competences for innov., supported by ESIF (12)	Digipolis manages RDI funds (13)

Table 10. Benchmarking of opportunities (4/4). Nrs in brackets link with regional SWOT

OPPORTUNITIES		LOWER SILESIA	NORTH KARELIA	SAXONY	STEREA ELLADA	UPPER STYRIA	VASTERBOTTEN
REHABILITATION	Mining heritage			UNESCO World Heritage tentative list: Montanregeon	Old bauxite mine transf. into educational center	1 mayor site (Europ. USP)+a dozen minor ones	
	Intertwining sectors						
	Environmental issues	Development of envirn. friendly technologies (19)			Environmental technologies low carbon economy (10)		
SOCIAL ISSUES	Tradition					MM tradition, outstanding Iron Route (1)	Long mining tradition, outstanding Boliden (1)
	Endogenous resources					Depop. promoting endogenous resources (7)	N Sparsely Pop. Areas highlights mining pot. (10)
	Activity in RM programmes			Highest of SME and acad. at EU/nat. level (12)			
	Social acceptance		Social license and political will to MM (9)	Relatively high social acceptance mostly due to included in the Saxon RM Strategy (4)		General social accep. of MM as economical base (6)	Social acceptance gained by mining companies (9)
	Arising awareness			Included in the Saxon RM Strategy (4)		Primary education highlights MM topics (10)	
				RM exhibition in 4 Industry Museums (8)		Plans for metallurgic visitor center	
ADMINISTRATION (SUPRAREG.)	Supranational policies	Cooperation with Saxony and Czech Rep. (15)		Interreg MineLife with Lower Silesia (7)	ROP plans to include the region in EU networks (16)		Supranat. Forum prioritize invest. in MM (11)
	National S3						National S3 supports mining and metal extrac. (12)
	National mineral strategies	Joining the coal regions in transition platform (8)	2 National mineral strategy and plan (10)	German Government's RM Strategy (2010) (6)	Upcoming Special Spatial Plan incl. RM (15)		National Sweden's Mineral Strategy (13)
	Subnational policies				Improve strategies to new investments (8)		Nat. Initiative to promote mining (17)
ADMINISTRATION (REGIONAL)	RIS3 revision			Latest update 2019			
	Develop. strategies	Program for the reindustrialization (7)	Reg. Strategy (POKAT) promotes MM (12)			Reg. Development Strat. supports metallurgy (8)	Reg. Development Strat. supports metallurgy (15)
	Mineral strategies		Reg. Strategy for Extractive Ind. (in prep.) (13)	Saxon RM Strategy (2017) (6)			
	Land use planning				ROP plans a new regional land use plan. (14)		
	Related entities	Business institutions and industrial parks (5)		Helmholtz Institute for M&M research (8)			
			Active reg. management (Business Joensuu) (14)	GKZ Freiberg networking at regional / EU levels (9)			
	Mining hubs, mining centres	Strong player effect (12) of KGHM Polska Miedz S.A.	Outokumpu Mining Camp (minning hub) (15)	Saxony is the focal point of RM in Germany (6)	EIT Raw materials-Regional Center Greece		
	RDI experiences	Strong consolidation of R&D environment (22)	Karelia experienced in EDP (16)				Innovative environ., outstanding Umea (7)
	Admon. in mining EU		Reg. Admon. in EU projects and platforms (17)	Participation through GKZ (MIREU, REMX) (7)	Participation through NTUA (REMX, MIREU)	Participation in H2020 + Interreg projects	Reg. Admon. in EU projects and platforms (16)
					Participation in ind. modernisation platform		
BUSINESS (ASSOCIATIONS AND CLUSTERS)	National		National assoc./cluster supporting MM (11)	EIT Raw Materials, GERRI (10)	Greek Mining Enterprises association (SME), Hellenic	Nat. industrial assoc. supporting M&M	National associations supporting MM (18)
	Supraregional		Suprarreg. Mining Cluster (AMIC) (11)				
	Regional						
SKILLED WORKFORCE	Universities	e.g. Wroclaw Univ. of Science and Technology (6)	Active eng. research in Karelian Universities (7)	Freiberg University of Mining and Technology (9)	Universities related to materials	University of Leoben reputed by mining (4)	Lulea University in Vaster and Norrbotten (8)
	Training centers		Training organizations for mining at reg. level (8)	Training school: BSZ Freiberg (8)	Close univ. related to geology and mining (5)	Highly skilled workers in metallurgy (5)	
	Employment				ROP plans to promote vocational training (ROP)	High demand for skilled workers in metallurgy	
FUNDING	Types	European funds (4)	RDI access to EU's structural funds (18)		Improve strategies to new investments (ROP) (8)	MM access to ERDF (11)	MM access to ERDF and ESF (20)
	Supranational						Supranat. Funding coop. to finance S3 (19)
	National		Access to funds through nat. Business Finland (19)	FONA r4, KMU, R+Impuls, mainly for RM efficiency		Access to funds of nat. business funding pgm.	
	Regional			ERDF Prevention of risks related with old mines (11)			

4.3.5 Threats

With the same approach used for opportunities, threats are identified here as those aspects that could hamper a greater presence of mining and metallurgy in the regional RIS3. Eight subjects of threats could be considered regarding to the Table 11, more or less coincident with those defined for opportunities:

Mining: closure of mines, depletion of resources, lack of alternatives in some regions or problems related with the mining context (e.g. volatile markets, lack of infrastructures) are seen as factors that can make less attractive this sector to RDI investments.

Processing: in the same way, a not well-developed value chain could limit the impact of mining in the regional economy and disadvantage eventual investments in the sector.

Table 11. Benchmarking of threats (1/2). Nrs in brackets link with regional SWOT.

THREATS		ALENTEJO	ANDALUCÍA	ARAGÓN	CASTILLA Y LEÓN	KOSICE	LAPLAND
MINING	Current resources			Mines closure (1)	Coal mines recently closed (10)	Important mining co. closed since 90s (7)	Low-grade or deep-seated deposits (2)
	Potential resources					Closure of Bankov magnesite mine (2)	
	Infrastructures						
	Markets	Long run trends of prices and volatility (1) No origin related marketing value (10)	High competition in metallics (2)				Volatility in the demand of mineral resources (1)
PROCESSING	Value chain	Value chain not well developed (8)			Value chain not well developed (8)		
REHABILITATION	Environmental issues	Environ. hazard of mining residues (7)					Emissions and wastes need to be reduced (8)
SOCIAL ISSUES	Social awareness		Lack of knowledge of the mining importance (5)	Lack of public awareness (energy needs minerals) (2)	Lack of awareness about the need of RM (6)		
	Education			Education bias negative aspects of mining (5)	Biased education about impacts of mining (7)		
	Social acceptance	Unfav. impression of mining from media (2) Weak linkage with SLO (3)	Negative social image of mining (4)		Social rejection for mining in some areas (5) Negative effects of non-rehabilitated mines (4)	No reference to social aspects (SLO) (3)	
	Compatibility with local issues	Limited link of mining with tourism or culture (9)	Conflict with tourism-based economic models (6)				Lack of reconciliation with Sami culture issues (11)
ADMINISTRATION	Mining policies			No legislative measures supporting mining sector (6) Policies focused on renewable resources (3)		It is unclear policy about MM (1)	
	Land use planning	Need of compatible industry and environ. (4)	Little integration of mining in land use plan. (9)		Land use planning ignores mining potential (2)		Limitations for extractive operations (3)
	Activities promoted				Preference for alternative rural activit. (3)		No use of rehabilitated mining sites after closure
	Permitting procedures				Long and complex permitting procedures (1)		Long and complex permitting procedures (4)
BUSINESS	Legal conditions						
	Relocation						
	RM supplies		Scarce relation extractive / ind. sectors (3)				
	Ownership						Finnish ownership must be increased (12)
SKILLED WORKFORCE	Clustering						
	Costs and investments		Higher costs to reduce environmental impacts (1)		Costly electricity for processing industries (9)		High water and energy consumptions (7)
	Innovations						Automation in mining must be encouraged (9) Lack of new explor / extract. technologies (6)
	Lack of skilled workforce		Deficit of centres for generating knowledge (7) Ageing of working population (8)			Increasing share of unskilled population (4) Missing graduates in tech. and nat. sciences (5)	Difficulties to recruit experts/skilled workers (5)
FUNDING	Leaving to other industries/reg.	Demography regression and low capacity to fix (5)				Persisting brain-drain abroad (6)	
				No public funds for mining sector (6) EU funds focused on renewable energies (4)		No individual regional EU funding programme (8)	

Rehabilitation: environmental problems related with the mining and metallurgy activity (emissions, wastes, hazards) could represent a hinder to this activity.

Social issues: the social opposition to mining or metallurgy or the competence with incompatible economic activities (e.g. rural tourism) could act as a major break for new projects. This is closely related with the lack of social awareness about the need of raw materials the biased education described in some regions and the negative image of mining, which threats to perpetuate and expand this opposition.

Administration: the lack of specific policies or political support is other potential challenge that could hinder the development of possible related programs in the RIS3. In addition, restrictive land use plans with little integration of mining, ignoring the mining potential and promoting alternative activities, together with long and complex permitting procedures, with high environmental regulations, represent sometimes a problem to develop mining projects.

Table 11. Benchmarking of threats (2/2). Nrs in brackets link with regional SWOT

THREATS		LOWER SILESIA	NORTH KARELIA	SAXONY	STEREA ELLADA	UPPER STYRIA	VASTERBOTTEN
MINING	Current resources	Depletion of resources (7)				Erzberg mine will be exhausted at cca. 2050 (1)	
	Potential resources	No alternatives after closing Cu and lignite (18)				No further mining potential (espec. CRM) (6)	
	Infrastructures	Insufficient transport infrastr. (local roads) (3)					Need for infrastructure and transport solutions (1)
	Markets	Fluctuations of RM prices on global markets (8)		International price volatility of commodities		Only 1 customer for ore - totally dependant Fluctuation of RM prices on global markets	
PROCESSING	Value chain	Lack of processing in the field of natural resour. (1)					
REHABILITATION	Environmental issues				Intense problems caused by metal activities (3)		
SOCIAL ISSUES	Social awareness			Disconnection between end products and raw materials	Lack of information about RM ind. achievements (2)	Lack of social awareness about the need of RM (5)	
	Education				Lack of information about environ. protection etc. (2)		
	Social acceptance	Low social acceptance for new mining activities (12)		One of the least popular industries in Germany (2)	Neutral to negative social acceptance (1)	Acceptance problems for metallur. in some areas (4)	
	Compatibility with local issues			Mining heritage vs reopening mines (2)	Competing with agriculture and fishery (6)		
					Competing with cultural sites (archaeological) (7)		
ADMINISTRATION	Mining policies	Lack of long-term planning in mining (6)	Nat. mining policy lacks a territorial approach (1)	MM plans subjected to political/public debates (4) Only 1 ministry supports Saxon RM Strategy (5) Huge burden for lignite regions transition (8)	No plans, measures supporting RM sector Not financially promoted actions RM (5)	No master plans (8)	
	Land use planning	Location of deposits in protected or built areas (2)				High environmental regulations (3)	Land use restricting mining capacities (2)
	Activities promoted				Natural conservation (4)	Preference for activities in conflict with mining (2)	
	Permitting procedures	Long time from decision to start a new mine (11)		Long and complex admin. of MM projects (3)	Long and complex, mainly issued (for metals) by		
	Legal conditions	Variable and unclear legal conditions (14) Poor protection of intellectual property (5)				Environment regulations hindering new plants	
BUSINESS	Relocation	Moving business to other regions/countries (15)				Relocation instead of export in metall. sector	
	RM supplies	Companies committing to use imported min. res. (16)		Difficulties in acquiring processible RM (1)			
	Ownership						
	Clustering		Weak mining cluster activity (2)		Reduced extroversion		
	Costs and investments	High invest. and social costs of opening mines (10) Cost increase (labor and mining costs) (9)				High CO2-compensation costs Very high wage costs	
	Innovations	Low level and high costs of RDI (4, 13)					
SKILLED WORKFORCE	Lack of skilled workforce			Lack of skilled labor for new mines (7) Sliding nº of students in RM sector (6)	Lack of experienced and skilled labor	Scarce workforce by decreasing population (7) Decrease of skilled workers	
	Leaving to other industries / reg.	Highly qualified workers leave to other markets (17)		M&M have to compete for skilled personnel (6)	Brain- drain due to economic crisis	Ongoing trend: migration from rural area to cities	
FUNDING				No funding programme to mining and metallurgy RDI		No individual M&M funding programme	
				No funding programme to knowledge transfer etc.			

Business: business policies and concerns talk about problems (especially related with costs) that companies have to face and cannot be solved by RDI investment through the RIS3. Lack of automation, new exploration technologies or cluster activities have been also pointed out in some regions.

Skilled workforce: in the same way, lack of skilled workforce by different causes (demography regression, ageing of working population, workers leaving to other regions/sectors, sliding number of students, etc.) could represent a problem to develop mining or metallurgy activities.

Funding: finally, some regions remark a lack of funds or regional programs specifically addressed to mining and metallurgy.

4.4 RELEVANT EU/UE POLICIES

This document does not intend to be a guide in a strict sense. Rather, it is a reminder of the some important European and UN policies that should be considered to include in a proper way mining and metallurgy in the RIS3.

4.4.1 Raw Materials Initiative (RMI)

This initiative²⁴⁷, launched in 2008, established an integrated strategy to respond to the different challenges related to access to non-energy and non-agricultural raw materials. The RMI is based on three pillars:

- Ensure access to raw materials from international markets under the same conditions as other industrial competitors
- Set the right framework conditions within the EU in order to foster sustainable supply of raw materials from European sources
- Boost overall resource efficiency and promote recycling to reduce the EU's consumption of primary raw materials and decrease the relative import dependence.

In this regard, the Smart Specialisation Strategies could cover the aim of pillars 2 and 3 of the RMI. Thus, some of the ten conclusions that represent the way forward, in terms of national policy but also includible in the RIS3 of the mining and metallurgy regions, are:

- Promote the sustainable access to raw materials in the field of development policy through the use of budget support, cooperation strategies and other instruments
 - Improve the regulatory framework related to access to land
 - Promote skills and focussed research on innovative exploration and extraction technologies, recycling, materials substitution and resource efficiency
 - Increase resource efficiency
- Promote recycling and facilitate the use of secondary raw materials in the EU

Some of these subjects have been already commented in the RIS3 SWOT analysis and benchmarking and could be taken into account in future updates.

4.4.2 Critical Raw Materials (CRM)

Promoted by the RMI, the EC regularly publishes a list of critical raw materials based on their economic importance and supply risk. So far, three lists have been published in 2011, 2014 and 2017. This last one²⁴⁸ includes the raw materials included in the Table 12:

²⁴⁷ <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0699:FIN:EN:PDF>

²⁴⁸ https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en

EU - CRITICAL RAW MATERIALS (2017)			
Antimony	Fluorspar	LREEs	Phosphorus
Baryte	Gallium	Magnesium	Scandium
Beryllium	Germanium	Natural graphite	Silicon metal
Bismuth	Hafnium	Natural rubber	Tantalum
Borate	Helium	Niobium	Tungsten
Cobalt	HREEs	PGMs	Vanadium
Coking coal	Indium	Phosphate rock	

Table 12. List of Critical Raw materials for the EU of 2017. *HREEs=heavy rare earth elements, LREEs=light rare earth elements, PGMs=platinum group metals

According to their assets in these materials, the mining and metallurgy regions should promote in their respective RIS3 the exploration and exploitation of such resources to contribute as much as possible to a secure supply for the EU industry.

4.4.3 European Innovation Partnership on Raw Materials

The European Innovation Partnership on Raw Materials (EIP-RM)²⁴⁹ is a stakeholder platform that brings together representatives from industry, public services, academia and NGOs. Its mission is to provide high-level guidance to the European Commission, Member States and private actors on innovative approaches to the challenges related to raw materials.

The Strategic Implementation Plan (SIP) of the EIP-RM aims as overall objective to contribute to the 2020 objectives of the EU's Industrial Policy –increasing the share of industry to 20% of GDP- and the objectives of the flagship initiatives "Innovation Union" and "Resource Efficient Europe", by ensuring the sustainable supply of raw materials to the European economy while increasing benefits for the society as a whole. This will be achieved by:

- Reducing import dependency and promoting production and exports by improving supply conditions from EU, diversifying raw materials sourcing and improving resource efficiency (including recycling) and finding alternative raw materials.
- Putting Europe at the forefront in raw materials sectors and mitigating the related negative environmental, social and health impacts.'

The SIP sets specific objectives and targets, to be achieved through a range of proposed actions including research and innovation coordination, technologies for raw materials production, substitution, framework conditions, knowledge and skills and international cooperation. To implement these actions, which cannot be done by the European Union (EU) institutions alone, the EC launched Calls for Commitments to Member States, industry, academia and other relevant stakeholders in 2013, 2015 and 2018. The 'Raw Material Commitments' (RMCs) are joint undertakings by several partners, who commit themselves to carrying out activities that will contribute to achieving the actions and targets of the EIP within the period 2014-2020.

Although this initiative is not focused in the regional policies, the RIS3 of the mining and metallurgy regions should take into account the activity carried out by the regional institutions in this regard, for example, in the assessment of the scientific and technological specialisation patterns. Thus, the smart specialisation strategies could reinforce and complement those

²⁴⁹ http://publications.jrc.ec.europa.eu/repository/bitstream/JRC113523/amr_2017_online_version.pdf

activities carried out by the regional industry, academy and others; and in the other sense, the RIS3 planned actions could take advantage of the activities carried out by such commitments.

Likewise, the RMCs are able to finance projects, mainly by means of EU funding (H2020, FP7, LIFE, etc.), which represented the 54% of the 2014-17 budget. Public national/regional bodies and private companies complete the sourcing of funds for these commitments.

4.4.4 European Institute of Innovation and Technology (EIT-RM)

EIT RawMaterials²⁵⁰, a body of the European Union, is the largest consortium in the raw materials sector worldwide. Its vision is to develop raw materials into a major strength for Europe. Its mission is to enable sustainable competitiveness of the European minerals, metals and materials sector along the value chain by driving innovation, education and entrepreneurship.

EIT RawMaterials unites more than 300 partners from leading industry, universities and research institutions from more than 20 EU countries. Partners of EIT RawMaterials are active across the entire raw materials value chain; from exploration, mining and mineral processing to substitution, recycling and circular economy. They collaborate on finding new, innovative solutions to secure the supplies and improve the raw materials sector in Europe.

EIT RawMaterials aims to significantly enhance innovation in the raw materials sector by sharing knowledge, facilitating matchmaking activities, developing innovative technologies and supporting business creation. In this sense, the regional innovation strategies could perfectly complement the activity of the EIT-RM.

It is outstanding to remark the presence of EIT-RM hubs in several MIREU regions, as North Silesia (Innovation Hub East-Wroclaw), Saxony (Regional Center Freiberg), Upper Styria (Regional Center Leoben), Kosice (Regional Center Kosice), and in the proximity (Innovation Hub North, Lulea, Norrbotten); Regional Center Athens). These hubs could provide an accurate vision of the innovation opportunities to define the most suitable priorities related to raw materials in the RIS3.

4.4.5 Resource Efficient Europe (REE)

The roadmap to a Resource Efficient Europe²⁵¹, approved in 2011, outlines how Europe can be transformed into a sustainable one by 2050. In accordance with this flagship initiative, transforming the economy onto a resource-efficient path requires policies focused on:

- Sustainable consumption and production
- Turning waste into a resource
- Supporting research and innovation
- Environmentally harmful subsidies and getting the prices right

Minerals and metals are described as part of the the Natural capital and ecosystem services. Several ways to increase resource productivity and decouple economic growth from resource use and its environmental impact are proposed to be promoted by the Commission and the Member States. Even when regions are not directly involved, it is clear that the RIS3 can help to achieve the REE objectives or, at least, to be alligned with such policies.

²⁵⁰ <https://eit.europa.eu/our-communities/eit-rawmaterials>

²⁵¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0571>

4.4.6 Innovation Union (IU)

The Innovation Union²⁵² is one of the 7 flagship initiatives of the Europe 2020 strategy for smart, sustainable and inclusive growth. The IU plan contained over 30 action points aiming:

- Make Europe into a world-class science performer
- Remove obstacles to innovation like expensive patenting, market fragmentation, slow standard-setting and skills shortages
- Revolutionize the way public and private sectors work together, notably through Innovation Partnerships between the European institutions, national and regional authorities and business.

The last review (2015) acknowledges the diversity of European regions and the development of Smart Specialisation Strategies; however, it perceives that territorial cohesion is still relatively low and that significant duplications in the Smart Specialisation Strategies of many regions may act as a barrier to their success. In this sense, RIS3 policies should be seen in a European framework to avoid duplications, look for complementarities and contribute to the achievement of the objectives of the EU policies on raw materials.

4.4.7 Circular Economy Action Plan

The Circular Economy Action Plan was created in 2015 to give a new boost to jobs, growth and investment and develop a carbon neutral, resources-efficient and competitive economy, through 54 actions (action plan)²⁵³. Sectors associated with circular economy employed more than four million workers in 2016 and generated additional jobs in relation to the markets for secondary raw materials. Circularity created new business models too.

In this plan, some of the actions implemented to build a Circular Economy are directly related to policies in raw materials extraction, mainly focused in critical raw material, secondary raw material and mining waste. Definitely, in this Circular Economy Action Plan it is considered key to know the composition of waste to permit efficient recovery of critical raw materials. The Commission's report on 'Critical Raw Materials and the Circular Economy' identifies key actions necessary to tap into these potential benefits: extraction at end-of-life of key components, improving data management on mining waste and mobilising funding.

Finally, the improvement of the use of secondary raw materials is other important action to develop the Circular Economy within raw material sector. For this, it is intended to foster trust in these materials working on possible standards for material-efficient high-quality recycling of CRMs out of waste batteries, waste electrical and electronic equipment and other complex end-of-life products.

So, RIS3 can help to achieve or improve the Circular Economy in mining and metallurgy regions by means of some necessary actions like the promotion the knowledge, use and recycling of end-of-life and mining wastes. The implementation of these actions would accelerate the transition towards a circular economy in Europe, being able to boost ongoing efforts to modernize the EU industrial base to ensure its global competitive edge and preserve and restore the EU's natural capital²⁵⁴.

²⁵²https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/innovation-union_es

²⁵³http://ec.europa.eu/environment/circular-economy/pdf/report_implementation_circular_economy_action_plan.pdf

²⁵⁴http://ec.europa.eu/environment/circular-economy/pdf/report_implementation_circular_economy_action_plan.pdf

4.4.8 EU Industrial Policy

The EU²⁵⁵ wants to and will remain the most attractive destination for foreign direct investment in the world. However, in exceptional cases, foreign investments may represent a risk for security or public order in Member States or in the whole Union. For that, the EU has just adopted a European framework to screen foreign direct investment. Member States should now ensure its swift, full and effective implementation. In this framework, the Regulation sets an indicative list of factors to help Member States and the Commission determine whether an investment is likely to affect security or public order. One of these factors is the supply of critical inputs, such as energy or raw materials.

On the other hand, the EU gears significant investments at industrial innovation. In the 2014-2020 period this investments of the EU in research, innovation and competitiveness SMEs was €190 billion (such as Horizon 2020) and in its proposal for the next long-term EU budget for 2021-2027, the Commission proposed to increase funding for investment, research and innovation.

This funding can help to keep under control the supply of critical raw materials by supporting SMEs of mining and metallurgy sector to find funds to develop their activities in exploration, extraction, metallurgy, recycling, use of waste, etc., all of them related to industrial innovation in mining and metallurgy sector. So, it is really important and necessary that regions in MIREU take into account these concerns and funding opportunities in their RIS3 due to lack of funds is a key aspect in the growth of the sector.

4.4.9 Raw Materials Scoreboard

Created in 2015, the Raw Materials Scoreboard has the aim to monitor the implementation of the EIP strategy. The Scoreboard, as well as the Raw Materials Information System (RMIS), is part of the EU's raw material knowledge base and provides insights on the EU's secure and sustainable supply of raw materials.

The last edition of the Raw Materials Scoreboard was launched in 2018 (the scoreboard is published every two years) and consists of 26 indicators grouped into five thematic clusters (see Figure 26). Several conclusions for these clusters are summarized in the following points.

Raw materials in the global context

- The EU economy requires a wide variety of raw materials. There is a low import dependency for construction materials and several industrial minerals (actually, the EU is the third world's largest producer of industrial minerals), but EU is far from being self-sufficient for many metal ores, relying on imports from the rest of the world; in particular, several raw material commodities that are important to the EU economy are produced in China (indicators 1 and 3).
- The EU is the world leading exporter of mining equipment, including technologies, with an average global share of 22% over the period 2011-2015; the United States is the main destination of this exports, followed by China (indicator 2).
- For the EU critical raw materials, the import reliance remains close to 100%. This dependency corresponds to lower security of supply, especially when combined with highly concentrated primary production in non-EU countries that have low levels of governance (indicator 4).

²⁵⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2017:479:FIN>

Competitiveness and innovation

- Domestic production of raw materials is an essential part of the EU economy, providing a reliable supply of inputs to many downstream industries. On the other hand, the EU processes and refines more materials than it extracts; this reflects that processed metals are partly produced based on imported materials and on secondary (indicator 6).
- Taken together, raw materials industries (extractive and processing) in the EU provided EUR 206 billion of added value and more than 3.4 million jobs in 2014 (indicator 7). (See Figure 27).
- The secure supply of raw materials is essential for many jobs in manufacturing sectors, including the production of fabricated metal products, construction, and machinery and equipment, which are estimated to provide EUR 1,422 billion and contribute to more than 24.6 million jobs (indicator 7).
- On the other hand, the repair and materials recovery sector will expand in next years, providing millions of jobs too (indicator 7).
- Financing and investment are really important in the development of the raw materials sector. Based on the financial indicators, it can be inferred that the investment attractiveness of the metal and mining sector declined over the 2010-2015 period, both in the EU and worldwide, but a revival in the metals and mining sector took place in 2016, accompanied by a price revival for minerals and metals (indicator 10).

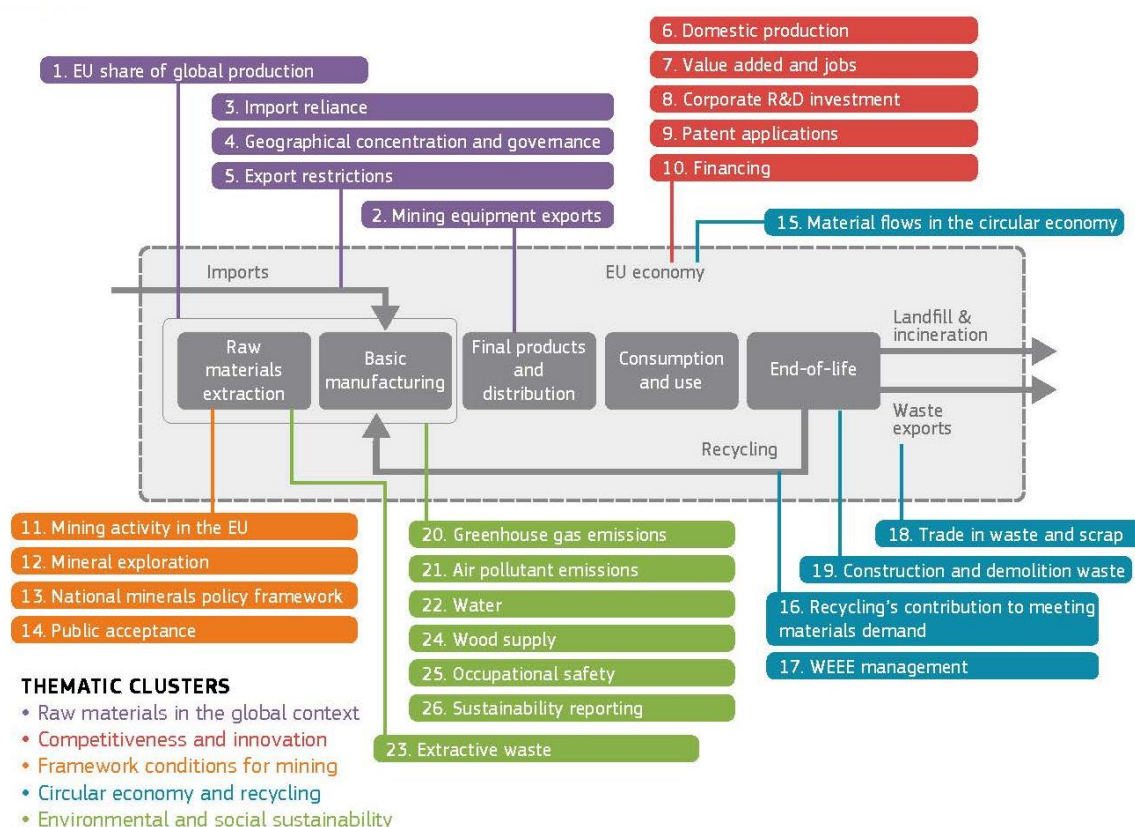


Figure 26. Thematic clusters and indicators of the Raw Materials Scoreboard 2018
(source: RM Scoreboard)

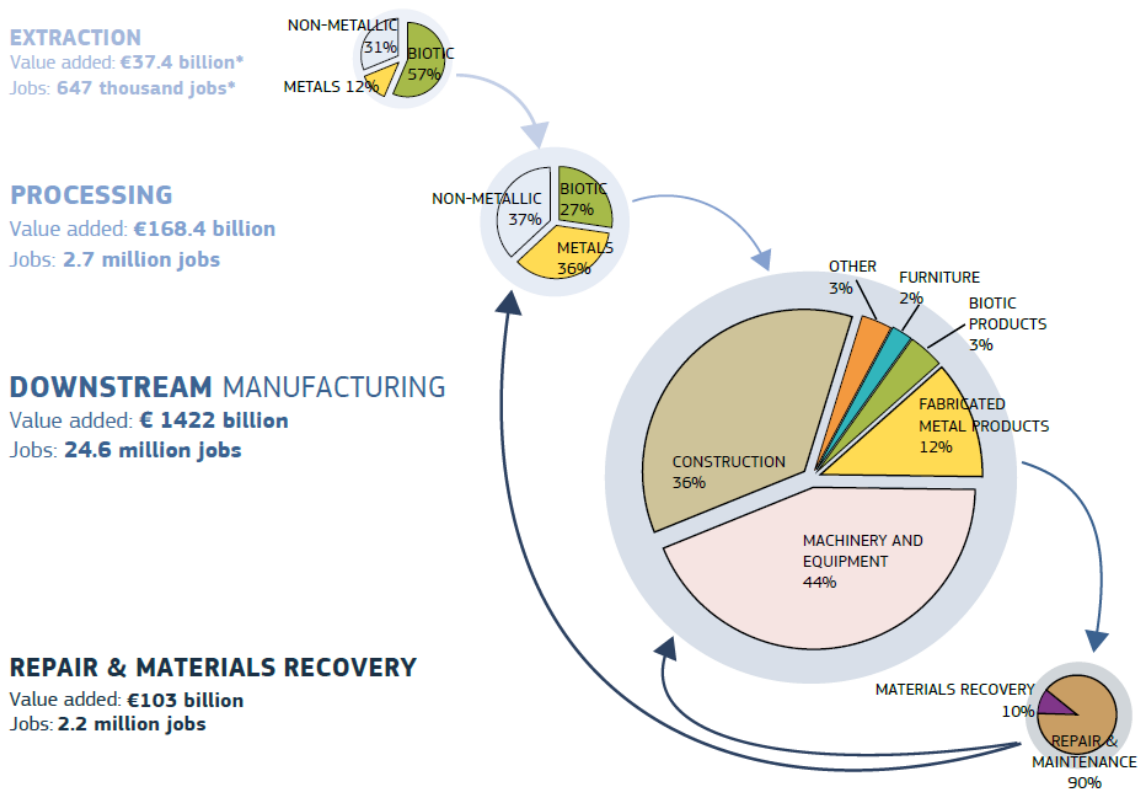


Figure 27. Value added and jobs across the production chain for a selection of RM and downstream sector (source: RM Scoreboard)

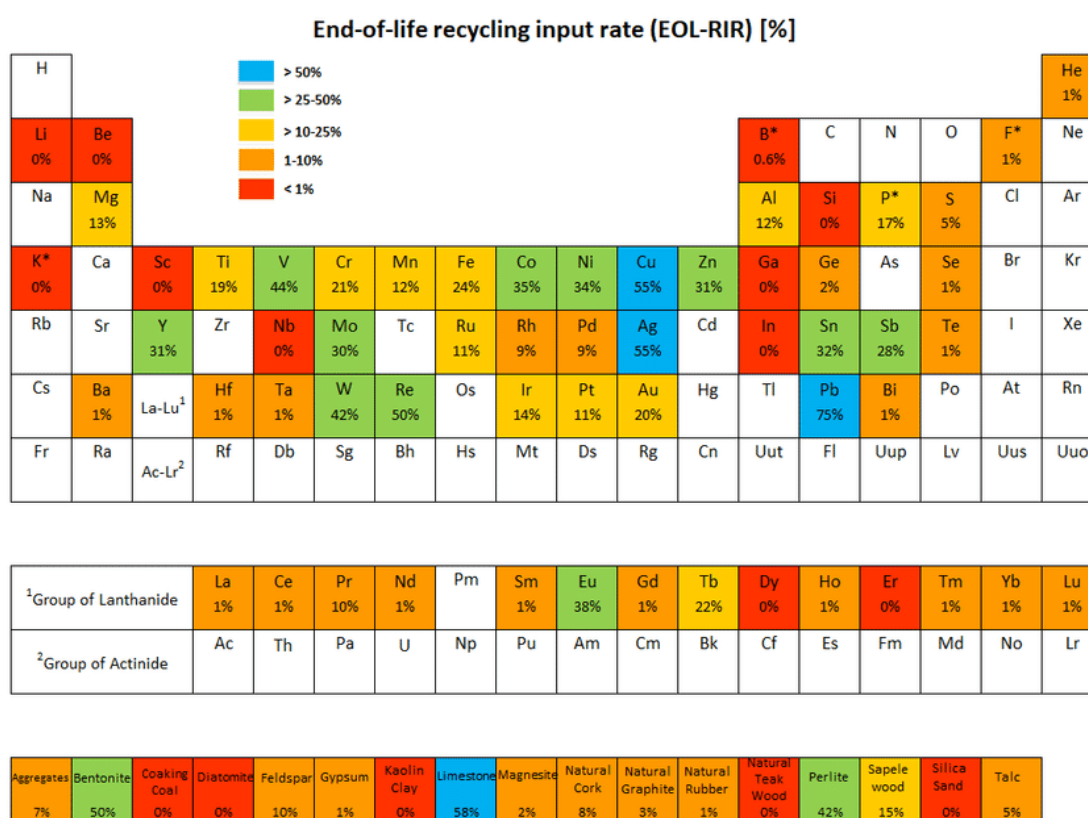
Framework conditions for mining

- The EU has a potential to increase its capacity to source raw materials domestically, as confirms the progress that took place during the period 2014-2017. Nevertheless, the moderate expansion of the mining activity is by far not sufficient to satisfy the raw materials demand (indicator 11).
- The investment in exploration in the EU remains low compared to that in other regions of the world. Mineral exploration is a complex and dynamic activity that requires time and investment, yet it is a key component of the EU's strategy for increasing the domestic supply of primary raw materials. Thus, mineral exploration is essential to ensure a stable and sustainable supply tomorrow; however, the EU's mineral potential remains under explored (indicator 12).
- A stable and efficient minerals policy framework remains crucial in encouraging and sustainable mining developments; it can either impede or expedite the development of mining operations (indicator 13).
- Public acceptance in the EU of extractive activities is low when compared with other economic sectors; this is a factor that greatly affects mining companies' operations. Cultural heritage (mining museums, local heritage ceremonies) may help to maintain positive public opinion about extractive mining. In contrast, tailings dam failures, pollution cases, and fatal accidents are most destructive for acceptance (indicator 14).
- Public acceptance of the secondary raw materials sector seems more favourable, as the public is involved in waste collection and as green technologies are perceived to be positive and/or environmentally friendly (indicator 14).

Circular economy and recycling

Circular economy requires increased reuse, remanufacturing, recycling as well as increased material efficiency. However, the circular use of raw materials in the EU economy is relatively low, below 10% (indicator 15). (See Figure 28²⁵⁶).

- For most materials, the available quantity of secondary raw materials is only a small share of overall demand for raw materials. Thus, in spite of the relatively high recycling rates for certain materials, primary extraction will continue to be the main means of satisfying demand for raw materials (indicator 15 and 16).
- The management of waste from electrical and electronic equipment (WEEE) provides interesting insights into the EU's potential to recover valuable raw materials (indicator 17).
- A significant amount of potential resources, are leaving EU in form of waste and scraps to other countries. In 2016, about 18 million tonnes were exported by EU (indicator 18).
- Construction and demolition is the biggest source of waste, contributing to around one third of the total mass of waste in the EU. Most materials contained in such waste



* F = Fluorspar; P = Phosphate rock; K = Potash, Si = Silicon metal, B=Borates.

Figure 28. End-of-life recycling input rates in the EU-28
(Source: Raw Materials Scoreboard).

²⁵⁶ <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/critical-raw-materials-and-circular-economy-background-report>

Environmental and social sustainability

- Greenhouse gas emissions and air pollutants from the EU raw materials have decreased significantly, reflecting the shift of production to other world regions but also improvements in emissions efficiency (indicator 20 and 21).
- Water use in the EU raw materials sector have been reduced in many cases, due to production decreases and improvement in water efficiency (for example increasing water re-use) (indicator 22).
- An important environmental and economic problem in the mining sector in EU is the management of extractive waste. There are not available databases for extractive wastes volumes, although available information suggest a relatively constant generation of extractive waste in the EU (indicator 23).
- Safety and health is essential for a productive economy, and raw material activities have relatively high rates of non-fatal accidents. However, accidents rates have been decreasing in this sector in the last years. A safe and well-adapted work environment is one of the key principles of the European pillar of social rights (indicator 25).
- EU raw materials industries are leaders in sustainability reporting. Regarding to health and safety, accident rates have been decreasing since 2009 (indicator 26).

Some of the conclusions before mentioned should have a reflection on the Smart Specialisation Strategies of the mining and metallurgy regions, either to correct weaknesses or to take advantage from the strengths. In the first case, it is outstanding the import reliance for many raw materials of the EU, especially those considered critical; as the raw materials supply is in the basis of the downstream industry, it is worth to highlight the importance of the added value (EUR1,422 billion) and employment (24.6 million jobs) relying on it. In this respect, the RIS3 could encourage the domestic sourcing of raw materials by different ways. For example, encouraging the mineral exploration in the EU, whose mineral potential is under explored; mineral exploration is the first stage to obtain raw materials and is an essential activity to ensure supplies in the future. RIS3 could lead as well to a growth of the raw materials production by improving the efficiency of processing of primary/secondary materials, especially in the last one since the end-of-life recycling rates still remains very low for many substances. Lateral policies are needed to achieve these goals; thus, a stable and efficient policy framework and a better public acceptance have been pointed out in the Scoreboard.

On the other hand, the RIS3 could contribute to keep or reinforce the world leading position of the EU as exporter of mining equipment and technologies.

4.4.10 Smart Specialisation Platform

Since 2011, the European Commission provides advice to regional and national authorities on how to develop, implement their smart specialisation strategies; via a mechanism called ‘Smart Specialisation Platform’. This Platform facilitates mutual learning, data gathering, analysis, and networking opportunities for around 170 EU regions and 18 national governments²⁵⁷.

Thematic Smart Specialisation platforms have also been created. Regions join forces and pool resources on the basis of matching smart specialisation priorities in high valued added sectors. There are three S3 Thematic Platforms: Agri-food, Energy and Industrial Modernisation. In addition, there are specific Thematic Areas within each S3 Thematic Platforms.

²⁵⁷ https://ec.europa.eu/regional_policy/sources/docgener/guides/smart_spec/strength_innov_regions_en.pdf

Topics about mining and metallurgy are addressed in the Smart Specialisation Platform for Industrial Modernisation (S3P-Industry) which aims to support EU regions committed to generate a pipeline of industrial investment projects following a bottom-up approach implemented through interregional cooperation, cluster participation and industry involvement.

The S3P-Industry contains 21 Thematic Areas and two of them talk about mining and metallurgy: Advanced materials for batteries (AMBP) and Mining industry.

The first (AMBP)²⁵⁸ was launched in October 2018. The main objective of the partnership is to develop joint R&D&I projects on topics of advanced materials, their characterisation, durability, suitable for extreme working conditions with the goal to deploy them in the field of batteries. Batteries here are electro-chemical products with the final goal of enabling electro-mobility and enhancing the capacity and performance of stationary energy storage. Of all the regions involved in this Thematic Area, only four take part in MIREU: Andalucía (ES), Castilla y León (ES), Aragón (ES) and Lapland (FI).

The AMBP Partnership has identified 6 Priority Pilots. Each Pilot consists in an application area in which innovation investment projects will be delineated and operationalised with industry. The Pilot 2 put the focus on mining and metallurgy issues: Sustainable Raw Material, Extraction and Processing (Lead Region: Castilla y León).

In second one (Mining Industry)²⁵⁹, the aims of the partnership are:

- to strengthen the regional and interregional innovation capacity to facilitate investments, growth and employment in mining industry, related industries and services in regions
- to identify novel opportunities for joint-demonstration between regions based on the survey and mapping exercise conducted in the early phase of this partnership
- to spread the knowledge of expert organisations to support regional growth and new business and work opportunities, and to create also a solid European collaboration among the regions involved in this initiative

The focus of this partnership is on Mining industry, related industries and services and global value chains. The background for this partnership is in Interreg Europe project Remix and H2020 project MIREU. MIREU regions taking part in this Thematic Area are: North Karelia (FI), Castilla y León (ES), Sterea Ellada (EL), Vasterbotten (SE) and Lapland (FI).

As the Thematic Smart Specialisation platforms work on smart specialisation priorities, it would be convenient that MIREU regions involved in Thematic Areas of Advanced materials for batteries (AMBP) and Mining industry include these topics in their respective RIS3.

²⁵⁸<http://s3platform.jrc.ec.europa.eu/batteries>

²⁵⁹<http://s3platform.jrc.ec.europa.eu/mining-industry>

4.4.11 UN Sustainable Development Goals

The UN 2030 Agenda (UN General Assembly, 2015) established 17 Goals for implementing sustainable development by acknowledging the interdependency of society, environment and economy, and by strengthening peaceful societies. With these goals, the EU aligned to the Sustainable Development Goals (SDGs) framework. Moreover, a set of indicators to monitor the SDGs at EU level has been published by Eurostat in 2017²⁶⁰

These UN Sustainable Development Goals (SDGs) have set out a vision for a future global society based on sustainability principles (UN General Assembly, 2015). The 17 SDGs (Fig. 29) and 169 targets that are composing the SDGs Agenda, cover the ecological, economic and social dimensions of sustainability, providing principles and a reference for national and local policies. Both governments and the private sector are called by the UN Agenda to be engaged in the implementation of the SDGs.

The UN 2030 Agenda does not include particular SDGs on raw materials. Nevertheless, mining and related industries are positively contributing or adversely impacting on all of the SDGs, as has been studied in the before mentioned JRC Policy Report “Mapping the role of Raw Materials in Sustainable Development Goals”. Some of the positive effects pointed out in the JRC document are, for example, the considerable increase of the R&D investment in the EU raw materials sector (SDG 9); the regional development linked to the physical infrastructures deployed by the mining activity (SDG 9); the economic growth linked to the production of materials and, downstream in the supply chain, in the manufacture of semi-finished products (SDG 8); and the contribution to SDGs (mainly to SDG 12, 8 and 9) of the EIP on Raw Materials, that promotes innovation by financing the Raw Material Commitments.

Among the multiple links between raw materials and SDGs pointed out in this document, some of them could be highlighted as subjects to be tackled in the regional S3 strategies:

- The importance of obtaining certain raw materials for several SDGs, e.g. phosphate and potash as fertilizers (SDG 1); tantalum and niobium for medical devices (SDG 2); copper, cobalt, cadmium, tellurium and rare earth elements for renewable and low-carbon energy componentry (SDG 7, 9 and 13); essential raw materials for pollution abatement (SDG 14 and 15). In addition, there will be a legal requirement from 2021 to ensure the source responsibly of the EU companies, avoiding the trade of “conflict minerals” (SDG 16).
- The circular economy-and related activities, such as waste management and recycling, as a source of employment (SDG 8), and a way to reduce environmental impacts and improve sustainability in the supply of raw materials (SDG 12 and 13).
- The resource efficiency along the full life cycle of raw materials, as well as the development of innovative and clean technologies to optimize the natural resources (land, water, energy, etc.) used to extract materials and produce semi-finished products (SDG 12).
- The use of potential post-mining assets as hydric resources (SDG 6) or cultural heritage (SDG 11).

To sum up, mining and metallurgy sector can contribute actively to the achievement of most of the SDGs. Thus, it would be really important that RIS3 of MIREU regions make reference to raw materials, mining and metallurgy not only to raise the resources and economy, but also to improve social, human and environmental aspects addressed in the UN 2030 Agenda.

²⁶⁰ Mapping the role of Raw Materials in Sustainable Development Goals. JRC Science for Policy Report.

The diagram illustrates the lifecycle of a product and its associated impacts on the UN Sustainable Development Goals (SDGs). The lifecycle stages are: Extraction, Manufacturing, Final Use, and End of Life. The impacts are categorized into four horizontal bands:

- INDIRECT (Top Band, Green):** Shows indirect impacts on SDGs. For example, Extraction impacts SDGs 17 (Partnerships for Goals), 4 (Quality Education), and 7 (Affordable and Clean Energy). Manufacturing impacts SDGs 17, 7, and 4. Final Use impacts SDGs 17, 13 (Climate Action), and 8 (Decent Work and Economic Growth). End of Life impacts SDG 17.
- Positive contribution (Middle Band, Light Green):** Shows positive contributions to SDGs. For example, Extraction contributes to SDGs 13 (Climate Action), 15 (Life on Land), and 6 (Clean Water and Sanitation). Manufacturing contributes to SDGs 12 (Responsible Consumption and Production), 8 (Decent Work and Economic Growth), and 9 (Industry, Innovation and Infrastructure). Final Use contributes to SDGs 6 (Clean Water and Sanitation), 11 (Sustainable Cities and Communities), and 12 (Responsible Consumption and Production). End of Life contributes to SDGs 13 (Climate Action), 14 (Life Below Water), and 15 (Life on Land).
- DIRECT (Center Band, Blue):** Shows the direct impacts of the product lifecycle stages. Extraction impacts SDGs 3 (Good Health and Well-being), 6 (Clean Water and Sanitation), and 8 (Decent Work and Economic Growth). Manufacturing impacts SDGs 14 (Life Below Water), 13 (Climate Action), and 15 (Life on Land). Final Use impacts SDGs 5 (Gender Equality), 11 (Sustainable Cities and Communities), and 8 (Decent Work and Economic Growth). End of Life impacts SDGs 3 (Good Health and Well-being), 8 (Decent Work and Economic Growth), and 12 (Responsible Consumption and Production).
- Adverse impact (Bottom Band, Pink):** Shows adverse impacts on SDGs. For example, Extraction adversely impacts SDGs 1 (No Poverty), 16 (Peace, Justice and Strong Institutions), and 2 (Zero Hunger). Manufacturing adversely impacts SDGs 16 (Peace, Justice and Strong Institutions), 7 (Affordable and Clean Energy), and 15 (Life on Land). Final Use adversely impacts SDG 3 (Good Health and Well-being). End of Life adversely impacts SDGs 3 (Good Health and Well-being), 8 (Decent Work and Economic Growth), and 12 (Responsible Consumption and Production).

A large blue arrow curves from the End of Life stage back to the Manufacturing stage, indicating a circular economy loop.

Figure 30. Potential contributions of the raw material industry to the SDGs along the supply chain.

4.5 GUIDANCE DOCUMENT

According to the description of Task 5.2 in the Annex 1 (Part A) of the MIREU project: *Specific guidance documents for the involved regions will be suggested in order to improve their RIS3 in accordance with MIREU's findings.*

Instead of different guidance documents for each region, a single guidance document has been prepared, summarizing in a dozen recommendations the SWOT model findings and the conclusions of the reviewed EU/UN policies. Thus, each region can take into consideration the most suitable perspectives to improve its RIS3 in relation to the mining and metallurgy sector by reinforcing strengths, correcting weaknesses, taking advantage of opportunities and avoiding threats, and taking into account the main EU/UN policies relating to raw materials.

a) **Harness the mineral potential**

Mining exploration is the basic stage to provide primary raw materials to the industry. Some of the RIS3 studied pay attention to this issue (sustainable or innovative technologies/processes in mining exploration) and the lack of this in the RIS3 is considered a weakness by some regional representatives.

According to the Raw Materials Scoreboard, the EU has the potential to increase its capacity to source raw materials domestically; however, the mineral potential is underexplored. Mineral potential is not equally distributed throughout the EU because it depends on the geology; thus, there are areas, such as the Iberian and Scandinavian peninsulas or Ireland, with a higher mineral potential than others. Regions have pointed out this potential as an opportunity, as well as the existence of advanced exploration mining projects.

On the other hand, there are minerals much more important than others in accordance to their use, availability and market conditions; the best examples are the Critical Raw Materials, but also the materials for renewable and low-carbon energy componentry (see Sustainable Development Goals).

For all that, the regional innovation strategies should pay attention to the mineral potential, especially in those highly prospective regions from a geological point of view or with potential for highly valued raw materials; in this sense, mining exploration should be taken into account to ensure the stable supply of raw materials to the EU industry.

b) **Facilitate access to endogenous resources**

Some RIS3 foresee actions to take advantage of the endogenous resources; this perspective has a social component since the economic activities linked to the endogenous resources contribute to maintaining population in rural areas, an issue of particular interest in depopulated regions. In this sense, the mineral assets as geology-linked and non-relocatable resources, can be considered as endogenous resources.

Mineral resources must be exploited where they are and an effective and secure access to land is needed. However, long and complex permitting procedures and restrictive land use planning have been described in the studied regions as a threat, and the lack of related activities in the RIS3 is considered a weakness. In an EU context, one of the conclusions of the Raw Materials Initiative is about the need for an improved regulatory framework to access the land; likewise, a stable and efficient mineral policy framework is described in the RM Scoreboard as a crucial condition to encourage mining developments.

Therefore, creating conditions to optimise the use of mineral or (more generic) endogenous resources, as is already planned in some RIS3, could be an action to be included in the regional innovation strategies of the MIREU regions.

c) Promote social acceptance for mining and metallurgy

Problems of social acceptance to the integration of mining in the socioeconomic model could represent an obstacle to the development of mining projects; this issue is considered by several regions as a threat, and the lack of support in the RIS3 in this regard as a weakness. This issue is related to the lack of awareness about the need for raw materials to keep the modern way of life. As in the previous point, RIS3 could provide a support to avoid these problems by creating conditions to gain the social acceptance for mining and metallurgy industries and integrate these activities in the local economic models.

d) Promote the rehabilitation of mining areas

Here there are two perspectives: environmental aspects and mining heritage. In the first one, problems related to mining residues have been described as a threat for future mining activities; some regions have already focussed on environmental aspects of mining in their RIS3 (recover degraded mining areas, monitor threats to environment, use of dumps), but likely they could be addressed as well in the RIS3 of other regions.

The second aspect, clearly linked with the environmental recovery, represents a way of taking advantage of the mining sites beyond the mining activity. This has only been promoted in the RIS3 of one region but can be included in some others as cultural heritage; actually, several regions see the exclusion of this aspect as a weakness of their RIS3, and many of them have remarked their heritage assets as opportunity. The promotion of the mining heritage by means of the RIS3 is a way to harness possible endogenous assets easily linkable to cultural aspects or touristic resources. Likewise, this subject would coincide with the Sustainable Development Goals.

e) Promote recycling

Several RIS3 have considered the promotion of the use of waste and the development of technologies for recycling and recovery as part of their priorities. Furthermore, most regions have pointed out the existence of recycling industries or the availability of residues as an opportunity. The use of secondary raw materials and recycling are activities to be promoted according to the Raw Materials Initiative and could contribute to the achievement of the Sustainable Development Goals (circular economy). The RM Scoreboard highlights, in addition, the low recycling rates for most wastes and scraps in the EU.

Taking into account all these elements, it seems that it is worth reinforcing the use and management of waste and recycling technologies in the RIS3, promoting the innovation in such a suitable field of work.

f) Increase efficiency and sustainability

Both concepts are present in the RIS3 of some of the studied regions (see strengths). Some others have pointed out a lack of RDI or technologies to increase efficiency (see weaknesses). Efficiency and sustainability along the full life cycle of raw materials are also among the conclusions of the Raw Materials Initiative and linked with the Sustainable Development Goals.

It should therefore be a general objective of the RIS3 of the mining and metallurgy regions to improve, by means of the innovation, the efficiency and sustainability of technologies and processes along the full life cycle of raw materials: extraction and processing of primary raw materials and in the recycling industries. This could complement, at the regional level and according to the regional assets, those innovation-related actions promoted by the EU through funding programs such as H2020, Interreg, etc.

Again, as was pointed out in mineral potential, priority should be placed on obtaining highly valued elements such as the EU critical raw materials.

g) Develop the value chain

Some regions have pointed out as a weakness of their RIS3 the lack of support to the development of downstream industries; this is particularly clear when the mineral raw materials, with hardly any processing, are exported. In this sense, the RIS3 can support a wider development of the value chain from the endogenous resources by promoting the creation of downstream industries or the clustering of mineral resources. It is worth mentioning here, as is said in the Raw Materials Scoreboard, the huge capacity to generate wealth and employment in manufacturing sectors from the supply of raw materials.

An additional aspect with regard to the processing industries is the development of new products or materials; thus, several regions have included in their RIS3 this objective among their priorities. This is an issue with a clear innovative character that can be reinforced or expanded to other regional innovation strategies.

h) Reinforce the leadership in equipment and technologies

Some regions have pointed out as an opportunity their strong position as providers of equipment, technology and expertise for mining and metallurgy. As is said in the Raw Materials Scoreboard, the EU has been the world leading exporter of mining equipment (including technologies) in this decade. It is worth highlighting this field of specialization of the EU that should be reinforced by means of the RIS3 in the most suitable regions.

i) Generate and transfer knowledge

This point is part of the RIS3 actions of some regions, leading to the reinforcement of the regional technology transfer systems or vouchers. In this sense, the existence of universities, training centers and specific RDI entities related with mining and metallurgy have been pointed out by the regions as an opportunity, and should be reinforced as vehicles to generate knowledge and technological innovation. Industrial associations, clusters and hubs, pointed out as opportunities in several regions, could facilitate the transfer of the RDI results to the industry.

j) Coordinate the RIS3 with other strategies

Most of the regions studied have regional or national development strategies, industrial strategies and mineral strategies, even though lack of specific plans supporting the mining sector have been pointed out in some regions. These strategies are seen as an opportunity as they define the lines of action with regard to the promotion of mining and metallurgy. These aligned policies should have a projection on the regional innovation strategies, in such a way that the RIS3 could provide access to resources for innovation.

k) Take advantage from the European experiences

The regional administration of the MIREU regions participate directly or indirectly in European funded projects such as MIREU, REMIX, MINLEX, INFAC, MINAREA, etc. and, in some cases, in S3 Thematic Platforms. These activities, considered as an opportunity by most regions, represent an occasion to share experiences and learn from each other, and the conclusions obtained from these are highly valuable for improving the RIS3 in relation to mining and metallurgy.

l) Improve RIS3 implementation and funding

Some criticism about the RIS3, at least regarding the mining and metallurgy aspects included in such strategies, have arisen in the SWOT analysis: vague or unspecific definitions of some actions, lack of inter-ministerial coordination, lack of programs to implement actions,

insufficient monitoring, inadequate promotion, etc., are some of them. Likewise, lack of budget to implement planned actions has been pointed out in some regions as a weakness, although many regions have highlighted funding opportunities for the mining and metallurgical sector. It seems, therefore, that there is room to improve and make the RIS3 more efficient.

5 CONCLUSIONS

5.1 Summary of achievements

In the first task (Task 5.1, chapter 3), for each MIREU region, the following aspects have been identified and described:

- RIS3 priorities related to RM or mining/metallurgy
- Structural funds and associated economic benefits
- Existing measures to foster market uptake
- Industrial strengths and possible symbiosis with RIS3

In the second task (Task 5.2, chapter 4), achievements have been:

- SWOT of the MIREU regions' RIS3 in relation to mining and metallurgy
- A SWOT model as result of the benchmarking of the previous work
- Identification of EU/UN policies on raw materials with possible impact on the RIS3
- Guidance document for a better integration of mining and metallurgy in future S3 strategies at regional level

5.2 Impacts

The expected impact of this work is a better inclusion of mining and metallurgy in future regional smart specialization strategies, enabling these sectors an easier access to funding for innovation.

This document represents a model to highlight both strengths and gaps, not only for RIS3 strategies but also regarding resource efficiency policies. In this sense, each region (not only in the MIREU scope) can implement this methodology to identify those aspects in which mining and metallurgy could be fostered in such policies.

In order to achieve this impact, it is important to remark the importance of disseminating this methodology among the stakeholders involved in the update process of the regional RIS3. The strategies studied cover the period up to 2020 and regions are already working on their respective updates for the next period. Thus, a pending task for the MIREU regional representatives would be to inform the corresponding stakeholders (maybe through the regional administration) of the achievements and outcomes of this work in order to forward conclusions to the updating team and promote a better inclusion of mining and metallurgy in their future RIS3.

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7 ANNEX

7.1 Benchmarking Tables

Benchmarking of Strengths

STRENGTHS		ALENTEJO	ANDALUCÍA	CASTILLA Y LEÓN	KOSICE	LAPLAND	LOWER SILESIA	N. KARELIA	SAXONY	VASTERBOT.
YEAR RIS3 (LAST UPDATE)		2014 (planned revision in 2019)	2015	2018	2015	2018	2015 (planned revision in 2019)	2013	2013 (2019 draft)	2014 (in updating)
RAW MATERIALS LIFE CYCLE	Exploration	X	X						X	
	Exploitation	X	X	X		X		X	X	X
	Processing, metallurgy		X	X	X	X	X	X	X	X
	Recycling and recovery	X	X	X		X	X		X	X
	Reinforce value chain		X	X	X	X	X			
MINING	Exploration	Activities related with sustain. exploration (1)	Innovation in exploitation processes (3)						Innovative processes for mining exploration (2)	
	Extraction	Strategic diversif. from extraction industries (1)	Innovative technologies for extraction (1, 3)	MM tech. to increase efficiency of processes (1)		Sustainable mining (3)		Analytics and proc. exp. for extractive sector (1)	Innovative processes for better exploitation (2)	Mining and mineral technology (1)
	Digitalisation		RDI in mining resources (2)						Digitalisation of all relevant RM geol. data (2)	
PROCESSING	Technologies and expertise		Technologies for processing (1)	MM tech. to increase efficiency of processes (1)	Advanced manufacturing (1)	Increase the refining of natural resources (1)		Chemistry-related materials expertise (2)	Efficient extraction of 1 st and 2 nd RM (2)	Mining and mineral technology (1)
	Machinery and engineering			Funding disruptive technological projects (4)	Robotics, automation, material engineering (1)			Machinery and engin. workshop solutions (2)		
	New products	Design and new construction materials (1)	Add value to new materials (1)	Develop. of competitive products from CYL's RM (1)	New materials (1)	Value chain based on batteries (2)	Technologies to acquire new prod. from mineral (1)			
							Advanced materials (2)			
	Waters						Technologies for thermal / min. waters (1)			
RECYCLING	Recycling, recovery	Use wastes (extractive ind. and natural stone) (4)	Use of dumps (1)	Use and promotion of waste (1)		Arctic Circular Economy (1)	Tech. for recovery, recycling, dispos. waste (1)		Efficient processing of complex waste (2)	Recycling is included in the development area (1)
	Environment	Mining IJD related to environmental issues (6)	Recovery of areas degraded by mining (1)	Tech. for recycling and recovery industry (3)			Systems to monitor threats to env. in mining (1)			
REHABILITATION	Mining heritage	As cultural heritage	Tourism in mining and industrial archaeology (1)	As cultural heritage						
SOCIAL ISSUES			RDI in cultural heritage (6)	Mineral RM as endogenous resources (1)						
BUSINESS	New companies / activities	Attract new business to add value to terr. res. (3)	Conditions to optimise use of endog. res. (2)			New platforms for business (1)				
	Clustering	Strengthen value chain by clustering min. res. (5)								
	Technology transfer	Strengthen Reg. Techno. Transfer System (2)	Promotion of technol. transfer to manage NatR(2)	Knowledge technological voucher (4)					Promote applying RDI results in industry (3)	

Benchmarking of Weaknesses

WEAKNESSES		ALENTEJO	ANDALUCÍA	CASTILLA Y LEÓN	KOSICE	LAPLAND	LOWER SILESIA	N. KARELIA	SAXONY	VASTERBOT.
YEAR OF RIS3 (LAST UPDATE)		2014 (planned revision in 2019)	2015	2018	2015	2018	2015 (planned revision in 2019)	2013	2013 (2019 draft)	2014 (in updating)
RAW MATERIALS LIFE CYCLE	Exploration			X	X	X	X	X		X
	Exploitation				X		X			
	Processing, metallurgy	X								
	Recycling and recovery				X			X		
	Reinforce value chain	X				X		X	X	
MINING	Exploration			Nothing about mining exploration (1)	Lack of support for mining exploration (4)	Exploration not addressed in the RIS3 (1)		Mining exploration is not addressed (1)		Mining exploration is not covered (1)
PROCESSING	Downstream industry		Low development of RM industry-related (3)						No consideration of downstream/metal ind. (4)	
	Efficiency and competitiveness	No reference to tech. to increase efficiency (5)			Productivity in metal. is not covered in RIS3 (1)				No consideration of research in resource eff. (4)	
REHABILITATION	MM legacy (reclamation) Heritage	No environ. strategies to recover mining legacy (4)			Competitiveness in metal. is not covered (1)					
SOCIAL ISSUES	Social acceptance	Mining heritage missing but could be in TP1 (6)								
	Access to resources		Integration of MM in society is not addressed (2)	Integration of MM in society is not addressed (3)	Integration of MM in society is not addressed (6)	Social acceptance issues not addressed (6)				Nothing about mining heritage (2)
ADMINISTRATION	EU policies		Nothing about efficient access to min. resources (1)	Nothing about efficient access to min. resources (2)	No mention to admin. access to resources (5)	Nothing about access mineral resources (5)				
	Environmental requirements						RIS3 defined before EP, RM, SIP and related (2)			
	Taxes						Legal changes in environ. protect. not considered (1)			
	Knowledge transfer	Insufficient mapping to enable know. transfer and communication (1)					No mention to mineral tax in Poland (1)		No support to transfer research results to ind. (5)	
BUSINESS	Clustering				No mention to MM clusters or bodies (3)					
FUNCTIONING	Definition			No budgets no funds for TPs (4)	Metal. has not access to ESIF through RIS3 (2)				No budget allocated (2)	
	Coordination			Vague definition of some Flagship Initiat. (5)					Description is rather unspecific (3)	
	Governance System	Insufficient consolidation (2)							No inter-ministerial coord. or strategies (1)	
	Implementation	Insufficient reg. monitoring (3)		No specific plans to implement TPs (4)					No implementation programmes (1)	
									No timeline and roadmap (2)	

OPPORTUNITIES		ALENTEJO	ANDALUCÍA	ARAGÓN	CASTILLA Y LEÓN	KOSICE	LAPLAND	LOWER SILESIA	N. KARELIA	SAXONY	STEREA ELLADA	U. STYRIA	VASTERBOT.	
MINING	Current activity	Economic relevance of Iberian Pyrite Belt (1)	5 metallic exploitations (1)	Strong mining sector, outstanding clay (2)	Strong mining sector (2 W mines) (2)	Exploitations of iron, barite, magnesite, etc. (1)	Four important mines (2 Au, 1 Cr, 1 Polymetallic) (2)	Access to rich natural resources (1)	Strong M sector (3 metallic, industrials) (1)	Three mines (Sn, W, Cu, Li) (1)	Important Ni mining deposits (1)	Strong mining sector, outstanding Fe Erzberg (2)	Strong mining sector (5 active metallic mines) (2)	
			37 industrial minerals exploitations (1)		Strong roofing slate sector (2)					Strong ind. min. mining (Kao, Flu, Bar, etc.) (1)	Important deposits of bauxite and magnesite (1)			
			2 energetic minerals exploit. (1)							3 lignite mines and activity lasting u. 2038 (1)	Promote technology and innovation (6)			
			430 expl. of aggregates and natural stone (1)					Health resorts based on thermal/therap. waters (14)		300 co. producing aggregates and others (1)				
	Advanced projects	International comp. interested in potential (2)		Important project (Potash MUGA) (6)	3 advanced projects for U, Fe, Sn-W and Pb-Zn (2)		Exploration projects (Sakatti, Rompas) (1)		3 Advanced explor. projects for metallics (2)					
	Exploration activities				Around 60 permits for metallics and ind. min. (3)			Exploration, acquisition and use of rare eraths (9)		21 exploration permits since 2011 (1)			76 explor. permits engaging foreign comp. (3)	
	Mining potential		For several CRMs as Sb, rare earths or W (2)		Interesting mining potential (CRM) (3)		Mining potential, especially for EU CRM (3)		Important mining pot. (outs. Au and polymet.) (3)	World-class deposits of Li, Sn, W, Zn, Cu, etc. (2)			Important mining pot. (outs. Au and VMS) (4)	
	Markets	Growth of international metals market (6)	Increasing exports (3)				Increased RM demand encourages new mines (5)	Development of electromobility (20)						
								Substitutes for critical materials (10)						
								Growing demand for innovative products (17)						
	Infrastructures				Lithotheque, nat. geological survey		Improved infrastructure related with MM (5)			Mining agency, mining archive, geol. survey (5)	Good transport options (by sea, road, railway) (3)	Mining university "next door"		
	Location		Geostrategic value (3)			Strong export position (geography, transports) (5)		Proximity of W and S Polish border (3)			Close to Athens (biggest logistic Greek center) (4)			
PROCESSING	Processing industries		Important for aggreg., natural st. and ind. min. (5)		Reg. ind. processing RM (cement, glass, etc.) (4)	Important metallurgy (60% of ind. production) (2)		Development of chemical industry (21)	Important processing Co project (FinnCobalt) (4)	Fluorspar value chain, Sn smelter (3)	Important metallurgy plants (2)	Industries and value chain related with ore (3)	Important processing industries (smelters) (5)	
			Capacity to attract foreign investment (4)			Iron and steel metallurgy (3)		Development of building materials (21)	Soapstone processing industry (5)	Potential industrial value for lithium (3)	Restructure economy industrial production (7)	Iron and steel metallurgy		
											Magnesite thermal processing			
	New products					Potential for new prods. for renewables and oth. (4)					New local production system (9)			
						Pot. In chemical processing for ceramics (6)								
Service providers						Global provider of equipment and technol. (4)		Tech companies provide equipment for MM (6)			Global provider of mining machinery (Sandvik)	Companies providing products, services, eng. (6)		
RECYCLING	Wastes, recycling	Residues could be used as secondary RM (11)	CLC in 2 H2020 projects related to mining waste (10)		1 company recycling Al (4)		Volume of wastes is expected to increase (4)	Supply of waste with valuable elements (11)		Several smelters operating with scraps (3)	Important recycling plants (2)	Several hightech recycl. SMEs with growth pot.		
REHABILITATION	Mining heritage	Mining heritage has been focus on old mines (9)			16 touristic mining sites, incl. museums (1)					Innovative recycling industry (pyro/hydro) (3)		Mining university with special recycl. department		
	Intertwining sectors	Wine, dairy, tourism and mining routes (10)								UNESCO World Heritage tentative list: Montanregeon Erzgeberg Krušnohore	Old bauxite mine transf. into educational center (Vagonetto)	1 mayor site (Europ. USP)+a dozen minor ones		
	Environmental issues							Development of envirm. friendly technologies (19)			Environmental technologies low carbon economy (10)			
SOCIAL ISSUES	Tradition			Mining tradition (1)	Mining tradition (1)							MM tradition, outstanding Iron Route (1)	Long mining tradition, outstanding Boliden (1)	
	Endogenous resources			Depopul. promoting endogenous resources (5)	Depopul. promoting endogenous resources (8)							Depop. promoting endogenous resources (7)	N Sparsely Pop. Areas highlights mining pot. (10)	
	Activity in RM programmes									Highest of SME and acad. at EU/nat. level (12)				
	Social acceptance	Sustainability of stone sector giving prestige (7)		Good social acceptance (4)	General social acceptance (7)		General social acceptance of MM (6)		Social license and political will to MM (9)	Relatively high social acceptance mostly due to mining tradition (4)		General social accep. of MM as economical base (6)	Social acceptance gained by mining companies (9)	
	Arising awareness		Activities to improve social image (6)		Included in the CYL Mn. Resources Strategy					Included in the Saxon RM Strategy (4)		Efforts to aware about the need of MM (9)		
										Included in the Saxon RM Strategy (4)		Primary education highlights MM topics (10)		
										RM exhibition in 4 Industry Museums (8)		Plans for metallurgic visitor center		
ADMINISTRATION (SUPRAREG.)	Supranational policies							Cooperation with Saxony and Czech Rep. (15)		Interreg MineLife with Lower Silesia (7)	ROP plans to include the region in EU networks (16)		Supranat. Forum prioritize invest. in MM (11)	
	National S3												National S3 supports mining and metal extrac. (12)	
	National mineral strategies					Finland's Mineral Strategy (8)	Joining the coal regions in transition platform (8)	2 National mineral strategy and plan (10)	German Government's RM Strategy (2010) (6)	Upcoming Special Spatial Plan incl. RM (15)		National Sweden's Mineral Strategy (13)		
	Subnational policies						Sust. Extract. Industry Action Plan (8)				Improve strategies to new investments (8)		Nat. Initiative to promote mining (17)	
ADMINISTRATION (REGIONAL)	RIS3 revision	Planned revision of RIS3 in 2019, interest in MM (5)									Latest update 2019			
	Develop. strategies		Industrial Strategy and Plan for R&D (7)	No alternatives to mining and energy (3)	Regional Industrial Master Plan support MM (9)	Nat/Reg. Development Strategy (7)	Industrial Strategy of Lapland 2030 (8)	Program for the reindustrialization (7)	Reg. Strategy (POKAT) promotes MM (12)			Reg. Development Strat. supports metallurgy (8)	Reg. Development Strat. supports metallurgy (15)	
	Mineral strategies		Anadalucia Mining Strat., related activities (7)		Regional Min. Strategy and related plans (9)				Reg. Strategy for Extractive Ind. (in prep.) (13)	Saxon RM Strategy (2017) (6)				
	Land use planning										ROP plans a new regional land use plan (14)			
	Related entities	Institutions promoting R&D in MM (CEGMA)			RDI entities (FSB, SIEMCAL, ICAMCYL) (10)		Digipolis-Kemi Technology Park (11)	Business institutions and industrial parks (5)		Helmholtz Institute for M&M research (8)				
									Active reg. management (Business Joensuu) (14)	GKZ Freiberg networking at regional / EU levels (9)				
	Mining hubs, mining centres					EIT-RM Hub Regional Center Kosice (8)	Rovaniemi nat. mining governance centre (7)	Strong player effect (12) of KGHM Polska Medz S.A. (13)	Outokumpu Mining Camp (minning hub) (15)	Saxony is the focal point of RM in Germany (6)	EIT Raw materials- Regional Center Greece			
								Kemi-Tornio hub of mining, metal ind. (10)						
	RDI experiences								Strong consolidation of R&D environment (22)	Karelia experienced in EDP (16)				Innovative environ., outstanding Umea (7)
	Admon. in mining EU	Regional stakeholders in EU projects (4)	MIREU, GEO-FPI, INFACIT, S3P Industry (8)		Reg. Admon. in EU projects and platforms (11)	Participation in EU projects and platforms (9)	Participation in H2020 projects (9)		Reg. Admon. in EU projects and platforms (17)	Participation through GKZ (MIREU, REMIX) (7)	Participation through NTUA (REMIX, MIREU)	Participation in H2020 + Interreg projects	Reg. Admon. in EU projects and platforms (16)	
										Participation in ind. modernisation platform				
										Local industries in EU funded R&D projects				
BUSINESS (ASSOCIATIONS AND CLUSTERS)	National		CONFEDEM, COMINROC, etc. (9)	National associations supporting MM (7)	National assoc./cluster supporting MM (12)			National assoc./cluster supporting MM (11)	EIT Raw Materials, GERRI (10)	Greek Mining Enterprises association (SME), Hellenic Federation of Enterprises (SEV), Technical Chamber of Greece	Nat. industrial assoc. supporting M&M	National associations supporting MM (18)		
	Supraregional					MM Chamber and Associations (8)	Suprarreg. Mining Cluster (AMC)		Suprarreg. Mining Cluster (AMIC) (11)					
	Regional		AMINER, AFA, AEMA, etc. (9)		Regional assoc./working group supporting MM (13)									
SKILLED WORKFORCE	Universities	Mining co. and univ. cooperating in R&D (8)	Universities with mining and geology (11)		Universities with mining and geology (5)	Universities with mining and geology (10)	Universities with mining and geology (12)	e.g. Wroclaw Univ. of Science and Technology (6)	Active eng. research in Karelian Universities (7)	Freiberg University of Mining and Technology (9)	Universities related to materials	University of Leoben reputed by mining (4)	Lulea University in Vaster and Norrbotten (8)	
	Training centers			Training for mining (8)	Training for mining (Sta. Bárbara Foundation) (6)				Training organizations for mining at reg. level	Training school: BSZ Freiberg (8)	Close univ. related to geology and mining (5)	Highly skilled workers in metallurgy (5)		
	Employment							Large demand for highly qualified workers (12)			ROP plans to promote vocational training ROP	High demand for skilled workers in metallurgy		
FUNDING	Types		ESIF (13)		ERDF and ESF (14)			European funds (4)	RDI access to EU's structural funds (18)		Improve strategies to new investments (ROP) (8)	MM access to ERDF (11)	MM access to ERDF and ESF (20)	
	Supranational		Improvement of financing of MM (12)										Supranat. Funding coop. to finance S3 (19)	
	National				MM access to EU funds (CDTI) (14)	Financial support to metallurgy (Dev. Strat.) (11)			Access to funds through nat. Business Finland (19)	FONA r4, KMJ, R+Impuls, mainly for RM efficiency (11)		Access to funds of nat. business funding pgm.		
	Regional				MM access to EU funds (ICE, Op. Plans) (14)	Competences for innov., supported by ESIF (12)	Digipolis manages RDI funds (13)			ERDF Prevention of risks related with old mines (11)				

Benchmarking of Threats

THREATS		ALENTEJO	ANDALUCÍA	ARAGÓN	CASTILLA Y LEÓN	KOSICE	LAPLAND	LOWER SILESIA	N. KARELIA	SAXONY	STEREA ELLADA	U. STYRIA	VASTERBOT.
MINING	Current resources			Mines closure (1)	Coal mines recently closed (10)	Important mining co. closed since 90s (7)	Low-grade or deep-seated deposits (2)	Depletion of resources (7)				Erzberg mine will be exhausted at cca. 2050 (1)	
	Potential resources					Closure of Bankov magnesite mine (2)		No alternatives after closing Cu and lignite (18)				No further mining potential (espec. CRM) (6)	
	Infrastructures							Insufficient transport infrastr. (local roads) (3)					Need for infrastructure and transport solutions (1)
	Markets	Long run trends of prices and volatility (1) No origin related marketing value (10)	High competition in metalics (2)				Volatility in the demand of mineral resources (1)	Fluctuations of RM prices on global markets (8)		International price volatility of commodities		Only 1 customer for ore - totally dependant Fluctuation of RM prices on global markets	
	Value chain	Value chain not well developed (8)			Value chain not well developed (8)			Lack of processing in the field of natural resour. (1)					
REHABILITATION	Environmental issues	Environ. hazard of mining residues (7)					Emissions and wastes need to be reduced (8)				Intense problems caused by metal activities (3)		
SOCIAL ISSUES	Social awareness		Lack of knowledge of the mining importance (5)	Lack of public awareness (energy needs minerals) (2)	Lack of awareness about the need of RM (6)					Disconnection between end products and raw materials	Lack of information about RM ind. achievements (2)	Lack of social awareness about the need of RM (5)	
	Education			Education bias negative aspects of mining (5)	Biased education about impacts of mining (7)						Lack of information about environ. protection etc. (2)		
	Social acceptance	Unfav. impression of mining from media (2) Weak linkage with SLO (3)	Negative social image of mining (4)		Social rejection for mining in some areas (5) Negative effects of non-rehabilitated mines (4)	No reference to social aspects (SLO) (3)		Low social acceptance for new mining activities (12)		One of the least popular industries in Germany (2)	Neutral to negative social acceptance (1)	Negative image of work + related educ. in industry Acceptance problems for metallur. in some areas (4)	
	Compatibility with local issues	Limited link of mining with tourism or culture (9)	Conflict with tourism-based economic models (6)				Lack of reconciliation with Sami culture issues (11)			Mining heritage vs reopening mines (2)	Competing with agriculture and fishery (6)		
											Competing with cultural sites (archaeological) (7) Competing with touristic activity (8)		
ADMINISTRATION	Mining policies			No legislative measures supporting mining sector (6) Policies focused on renewable resources (3)		It is unclear policy about MM (1)		Lack of long-term planning in mining (6)	Nat. mining policy lacks a territorial approach (1)	MM plans subjected to political/public debates (4) Only 1 ministry supports Saxon RM Strategy (5) Huge burden for lignite regions transition (8)	No plans, measures supporting RM sector Not financially promoted actions RM (5)	No master plans (8)	
	Land use planning	Need of compatible industry and environ. (4)	Little integration of mining in land use plan. (9)		Land use planning ignores mining potential (2) Preference for alternative rural activit. (3)		Limitations for extractive operations (3) No use of rehabilitated mining sites after closure (10)	Location of deposits in protected or built areas (2)			Natural conservation (4)	High environmental regulations (3) Preference for activities in conflict with mining (2)	Land use restricting mining capacities (2)
	Activities promoted												
	Permitting procedures				Long and complex permitting procedures (1)		Long and complex permitting procedures (4)	Long time from decision to start a new mine (11)		Long and complex admin. of MM projects (3)	Long and complex, mainly issued (for metals) by central government		
	Legal conditions							Variable and unclear legal conditions (14) Poor protection of intellectual property (5) Moving business to other regions/countries (15)				Environment regulations hindering new plants	
BUSINESS	Relocation											Relocation instead of export in metall. sector	
	RM supplies		Scarce relation extractive / ind. sectors (3)					Companies compitting to use imported min. res. (16)		Difficulties in acquiring processible RM (1)			
	Ownership						Finnish ownership must be increased (12)						
	Clustering								Weak mining cluster activity (2)		Reduced extroversion		
	Costs and investments		Higher costs to reduce environmental impacts (1)		Costly electricity for processing industries (9)		High water and energy consumptions (7) Automation in mining must be encouraged (9) Lack of new explor / extract. technologies (6)	High invest. and social costs of opening mines (10) Cost increase (labor and mining costs) (9) Low level and high costs of RDI (4, 13)				High CO2-compensation costs Very high wage costs	
SKILLED WORKFORCE	Lack of skilled workforce		Deficit of centres for generating knowledge (7) Ageing of working population (8)			Increasing share of unskilled population (4) Missing graduates in tech. and nat. sciences (5) Persisting brain-drain abroad (6)	Difficulties to recruit experts/skilled workers (5)			Lack of skilled labor for new mines (7) Sliding nº of students in RM sector (6)	Lack of experienced and skilled labor	Scarce workforce by decreasing population (7) Decrease of skilled workers	
	Leaving to other industries/reg.	Demography regression and low capacity to fix (5)						Highly qualified workers leave to other markets (17)		M&M have to compete for skilled personnel (6)	Brain- drain due to economic crisis	Ongoing trend: migration from rural area to cities	
FUNDING				No public funds for mining sector (6)		No individual regional EU funding programme (8)				No funding programme to mining and metallurgy RDI or knowledge transfer etc.		No individual M&M funding programme	
				EU funds focused on renewable energies (4)						No funding programme to knowledge transfer etc.			