



Common scenarios on the EU mining sector Regions as driving forces in implementation of Circularity and Sustainable mining in EU

Catarina Alves, 2019



Contents

Introduction	3
Methodology	5
Objective.....	5
On line inquiry and interviews	6
Study presentation session	6
Other strategies	6
Results - Regional perspectives	7
Alentejo, Portugal	7
Andalucia, Spain.....	10
Aragon, Spain.....	12
Castilla-León, Spain	13
Centro, Portugal	15
Cornwall & Isles of Scilly, UK	16
Ireland, Ireland.....	17
Kosice, Slovakia	19
Lapland, Finland	20
Lower Silesia, Poland	22
North-West (Maramures), Romania	26
North Karelia, Finland.....	27
Saxony, Germany.....	28
Sterea Ellada, Greece	30
Styria, Austria	32
Common Scenarios Analysis.....	34
Cultural	34
Regulatory	35
Market.....	36
Technological	37
Final Remarks	38
Acknowledgements.....	40
References	40
Annex – Inquiry Model.....	41



Introduction

Circular economy (CE) "Describes an economic system that is based on business models which replace the "end-of-life" concept with reducing, reusing and/or recycling materials in production/ distribution and consumption which implies creating environmental quality, economic prosperity and social equity to the benefit of current and future generations" (Kirchherr *et al*, 2017)".

Tough CE is a popular concept that is receiving increasing attention by political, business and citizens it is also a challenge to implement since a number of barriers have been identified for "full circularity" of economy. While many business and policy circles have proclaimed their support to CE, its implementation still appears to be in the early stages (Kirchherr *et al*, 2018), China being the only notable exception since it adopted its "Circular Economy Promotion Law of PRC" in 2009 and has been at the forefront of CE implementation ever since (Kirchherr *et al*, 2017; Liu & Bai, 2014).

A recent study (Kirchherr *et al*, 2018) identified several barriers in EU (Figure 1 where the top 3 barriers identified were: 1) Lacking consumer awareness and interest; 2) Hesitant company culture and 3) Low virgin material prices". In this study it is suggested that "low virgin material prices" can favour linear products and lead to "Lacking consumer interest and awareness", which in turn leads to "Hesitant company culture" since public consumption is the motor for sales and profit of business. Interestingly, "technological barriers" were not identified as a pressing barrier. Tough it is mentioned that sectorial analysis of this study to other areas (e.g. mining industry) may showcase other particular realities.

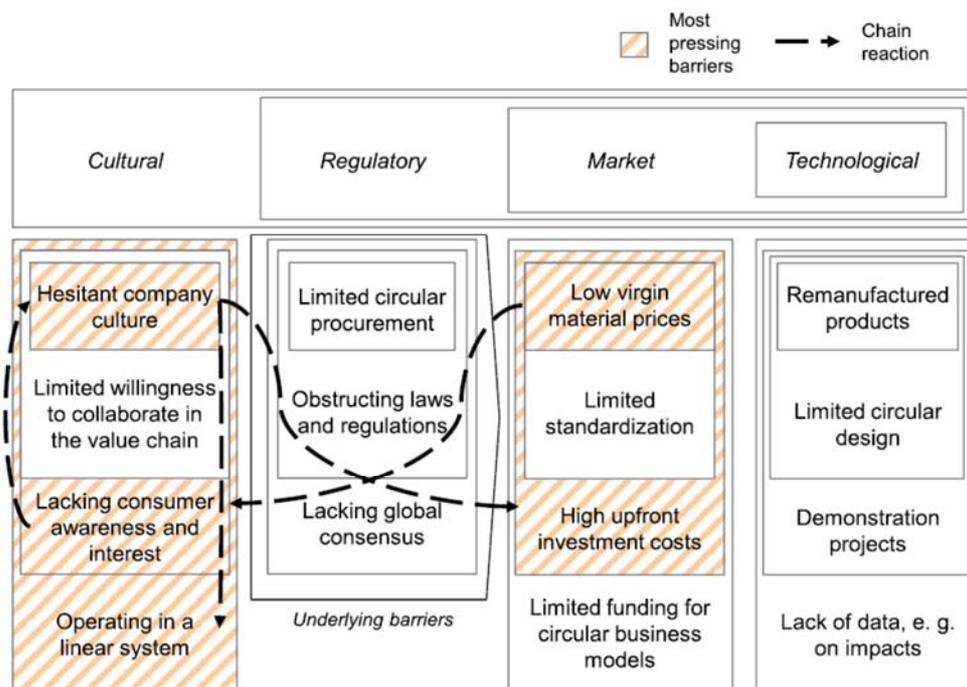


Figure 1 – Key circular economy barriers and their interaction in the EU (Kirchherr *et al* 2018).

Kirchherr *et al* (2018) suggest that governments are a key player that may accelerate CE transition, since they could tackle the most pressing barriers identified: "Low virgin material process" and "High upfront investment



costs” through, for example, elimination of fuel subsidies or introduction of financial incentives for circular investments, reduced value added Tax (VAT) for reparation. Regions have undoubtedly a role to play, they are the most suitable level for closing material loops and creating sustainable industrial ecosystems, while at the same time they face multiple obstacles to put Circular Business models into practice (Interreg Europe, 2019).

REMIX Project encourages resource efficient and environmentally and socially acceptable production of raw materials, including critical raw materials. During REMIX a set of good practices have been identified and shared among partnership. Common barriers/bottlenecks and ways to address them need to be mapped as well as challenges and opportunities in order to boost EU competitiveness and stimulate sustainable development, growth, jobs and new SME in the mining sector.

The report wishes to deliver the analyse the “Common scenarios on the EU mining sector development in the foreseeable future – Regions as driving force in implementation of the Circular and Green mining in EU”. The objective of this publication is to produce an overview of European Union mining sector from regions perspective focused on sustainable mining and potential in EU, particularly focused on:

- Bottlenecks/Barriers
- Challenges
- Opportunities

This report encloses a *screening* exercise in EU Mining Regions and wishes to contribute to understand the role regions may play in implementing circularity and sustainable mining in EU.



Methodology

Objective

The objective of the review desk study is to produce an assessment of current situation of European mining sector from a regional perspective in terms of implementation of the Circular and Green Economy in order to extract the Common scenarios on the EU mining sector development in the foreseeable future.

Tough in EU Action Plan for Circular Economy, the fact is that barriers/bottlenecks that are faced by mining industry business to fully implement this vision are still emerging as Circularity models are being tested and implemented in each region, with different mining deposits, assess abilities, processing, manufacturing and market conditions. The aim was to characterize Regional characteristics and assess also the different regional challenges and opportunities. The common scenarios and how regions were dealing with challenges and opportunities in mining sector were determined, so that the best solutions could be shared to overcome the barriers identified.

The following questions were surveyed:

I - Primary question

Do the different regions in Europe have different mining characteristics (REMIX stakeholder community)? What are their key characteristics on: Mining deposits, assess abilities, processing, manufacturing and market conditions? First, an assessment was made on the literature on CE projects implemented in the Mining Sector for different regions and select key stakeholder groups to ask to reply to on line inquiry and interviews (See Annex I - Model on online inquiry). Data collected included also information gathered mostly by REMIX and MIREU projects due to lack of time for delivering report.

II - Secondary question

What are the key barriers of CE and sustainability implementation in the Mining sector? The barriers which are being the main impediments in the mining sector at regional level were explored.

- Are there cultural barriers in the Mining Sector? Which? The cultural barriers which are being mainly worked on in the mining sector at regional level were explored.

- Are there regulatory barriers in the Mining Sector? Which? The regulatory barriers which are being mainly worked on in the mining sector were explored.

- Are there market barriers in the Mining Sector? Which? The market barriers which are being mainly worked on in the mining sector were explored.

- Are there technological barriers in the Mining Sector? Which? The technological barriers which are being mainly worked on in the mining sector were explored.

III - Tertiary question

What are the key challenges and opportunities in the Mining Sector? The challenges and opportunities that are being mainly worked on in the mining sector at regional level were explored.



On line inquiry and interviews

Based on the assessment review literature and on-line inquiry was designed with a set of interview questions (Annex 2). The on-line inquiry included general questions on the activities of the organizations and continue with more specific questions on bottlenecks/barriers, challenges and opportunities of the mining regions.

Study presentation session

A workshop session was organised at the Second Mining Conference (Wrocław, Poland, May 15, 2019) to explain importance of this report and ask participants to fill in the template of the on-line inquiry each targeted to identify: Bottlenecks/barriers, challenges, and opportunities.

REMIX partners and stakeholders present at the Second Mining Conference (representing regions) had 30 minutes to discuss and fill in template which was used to fill in the on-line inquiry.

Other strategies

Due to low rate of detailed replies, the following MIREU deliverables were used to gather the information needed to fill in the template of the on-line inquiry for regions where information was missing:

- D. 3.1 Review of the applicable regulatory and policy conditions in the MIREU regions – used to fill in regulatory barriers, challenges and opportunities (Murgia et al, 2019)
- D. 4.1 Regional Cultural Identity and stakeholders mapping report – used to fill in cultural barriers, challenges and opportunities (Murgia et al, 2018)
- D. 5.1. – Strategic analysis of EU regions and mining potential and opportunities within their RIS3 – used to fill barriers, challenges and opportunities in general (MIREUa, 2019)

It is now reported which barriers were identified as more important in the mining sector in 15 European regions.



Results - Regional perspectives

Alentejo, Portugal

Overview of region characteristics	
Mining deposits characteristics	Metallic and non-metallic: Cu, Zn, Ag, Sn, Au, U, ornamental rocks (marbles, granites and schists), industrial rocks (aggregates).
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not available
Accessibilities	Good accessibilities for some mines particularly through railway, but other mines are not active due to lack/poor of accessibilities that increase the price of the product making it non-profitable for exploitation
Can you provide a list of the active and un-active mining industries in your region?	Minas do Lousal – Revitalised and pollution control through restoration project – Development of a Life Science Centre.

Barriers/bottlenecks	
Cultural	<ul style="list-style-type: none"> Hesitant company culture (4) Limited willingness to collaborate in the value chain (2) Lacking consumer awareness and interest (5) Operating in linear system (3) Conflicts of interest with citizens due to pollution problems
Regulatory	<ul style="list-style-type: none"> Limited circular procurement (4) Obstructing laws and regulations (5) Companies are not obliged to use standard national code, which means there is no harmonization of data collected No Alentejo sectorial plan for mining industry
Market	<ul style="list-style-type: none"> Low virgin material prices (5) Limited standardization (5) High upfront costs (5) Limited funding for circular business models (4) Limited funding for sustainable practices (5) No use of mineral demand estimates by authorities



Technological	Lowering production costs, Less energy consumption Higher recovery rate of minerals
----------------------	---

Challenges

Cultural	Restoration and revitalization of old mining facilities, Networking of mining regions in Portugal
Regulatory	No Alentejo Mining industry sectorial plan
Market	Use of estimates of demand by authorities
Technological	Lowering production costs, less energy consumption, higher recovery rate of minerals

Opportunities

Cultural	Development of restoration and pollution control projects in old mining facilities as well as development of mining archeology; Improvement of networking between mining regions
Regulatory	Development of Alentejo Mining industry sectorial plan
Market	Profitability over time
Technological	Development of joint project between universities and business for lowering production costs, decrease energy consumption and promote higher recovery rate of minerals

Andalucia, Spain

Overview of region characteristics

Mining characteristics	deposits	Metallic and non-metallic: Cu, Zn, Pb, Sn, Sr, Au, Ag, Fe, F, Ba, industrial minerals, natural stone
Does the region have processing?		Yes
Does the region have manufacturing?		Yes
Market conditions		Information not provided
Accessibilities		Information not provided



Can you provide a list of the active an un-active mining industries in your region?

Information not provided

Barriers/bottlenecks

Cultural –	Conflicts of interest due to Natura 200 network, Mine closure and related loss of jobs, Restoration - court problems of mining projects have existed in the past (Los Frailes and Hornos Ibéricos), lack of good information provided by the media
Regulatory	National Mine Act too general and sometimes conflicting, Un-updated Mineral Resource Plan of Andalusia, Land use planning policy conflicting with National Mine Act and Mineral Resources Plan of Andalusia Development of protected areas for mining to ensure mineral supply at different levels, Royalties from mining activities are not regulated so many possible benefits for regions haveto be negotiated in a case by case basis
Market	Limited funding for circular business models Limited funding for sustainable practices Need for regulatory tools for restoration and social damages in end of cycle, New regulation on mining capacity (economic, technical and organizational)
Technological	No research group specific on mining

Challenges

Cultural	No Social License to Operate or related guidance documents or toolkits at national, regional or municipal levels, media education
Regulatory	Revision of the National Mine Act, Update of the Mineral Resource Plan of Andalusia, Revise land use planning policy, Development of protected areas for mining to ensure mineral supply at different levels, Development of Royalty strategy of use
Market	New regulation of economic instruments for mining Development of royalty strategy for mining
Technological	Lack of Research and Investigation capacities



Opportunities

Cultural	Development of SLO or related guidance documents
Regulatory	Production of update version of National Mine Act Production of the Mineral Resources Plan of Andalusia Map the protected areas for mining Production of legal act for royalty management
Market	New funding instruments to foster mining
Technological	Improvement of Research and Investigation to mining

Andalucia, Spain

Overview of region characteristics

Mining characteristics deposits	Metallic and non-metallic: Cu, Zn, Pb, Sn, Sr, Au, Ag, Fe, F, Ba, industrial minerals, natural stone
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active an un-active mining industries in your region?	Information not provided

Barriers/bottlenecks

Cultural –	Conflicts of interest due to Natura 200 network, Mine closure and related loss of jobs, Restoration - court problems of mining projects have existed in the past (Los Frailes and Hornos Ibéricos), lack of good information provided by the media
Regulatory	National Mine Act too general and sometimes conflicting, Un-updated Mineral Resource Plan of Andalusia,



	<p>Land use planning policy conflicting with National Mine Act and Mineral Resources Plan of Andalusia</p> <p>Development of protected areas for mining to ensure mineral supply at different levels,</p> <p>Royalties from mining activities are not regulated so many possible benefits for regions have to be negotiated in a case by case basis</p>
Market	<p>Limited funding for circular business models</p> <p>Limited funding for sustainable practices</p> <p>Need for regulatory tools for restoration and social damages in end of cycle,</p> <p>New regulation on mining capacity (economic, technical and organizational)</p>
Technological	<p>No research group specific on mining</p>

Challenges

Cultural	<p>No Social License to Operate or related guidance documents or toolkits at national, regional or municipal levels, media education</p>
Regulatory	<p>Revision of the National Mine Act,</p> <p>Update of the Mineral Resource Plan of Andalusia,</p> <p>Revise land use planning policy,</p> <p>Development of protected areas for mining to ensure mineral supply at different levels,</p> <p>Development of Royalty strategy of use</p>
Market	<p>New regulation of economic instruments for mining</p> <p>Development of royalty strategy for mining</p>
Technological	<p>Lack of Research and Investigation capacities</p>

Opportunities

Cultural	<p>Development of SLO or related guidance documents</p>
Regulatory	<p>Production of update version of National Mine Act</p> <p>Production of the Mineral Resources Plan of Andalusia</p> <p>Map the protected areas for mining</p> <p>Production of legal act for royalty management</p>
Market	<p>New funding instruments to foster mining</p>
Technological	<p>Improvement of Research and Investigation to mining</p>



Aragon, Spain

Overview of region characteristics

Mining deposits characteristics	Non-metallic: C, NaCl, KCl
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active and un-active mining industries in your region?	Information not provided

Barriers/bottlenecks

Cultural	Conflicts of interest due to use, Lack of good information provided by the media
Regulatory	Revision of the National Mine Act, Update of the Mineral Resource Plan of Andalusia, revise land use planning policy, development of protected areas for mining to ensure mineral supply at different levels, Royalties from mining activities are not regulated so many possible benefits for regions have to be negotiated in a case by case basis
Market	Information not provided
Technological	Information not provided

Challenges

Cultural	No Social License to Operate or related guidance documents or toolkits at national, regional or municipal levels, media education
Regulatory	Revision of the National Mine Act, Update of the Mineral Resource Plan of Andalusia, Revise land use planning policy,



	Development of protected areas for mining to ensure mineral supply at different levels, Development of Royalty strategy of use
Market	Information not provided
Technological	Information not provided

Opportunities

Cultural	Development of SLO or related guidance documents
Regulatory	Revision of the National Mine Act, Update of the Mineral Resource Plan of Andalusia, Revise land use planning policy, Development of protected areas for mining to ensure mineral supply at different levels, Development of Royalty strategy of use
Market	Information not provided
Technological	Information not provided

Castilla-León, Spain

Overview of region characteristics

Mining deposits characteristics –	Metallic and non-metallic: W, Mg, Fe, U, C, Cu, Pb, Zn, Au, industrial minerals,
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active and un-active mining industries in your region?	Information not provided



Barriers/bottlenecks

Cultural	Conflicts of interest due to use Conflict due to mine closure, Lack of good information provided by the media
Regulatory	Revision of the National Mine Act and the law of Urbanism of Castilla-León, Royalties from mining activities are not regulated so many possible benefits for regions must be negotiated in a case by case basis
Market	Information not provided
Technological	Information not provided

Challenges

Cultural	No Social License to Operate or related guidance documents or toolkits at national, regional or municipal levels; conflicts due to loss of jobs, media education
Regulatory	Revision of the National Mine Act, Update of the Mineral Resource Plan of Castilla-Léon, Revise land use planning policy, Development of protected areas for mining to ensure mineral supply at different levels, Development of Royalty strategy of use
Market	Information not provided
Technological	Technologies more safe for people and environment

Opportunities

Cultural	Development of SLO or related guidance documents; development of safe to people, social and environmental responsible projects
Regulatory	Revision of the National Mine Act, Update of the Mineral Resource Plan of Castilla-Léon, Revise land use planning policy, Development of protected areas for mining to ensure mineral supply at different levels, Development of Royalty strategy of use
Market	Information not provided
Technological	Region with research capacity on advanced raw materials and geology



Centro, Portugal

Overview of region characteristics

Mining deposits characteristics –	Metallic, non-metallic, geothermic, energetic
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active and inactive mining industries in your region?	Quartzo Museum

Barriers/bottlenecks

Cultural	Conflicts of interest with citizens due to pollution problems
Regulatory	Companies are not obliged to use standard national code, which means there is no harmonization of data collected
Market	No use of mineral demand estimates by authorities
Technological	Lowering production costs, less energy consumption, higher recovery rate of minerals

Challenges

Cultural	Restoration and revitalization of old mining facilities, networking of mining regions in Portugal
Regulatory	No Centro Mining industry sectorial plan
Market	Use of estimates of demand by authorities
Technological	Lack of projects involving new technological processes in order to utilize the maximum amount of materials extracted from ore, tailings and dumps, as well as improvements in mining processes in terms of energy efficiency and safety. Needs for new mapping and prospecting processes, carried out in partnership between public and private institutions, in view of the synergies created for possible licensing processes, as well as monitoring, evaluation and environmental restoration



projects, in order to improve and foster the mineral resources of the Central region (including groundwater).

Opportunities

Cultural	Development of restoration and pollution control projects in olds mining facilities as well as development of mining archaeology; improvement of networking between mining regions
Regulatory	Development of Centro Mining industry sectorial plan
Market	Profitability over time
Technological	Development of projects involving new technological processes in order to utilize the maximum amount of materials extracted from ore, tailings and dumps, as well as improvements in mining processes in terms of energy efficiency and safety. Development of projects involving new mapping and prospecting processes, carried out in partnership between public and private institutions, in view of the synergies created for possible licensing processes, as well as monitoring, evaluation and environmental restoration projects, in order to improve and foster the mineral resources of the Central region (including groundwater).

Corwall & Isles of Scilly, UK

Overview of region characteristics

Mining deposits characteristics –	Metallic and non-metallic: Sn, W, Li, Ln, industrial minerals, China Clay
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active an un-active mining industries in your region?	The Wheal Jane Group, owns of the site, that consists of five interrelated businesses; Wheal Jane Ltd, Carnon Contracting, Wheal Jane Laboratory, Wheal Jane Consultancy and the South Crofty Collection. These businesses can work independently or in any combination to provide a one-stop-shop consultancy and contracting service covering land, property, construction and all post mining legacy issues.

Barriers/bottlenecks

Cultural	High contamination of soil and water from past mining projects leading to non-supportive population
-----------------	---



Regulatory	There is no evidence to report to a single international reporting, There is no UK regulatory system for mining, Royalties to grant exploration and mining licenses are determined by the mineral owner, but mining permit must be obtained from land planning authority
Market	Low procurement for materials Limited funding for circular business models Limited funding for sustainable practices
Technological	Information not provided

Challenges

Cultural	Compatible tourism and old mining facilities, high employment expectations and environmental stewardship requirements for new mining projects is high
Regulatory	Development of National mining Policy, adjustments on permitting and royalties use
Market	Information not provided
Technological	Information not provided

Opportunities

Cultural	Compatible tourism and old mining facilities, Implementation of SLO or related guidance documents for new projects, Development of new projects in old mining facilities where un-employment is high
Regulatory	Development of National mining Policy, Adjustments on permitting and royalties use
Market	Information not provided
Technological	High technological knowledge, training needs (re-cover of past mining employers)

Ireland, Ireland

Overview of region characteristics

Mining deposits characteristics –	Metallic and non-metallic: Znm Pb, Cu, Aum Ag, Li, Sn, Ta, PGE, REE, Fe, gemstones, industrial minerals
Does the region have processing?	Yes
Does the region have manufacturing?	Yes



Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active an un-active mining industries in your region?	Information not provided

Barriers/bottlenecks

Cultural	Conflicts of interest, No National Circular Economy and Resource Efficiency strategy
Regulatory	No direct minerals policy established, No concept of mineral safeguarding in land use planning, No Circular Economy and Resource Efficiency strategy
Market	Government authorities take into account future supply/demand needs
Technological	Information not provided

Challenges

Cultural	Information not provided
Regulatory	No direct minerals policy established, No concept of mineral safeguarding in land use planning
Market	Information about future mineral needs to regulate production and permitting
Technological	Information not provided

Opportunities

Cultural	Information not provided
Regulatory	Development of National Minerals Policy, Development of safeguard mineral zones in land use planning
Market	Government authorities take into account future supply/demand needs
Technological	Information not provided



Kosice, Slovakia

Overview of region characteristics

Mining deposits characteristics –	Mainly metallic: Mg, Au, Cu, Fe
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active and un-active mining industries in your region?	Information not provided

Barriers/bottlenecks

Cultural	Conflicts of interest
Regulatory	Land use planning detail at several levels , No CE policy, Update of National Raw Materials policy
Market	Incorporate demand and supply for decision making
Technological	Harmonization of geologic data gathering,

Challenges

Cultural	Information not provided
Regulatory	Implementation of the Kosice Raw Materials Policy
Market	Need for a governance system to incorporate demand and supply for decision making in mining exploitation Development of CE strategy in mining sector Update of National Raw Materials policy
Technological	Information not provided



Opportunities

Cultural	Information not provided
Regulatory	Implementation of the Kosice Raw Materials Policy Development of CE principles
Market	Develop governance system to incorporate demand and supply for decision making in mining exploitation Development of CE principles Update of National Raw Materials policy
Technological	Information not provided

Lapland, Finland

Overview of region characteristics

Mining deposits characteristics –	Metallic and non-metallic: Au, Cr, Ni, Cu, Co, PGM, industrial minerals, gemstones
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	National turnover of mining in 2018 was about 2 B€. Outokumpu Chrome Oy 542 M€, Agnico Eagle Finland Oy 201,7 M€, Boliden Kevitsa Mining Oy 284,4 M€
Accessibilities	All active mines easily accessible by roads.
Can you provide a list of the active and un-active mining industries in your region?	<p>Active mines:</p> <p>Outokumpu Chrome Oy, Kemi Mine, Kemi. Europe's only chromium mine. Agnico Eagle Finland Oy, Kittilä Mine, Kittilä, Europe's largest gold mine. Boliden Kevitsa Mining Oy, Sodankylä, nickel, copper, gold, platinum and palladium. SMA Mineral, Kalkkima, Tornio, dolomite quarry. SMA Mineral Ristimaa, Tornio, quartz quarry. Arctic Ametisti, Pelkosenniemi, Amethyst mine.</p> <p>Mining and exploration projects:</p> <p>Rupert Resources Oy, Sodankylä, gold. Hannukainen Mining Oy, Kolari, iron, copper, gold. AA Sakatti Mining Oy, Sodankylä, copper, nickel, PGE. Arctic Platinum Oy, Ranua, platinum, palladium, gold, copper, nickel.</p>



Mawson Oy, Ylitornio, gold, cobalt.

Barriers/bottlenecks

Cultural	Conflicts of interest
Regulatory	Facilitating investments, Improvement the permitting process, Region need to secure internal/local needs, Need of international standards compliance but no code specified in law
Market	Information not provided
Technological	Information not provided

Challenges

Cultural	Conflicts due to soil and water contamination and biodiversity protection, conflicts for different uses in protected areas due to local indigenous space reserves and reindeer farming
Regulatory	Securing labor supply to minerals sector, facilitating investments, improvement of the permitting process, region needs to secure internal/local needs, need of international standards compliance but no code specified in law
Market	
Technological	Development of new technologies that are more cost effective for the industry, lack of adequate testing and safeguards in pilot projects made

Opportunities

Cultural	SLO is already used in Lapland particularly due to the existence of the only indigenous people in EU (Sámi), creation of the Finnish Network of Sustainable Mining
Regulatory	Permitting process, regions regulations to secure local needs, specify international standard mining code in law
Market	Organization of the non-metallic and metallic sectors in new sustainable artic industry and circular economy mining cluster
Technological	Good deal of capacity in SLO research and technological issues, existence of a mining degree and mining related programs, better projected pilot projects in new technological fields



Overview of region characteristics

<p>Mining deposits characteristics</p>	<p>Multielement metal deposit [Cu, Ag, Re, Au, Pb, Pt, Pd, Mo, Ni ...] - Located in north-west part of Region (Legnica, Lubin, Głogó)</p> <ul style="list-style-type: none"> - Lignite (coal) - located in west part of Region (Bogatynia/Turoszów - south west, Legnica - north west) - Natural gas; deposit in north part of the region: Głogów - Góra - Milicz – Trzebnica - Construction stone (different types: granite, sandstone, limestone, etc..).Almost all region, highest concentration in central part of region: Strzegom - Strzelin (granite). - Rock raw materials: sands and gravels, quartz sands, basalt, granite, feldspar, serpentinite, quartz vein, dolomite, syenite, bentonites, ceramic and refractory clay, clayey building ceramics, porphyry, melaphyre, gneiss, migmatite, marble, limestone , sandstone, greywack, refractory quartzites, quartzite and mica schists, magnesites, gypsums and anhydrites - High-mineralised water - Deposits located in southern part of Region (Sudety Mountains) - gemstones are Czech garnet and moldavite used in jewellery
<p>Does the region have processing?</p>	<p>Mining</p> <p>Hydro metallurgy</p> <p>Pyro metallurgy</p> <p>Energy production</p> <p>Natural Gas deposit recognised, exploited in small scale (only for R&D scale)</p> <p>Mining</p> <p>Sashing/grinding</p> <p>Production of elements (stone slabs, gravestones, windowsills etc.)</p>
<p>Does the region have manufacturing?</p>	<p>Forging (preparation of moulders semi-products)</p> <p>Lot of private enterprises (incl. SME) working in construction stone. Two large clusters: Klaster Kamieniarski (Stone-masonry Cluster)</p> <p>Klaster Wałbrzyskie Surowce (Wałbrzych raw materials Cluster)</p> <p>Use of Water in Spa medicine – Bottled- Many local companies selling bottled mineral water.The most famous: “Staropolanka” “Długopolanka”,</p>



Market conditions	<p>Good market conditions</p> <p>Cu - 78% exported</p> <p>Ag - 99% exported</p> <p>Re - 99% exported</p> <p>Other - data n.a. but mostly produced for export</p> <p>Lignite is used locally</p> <p>Water – mainly local and national market.</p>
Accessibilities	<p>Mainly road - good accessibilities, however, the transport of rocks is difficult</p> <p>Bogatynia/Turoszów - good (open pit mine)</p> <p>Legnica - problematic (main deposit is located under the city with 150 thousands of inhabitants). New technologies of exploitation are minded (e.g. underground gasification)</p>
Can you provide a list of the active and un-active mining industries in your region?	<p>SPAs managed by Polska Grupa Uzdrowiskowa: https://uzdrowiska-pgu.pl</p>

Barriers/bottlenecks

<p>Cultural – please indicate if and which are present and score them from hesitant company culture, limited willingness to collaborate in the value chain; lacking consumer awareness and interest; operating in a linear system. Please give further details on the barriers you have chosen; other</p>	<p>Hesitant company culture (5)</p> <p>Limited willingness to collaborate in the value chain (4)</p> <p>Lacking consumer awareness and interest (2)</p> <p>Operating in linear system (3)</p> <p>The social status of a stonecutter and a stonemason is low. There is the lack of people willing to learn in the profession. The industry is perceived as non-modern and the work in the industry as a manual and heavy, associated with diseases and exhaustion of the body. Stereotypes are wrong, but quite firmly rooted in society.</p>
<p>Regulatory – please indicate if and which are present and score them from 1 (poor importance) to 5 (high importance): limited circular procurement, obstructing laws and regulations, lacking global consensus. Please give further details on the barriers you have chosen</p>	<p>Limited circular procurement (5) - In public procurement (and this is the huge part of orders for building stones such as curbs, flagstones, etc.)</p> <p>Obstructing laws and regulations (5)</p> <p>Lacking global consensus (5)</p> <p>Complicated formal, legal and environmental conditions regarding the commencement and conduct of mining activities.</p>



	Long-lasting procedures for starting mining operations (obtaining permits, decisions, etc.)
Market - please indicate if and which are present and score them from 1 (poor importance) to 5 (high importance): low virgin material prices, limited standardization, high upfront costs, limited funding for circular business models, limited funding for sustainable practices. Please give further details on the barriers you have chosen	<p>Low virgin material prices (5)</p> <p>Limited standardization (5)</p> <p>High upfront costs (5)</p> <p>Limited funding for circular business models (4)</p> <p>Limited funding for sustainable practices (5)</p> <p>“the lowest price criterion”. 4</p>
Technological - please indicate if and which are present and score them from 1 (poor importance) to 5 (high importance): remanufactured products, limited circular design, demonstration projects, lack of data (e.g. on impacts, on profitability). Please give further details on the barriers you have chosen	<p>Remanufactured products (5)</p> <p>Limited circular design (5)</p> <p>Demonstration projects (5) – eg on reuse of stone materials or in cement products, development of new concretes with new properties</p> <p>Lack of data (e.g. on impacts, on profitability) (4)</p>

Challenges

Cultural – please indicate if and give further details on the challenges you may have in your region.	<p>Lack of strong links and willingness to cooperate in the value chain as well as in the field of technology transfer from the R & D sector to the economy.</p> <p>Changing the image of stonework in the minds of Poles.</p> <p>Increasing knowledge and awareness about natural stone in society.</p>
Regulatory – please indicate if and give further details on the challenges you may have in your region.	<p>Until there are no bans on conducting business - as a result of new EU environmental and raw materials policies - there are no bigger challenges.</p> <p>Change in the manner of respecting the provisions of the Public Procurement Law.</p>
Market - please indicate if and give further details on the challenges you may have in your region.	<p>The extraction of lignite for energy purposes can clash with the European zero-emission policy.</p> <p>The market for Ag and Cu is shrinking. On the other hand, the market for other metals (like Re) is growing - which means possible perturbations in the situation of KGHM with an ambiguous direction.</p>



	<p>The increase in labor costs and the lack of employees may lead to an increase in production costs and affect competitiveness.</p> <p>The limitation is the lack of employees and not the lack of orders, at the moment.</p> <p>Replacement of conventional renewable energy sources.</p> <p>Minimization of machining costs.</p>
<p>Technological - please indicate if and give further details on the challenges you may have in your region.</p>	<p>New technologies guaranteeing the yield (to a larger extent than before) of rare metals from multielement ores are necessary. In addition, technologies that improve recovery rates (circular economy and urban mining).</p> <p>Reduction of harmful factors for man while working with stone (dusting, humidity, weight transfer).</p> <p>Mechanization (lack of people willing to work in masonry)</p> <p>Industry cooperation with Universities</p>

Opportunities

<p>Cultural – please indicate if and give further details on the opportunities you may have in your region.</p>	<p>High-quality research and scientific centres practically from the entire area associated with mining and practical use of raw materials. A wide network of potential co-operators - the machine industry is another smart specialization of the region, as well as chemistry.</p> <p>Due to the geographical distribution of resources, Lower Silesia is associated with stone processing. It has well-developed, strong plants and experienced staff. From 1945, the Polish tradition of stonemasonry was created, based on the achievements of previous hosts. Natural stone ceases to be a luxury good and becomes a common good.</p>
<p>Regulatory – please indicate if and give further details on the opportunities you may have in your region.</p>	<p>Implementation of the State's Raw Materials Policy (draft from 2018)</p> <p>Simplification of procedures related to launching new investment projects. Shortening the time of obtaining decisions, concessions, permits.</p>
<p>Market - please indicate if and give further details on the opportunities you may have in your region.</p>	<p>Demand for metals occurring in multielemental ores and rare earths.</p>



Technological - please indicate if and give further details on the opportunities you may have in your region.	<p>Life span of mining technologies - as all over the world - is quite long, which means that majority of mining companies work on old technologies (20- and more year old)</p> <p>Reduction of harmful factors for man while working with stone (dusting, humidity, weight transfer).</p> <p>Improve the technology of extraction and processing of raw materials, close cooperation between the industry and research / academic centers is necessary.</p>
--	--

North-West (Maramures), Romania

Overview of region characteristics	
Mining deposits characteristics –	Mainly metallic: Pb, Zn, Cu, Au, Ag
Does the region have processing?	Yes
Does the region have manufacturing?	No
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active and un-active mining industries in your region?	Information not provided

Barriers/bottlenecks	
Cultural	Information not provided
Regulatory	Minerals are not safeguarded in land use plans, No CE policy
Market	No use of mineral demand estimates by authorities, lack of efficient resource management,
Technological	There is centralised data collection process for mineral inventory but no harmonization procedures are used



Challenges

Cultural	Information not provided
Regulatory	Minerals are not safeguarded in land use plans,
Market	Deficient resource management policy, No CE policy
Technological	there is centralized data collection process for mineral inventory but no harmonization procedures are used

Opportunities

Cultural	Information not provided
Regulatory	Safeguard minerals areas in landuse plans, harmonization of data collection
Market	Government authorities take into account future supply/demand needs, Development of CE policy, Development of adequate management policies
Technological	Development of centralised system for data collection

North Karelia, Finland

Overview of region characteristics

Mining deposits characteristics –	Metallic and non-metallic: Cu, Zn, Tlc, Dol, Au, Ag, Ni, Co, industrial minerals
Does the region have processing?	Yes
Does the region have manufacturing?	No
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active and un-active mining industries in your region?	Information not provided



Barriers/bottlenecks	
Cultural	Conflicts of interest
Regulatory	No protection mechanisms for mining workers limited funding for circular business models and for sustainable practices Difficult permitting process No international standards for mineral and reserves - codes
Market	Balance between import and export of products to secure needs of local/national
Technological	Information not provided

Challenges	
Cultural	Secure conflicts and needs through development of SLO
Regulatory	Securing labor supply to minerals sector, Facilitating investments, Improvement the permitting process, Need of international standards compliance but no code specified in law
Market	Region need to secure internal needs
Technological	Information not provided

Opportunities	
Cultural	Development of SLO practices
Regulatory	Permitting process improvement Regions regulations to secure local needs, Specify international standard mining code in law
Market	Balance import and export
Technological	Information not provided

Saxony, Germany

Overview of region characteristics	
Mining deposits characteristics	Metallic and non-metallic: Sn, W, Li, F, Ga, Ln, REE, industrial minerals
–	



Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active an un-active mining industries in your region?	

Barriers/bottlenecks	
Cultural	Loss of industrial acceptance due to growing awareness of the public on environmental issues, Lack of good information provided by the media, Conflict of land uses by nature and cultural tourism
Regulatory	Increasing regional, national and EU regulations that has impact on acceptance of EU legal framework by SME's and local companies
Market	Profitability over time, Loss of domestic and foreign investors due to loss of industrial acceptance, Problems in obtaining and retaining professionals, Competition with other industries (e. automotive)
Technological	Mining recycling and decrease exploitation costs and security

Challenges	
Cultural	Weak networking of existing structures in university/non-university fields, No Social License to Operate or related guidance documents or toolkits at national, regional or municipal levels, Decrease of industrial acceptance
Regulatory	Land use planning policies categories and their types of use are not clear; Collection of data on mineral resources and reserves is not legally required (no standards - each regions uses its Federal codes), No waste and close-the-cycle management
Market	Profitability over time
Technological	Encourage additional stakeholders to contribute with their potential to existing structures (triple helix cluster)



Opportunities

Cultural	<p>To strengthen, expand and enable closer networking of existing structures in university/non-university fields,</p> <p>Improvement of current rating system for mining operation by people considering developing a SLO standards,</p> <p>Raise raw materials awareness (at school level),</p> <p>Increase transparency and improve public relations,</p> <p>Employ professional conflict management personnel to facilitate dialogue,</p> <p>Create focus groups on acceptance in the various industries</p>
Regulatory	<p>Land use planning policies improvement particularly categories and their types of use;</p> <p>Development of laws that oblige collection of data on mineral resources and reserves and the use of international standard codes,</p> <p>Development of waste and close-the-cycle management to make landfill superfluous,</p> <p>Implementation of the Saxon Raw Materials Strategy</p>
Market	<p>Developing economic capacities and expertise in Saxony's raw material economy</p>
Technological	<p>Developing scientific capacities and expertise in Saxony's raw material economy,</p> <p>Development of projects of mining recycling,</p> <p>Development of mining robots,</p> <p>Biomining (CE technique) and new technologies developed in advanced processing</p>

Stereia Ellada, Greece

Overview of region characteristics

Mining deposits characteristics –	Metallic and non-metallic: Al, Ni, Cr, industrial minerals
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Ni- 100% export
Accessibilities	Information not provided



Can you provide a list of the active an un-active mining industries in your region?	Information not provided
---	--------------------------

Barriers/bottlenecks

Cultural	Employment is more important than environment, No CE principles and lack of awareness from people are a constraint to CE.
Regulatory	No regulatory framework exists to foster Circular Economy, According to MIREU partners of SE region power of mining regulation should be in the control of regions
Market	Sustainable supply trough time
Technological	Environmental and energy saving technologies

Challenges

Cultural	No regulatory framework exists to foster Circular Economy
Regulatory	Land use planning policies categories and their types of use are not clear; Collection of data on mineral resources and reserves is not legally required (no standards - each regions uses its Federal codes)
Market	Profitability over time; Demand is not considered for extraction (which minerals, methods)
Technological	Lack of Environmental and energy saving technologies

Opportunities

Cultural	No need for social acceptance since employment is needed at higher degree, but may need environmental education for more conscient decisions
Regulatory	Land use planning policies improvement particularly categories and their types of use; Development of laws that oblige collection of data on mineral resources and reserves and the use of international standard codes
Market	Developing economic capacities and expertise in Sterea Ellada extraction economy
Technological	Development of a technological competitive cluster



Styria, Austria

Overview of region characteristics

Mining deposits characteristics –	Metallic and non-metallic: Fe, industrial minerals
Does the region have processing?	Yes
Does the region have manufacturing?	Yes
Market conditions	Information not provided
Accessibilities	Information not provided
Can you provide a list of the active an un-active mining industries in your region?	Information not provided

Barriers/bottlenecks

Cultural	Competing user interests, decrease in noise of operating mines close to village
Regulatory	Legal Land-use planning conflicts; Law does not obey to quantify neither mineral resources or reserves only map, Land use conflicts due to environmental legislation, The Austrian Mineral Resources Plan does not have any enforcement regulations to protect or safeguard the priority zones since spatial planning is the responsible body.
Market	Secure supplies of high quality mineral raw materials for the need of industry and competition with suppliers outside Europe
Technological	Need for new technologies to reduce noise of mining operations

Challenges

Cultural	Compatible tourism and old mining facilities, SLO is not used, but rather Social Acceptance, Involvement of the people on land use planning of the region/improvement of participatory process
Regulatory	Land use planning and reduction of conflicts with exploitation, Implementation of the Austrian Mineral Resources Plan at regional level
Market	Information not provided
Technological	Development of new techniques that reduce noise while operating mines close to villages



Opportunities

Cultural	Due to the long, positive historical mining legacy region stakeholders are in favor of mining, Development of tourist project in old mining facilities in a sustainable and innovative way (reshaping of old mining facilities for nature and walking/sports purposes)
Regulatory	New law that obliges to quantify mineral resources and reserves, Improve accessibility and finding conflict areas, Development of safeguard priority zones for mining in the region
Market	Information not provided
Technological	MUL high technology know how in: energy technology, resource management, safety engineering and risk management, mathematics, natural sciences and economics, development of noise reduction project



Common Scenarios Analysis

If we analyse the results section, we conclude that in fact that regions share a set of barriers, challenges and opportunities in Cultural, Regulatory, Market and Technological fields. In the next section we gathered which barriers, challenges and opportunities are the most common these 15 European Mining regions, in an attempt to contribute to jointly find solutions. In bold the most commonly mentioned aspects.

Cultural



Key expectation from populations around mining operations includes, jobs, economic development, environmental safety as well as safety for mining operators and villagers. New mining projects tend to trigger different dialogues than existing ones as these are important due to their impact on communities (MIREUa, 2019). However, older mining operations can themselves face different problems, such as communities that became aware of environmental problems, nonetheless according to this review is it more common than successful and transparent older mining operations get big support from local communities. The development of Social Licence to Operate and other guidance documents as well as using professional assistance for conflict mediation, seems to be the way forward that regions could use to overcome cultural barriers identified. The practice of transparency and development of restoration and pollution control projects in new and old mining facilities as well as new touristic and revitalization projects show that good examples exist from the most up-front mining regions that could serve as a source of inspiration and replication across Europe.

The media was also other barriers that was frequently mentioned by the regions that participated in this review, in fact, bad quality of information conveyed by the media generates conflicts between interested parties. Media coverage emphasizes the lack of transparency and communication from exploration, mining and recycling companies as well as accidents, whether inside or outside the companies (MIREUa, 2019). This fact is even more exacerbated by the fact that most media consumption is from internet, which lacks critical review by editors



or experts (Murgia et al, 2019). Media education was one of the aspects that was mentioned as needed by the great majority of regions that participated in this review.

Regulatory



The lack of National and or Regional mining strategies or plans seems to be common in the mining regions of that participated in this survey. Mining regions which do have plans seem to be more developed than the other. The development of such plans is considered a good way to organise the sector and its recurrent barriers: lack of mineral protected areas, lack of database collection system that is International and mandatory, lack of landscaping mining congruence planning. Regulatory barriers and the challenges that regions face seem to interact with other topology of barriers: cultural, due to conflicts of interest for and use; technological, due to lack of data and enforcement mechanisms to foster circular economy in the mining sector and also market, since funding instruments (e.g. taxation) seem to be important to trigger some possibly profitable mining projects.

The lack of Circular Economy plans at National and regional level is one of the most critical points that regions may commonly contribute to the implementation of Circularity and Sustainable mining in EU.



Market



The most common barrier mentioned by the regions was the lack of use of mineral demand estimates by government to ensure profitability over time, which in turn seem to be solved with the development of management and governance mechanisms that use mineral demand estimates. To achieve this the development of mandatory database systems is critical, which interlinks this barrier to regulatory barriers. Also, the existence of economic mining experts to develop appropriate mining strategies seem to interact with technological fields. The use of European networks of mining regions as well as research institutions could help overcome these barriers. Regions together can help critically address market barriers and contribute to sustainable profitability over time.



Technological



Barriers

- **Lack of harmonised and centralised data collection in International Standard**
- **Lowering production costs,**
 - Less energy consumption,
- **Higher recovery rate of minerals**
- Lack of research capacities in the regions
- **Environmental and energy saving technologies**



Challenges

- **Technologies more safe for people and environment**
- **Development of new technologies that are more cost effective for the industry,**
 - Lack of adequate testing and safeguards in pilot projects made
- Encourage additional stakeholders to contribute with their potential to existing structures (triple helix cluster)
- **Need for advance materials technologies to cooperate more in the business, science and government axis,**
 - Development of integrating systems for monitoring threats in the environment of a mining plant
- **Improve technologies for the recovery of useful materials**
 - Development of new techniques that reduce noise while operating mines close to villages



Opportunities

- Region with research capacity on advanced raw materials and geology
- High technological knowledge, training needs (re-cover of past mining employers)
- **Better projected pilot projects in new technological fields**
- Developing scientific capacities and expertise in regions raw material economy,
- **Development of projects of mining recycling,**
- **Development of mining robots,**
- **Biomining (CE technique)**
- **New technologies developed in advanced processing**
 - High research and development institutes dedicated to mining
 - Development of technological competitive cluster

The most frequently mentioned barriers are associated with the lack of harmonised and centralised data collection in International Standard mode, which have impact on other barriers: regulatory and market. Development and improvement of these systems, when they exist, is mandatory. Governance aspects may need to be looked in so that this barrier can be an opportunity to mining regions to grow in a more sustainable way. Development of projects in mining recycling, biomining and new technologies of advanced processing reveal the interest of the sector in working towards a more circular and sustainable mining sector. Also, the importance of well-designed pilot projects in mining facilities was mentioned by one of the more advanced regions which can be of interest to be used by others to overcome any possible future flaw in pilot project implementation.



Final Remarks

Figure 2 summarizes the key barriers and possible ways to overcome them seen by the regions that participated in this review.

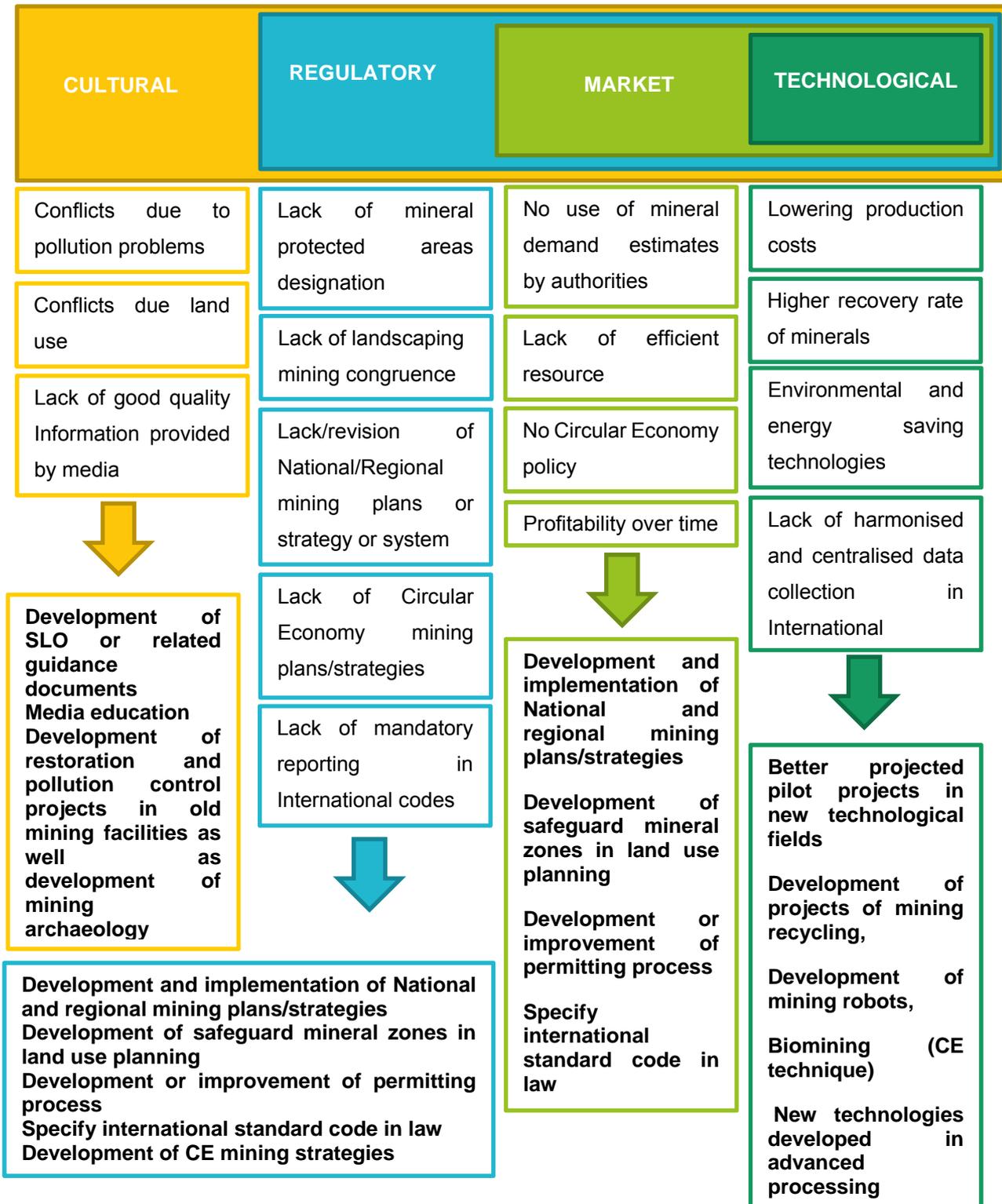


Figure 2 – Key barriers and possible ways to overcome them through the implementation of new opportunities.



According to Tayebi-Khorami et al (2019) cultural conflicts remain poorly understood in the mining sector, where costs of conflicts between community and companies in mining and gas sectors were not fully identified, while in the extractive companies, conflicts arise mainly due to environmental issues. This report identifies conflicts of several sources as barriers to mining projects. In such a scenario, regions may play an important role if starting to use new social approaches (SLO principles) to mining that may foster cultural acceptance of mining industry.

Regulatory and market barriers play an important, if not critical, role in establishing new paradigms and allowing innovative approaches to be implemented, since without a proper understanding of the economics as well as legislative and regulatory context, technically feasible solutions that deliver better outcomes can fail (Tayebi-Khorami et al, 2019). This report, indeed supports this view as we can see that regulatory aspects have spill over effects in market, technological and cultural barriers. Regions and the development of their CE and/or mining plans are essential to contribute to better and more robust legislative and governance sets that may lead to more profitable and less conflicting mining projects.

Results presented in this report show consistency with a recent study on Circularity in the Mining Industry (Kinnunen, 2019), where: 1) databases were identified as needed (especially those regarding tailings); 2) funding to SEMs and adequate financing were seen as having the potential to create the required actors to the value chains needed; 3) the need for institutions to remove barriers to CE; 4) permitting, legislation, cultural attitudes were identified to provide support for knowledge transfer, technology development and business ecosystem creation.

Regarding technological barriers and opportunities, the results of this report support Pomykala & Tora (2017) that mention that for the transition to circular economy in mineral processing, scientific research that allows for knowledge transfer between different segments of the mineral value chain is required. Sustainable mining, enhanced material recovery, better materials and product design and sustainable resource policies are all essential parts of the science to meet the demands of the circular economy in the mining sectors.

As a concluding remark of this report and looking forward into the future, it must be stated that the use of the results of this report should be used to improve/modify the inquiry that could be sent to a larger audience in Europe, e.g. through the European Association of Mining Industries, Metal Ores & Industrial Minerals or EIP on Raw Materials stakeholders. This would allow a bigger picture of the common scenarios for full circularity and sustainability implementation in the mining regions. Barriers and ways to address them are the main impediments to implementation of CE in the EU (Tayebi-Khorami et al, 2019).



Acknowledgements

Thanks are due to all mining regions that contributed to deliver the requested information, and special thanks are due to Lower Silesia for providing detailed information. Alexandra Ribeiro, FCT NOVA coordinator of REMIX project, is acknowledged not only by having chaired the workshop session organised at the Second Mining Conference (Wrocław, Poland, May 15, 2019) entitled “Common scenarios on the EU mining sector”, but also for having contributed with considerable literature, that made this report possible, since the majority of data of regions characterization was retrieved from the deliverables of MIREU project that were forward.

References

- Kinnunen P. (2019) *Towards Circular Economy in the Mining industry: implications of institutions on the drivers and barriers for tailing valorization*. Master Thesis, Faculty of Management and Business, Tampere University, Finland.
- Kirchherra J., L. Piscicellia, R. Boura, E. Kostense-Smith, J. Mullerb, A. Huibrechtse-Truijensb & M. Hekkert (2018) Barriers to the Circular Economy: Evidence from the European Union (EU) *Ecological Economics* 150: 264-272.
- Kirchherr, J., D. Reike & M. Hekkert (2017) Conceptualizing the circular economy: an analysis of 114 definitions. *Resour. Conserv. Recycl.* 127, 221–232.
- Murguia D., G. Tiess & MinPol (2019) MIREU report – Deliverable. 3.1 Review of the applicable regulatory and policy conditions in the MIREU regions – used to fill in regulatory barriers, challenges and opportunities.
- Murgia D., G. Tiess, P. Lesser & G. Poelzer (2018) MIREU report Deliverable. 4.1 Regional Cultural Identity and stakeholders mapping report – used to fill in cultural barriers, challenges and opportunities.
- MIREUa, 2019 Draft MIREU report Deliverable. 5.1. – Strategic analysis of EU regions and mining potential and opportunities within their RIS3 – used to fill barriers, challenges and opportunities in general.
- Pomykala R. & B. Tora (2017) Circular Economy in the Mineral processing *E3S Web of conferences* 18, 01024 Euromines Report.
- Tayebi-Khorami M., M. Edraki, G. Corder & A. Golev (2019) Re-Thinking Mining Waste Through an Integrative Approach Led by Circular Economy Aspirations *Minerals* 2019: 9, 296.



Annex – Inquiry Model



Common scenarios on the EU mining sector Regions as driving forces in implementation of Circular and Green Mining

This questionnaire is part of Interreg Europe REMIX project

It seeks to identify barriers, challenges and opportunities of EU mining regions. We thank you for completing all answers to the questions raised. The results will be used for improvement of Circular and Green Mining policies in the EU.

1. What is the mining region you work in?

2. What is the type of geologic resource your regions mostly explores?

- Non-metallic
- Metallic
- Energetic
- Geothermic
- Outro (especifique)

3. Does your region have processing (includes beneficiation and all metallurgic processes) of geologic resources?

- Yes
- No

If yes, which type?

4. Does your region have manufacturing (please refer if after processing there's any manufacturing present in the region that uses the resource)?

- Yes
- No

If yes, please specify



5. Where are the products sold?

- National market
- European market
- Non-European (external) market

In case export of material can you please specify the share of import/export material?

6. Is there good accessibility to run off the materials?

- Yes
- No

7. Which main accessibility are used?

8. Are there any of the following cultural barriers to Circular Economy applied to mining processes at your region? Please rank importance from 1 to 5, being 1 poor importance and 5 highest importance

	1	2	3	4	5	Don't know
Hesitant company culture - companies do not see circular economy as potential in-come	<input type="radio"/>					
Limited willingness to collaborate in the value chain	<input type="radio"/>					
Lacking consumer awareness and interest	<input type="radio"/>					
Operating in linear business model system	<input type="radio"/>					

Outro (especificue)

9. Are there any of the following regulatory barriers to Circular Economy applied to mining processes at your region? Please rank importance from 1 to 5, being 1 poor importance and 5 highest importance

	1	2	3	4	5	Don't know
Limited circular procurement	<input type="radio"/>					
Obstructing laws and regulations	<input type="radio"/>					
Lacking global consensus	<input type="radio"/>					

Outro (especificue)



10. Are there any of the following market barriers to Circular Economy applied to mining processes at your region? Please rank importance from 1 to 5, being 1 poor importance and 5 highest importance

	1	2	3	4	5	Don't know
Low virgin material prices	<input type="radio"/>					
Limited standardization of new circular products	<input type="radio"/>					
High up-front costs	<input type="radio"/>					
Limited funding for circular business models	<input type="radio"/>					
Limited funding for sustainable resources	<input type="radio"/>					

Outro (especifique)

11. Are there any of the following technological barriers to Circular Economy applied to mining processes at your region? Please rank importance from 1 to 5, being 1 poor importance and 5 highest importance

	1	2	3	4	5	Don't know
Remanufactured products	<input type="radio"/>					
Limited circular design	<input type="radio"/>					
Demonstration projects	<input type="radio"/>					
Lack of data (e.g. on impacts, profitability)	<input type="radio"/>					

Outro (especifique)

12. Are there any cultural challenges at your mining regions? Please specify their type

Yes

No

If yes, please specify

13. Are there any cultural opportunities at your mining region?

Yes

No

If yes, please specify



14. Are there any regulatory challenges at your mining region?

Yes

No

If yes, please specify

15. Are there any regulatory opportunities at your region?

Yes

No

If yes, please specify

16. Are there any market challenges at your mining region?

Yes

No

If yes, please specify

17. Are there any market opportunities at your region?

Yes

No

If yes, please specify

18. Are there any technological challenges at your mining region?

Yes

No

If yes, please specify

19. Are there any technological opportunities at your mining region?

Yes

No

If yes, please specify