Minerals Policy Guidance for Europe

Innovative Waste Management and Mine Closure

Deliverable 5.1

Policy and legislation framework for innovation in waste management and mine closure

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1. Background and objectives

MIN-GUIDE: a brief introduction

The Horizon 2020-funded MIN-GUIDE project aims to support the secure and sustainable supply of minerals in Europe through the development of a major new online repository: the MIN-GUIDE Minerals Policy Guide outlining guidance and the latest in good practice for minerals policy decision makers. The project's key objectives are (1) to provide guidance for EU and EU Member States minerals policy, (2) to facilitate minerals policy decision making through knowledge co-production for transferability of best practice minerals policy, and (3) to foster community and network building for the co-management of an innovation-catalysing minerals policy framework. MIN-GUIDE will profile relevant policy and legislation in Europe, identifying innovation-friendly good practice through quantitative indicators, qualitative analysis of country-specific framework conditions, and the compilation of minerals statistics and reporting systems. These insights will form the basis for the project's key output, an online Minerals Policy Guide (referred to in this document as 'the Policy Guide').

The project is split across 8 work packages (WPs) (see Table 1 below). The content-rich work packages are WPs 2-6: WP2 will produce a comprehensive and well-structured knowledge repository of EU level and EU Member States' mineral policies and governance frameworks; WPs 3-5 will identify, benchmark, and elaborate good practice on policy innovation capacity according to the different activities along the whole mining value chain (permitting, exploration, extraction, cross-border exploitation, processing, waste management, recycling, remediation and mine closure); and WP6 will review the mineral data base and recommend standardisation and systematic reporting requirements for EU Member States.

Table 1: The MIN-GUIDE work packages

Common approach	WP1	Minerals policy guide development and conceptual basis
Core content	WP2	Stock-taking of EU and EU MS mineral policy and legislation
	WP3	Innovative exploration and extraction
	WP4	Innovative processing
	WP5	Innovative waste management and mine closure
	WP6	Raw materials knowledge and information base
Cross-cutting management and engagement	WP7	Stakeholder management, communication and dissemination
	WP8	Project management

Work package 5 and objectives

WP5 investigates how innovation processes in the waste management and mine closure are functioning in the different EU Member States and on EU level and how they are supported or inhibited by national and European policy and legislation. The focus of WP5 is set on policies concerning waste management and mine closure. WP5 encompasses a multi-stage methodology for the compilation of mineral policies and legislation with elaboration of good practices and ways of fostering innovation in the context of waste management and mine closure.

The scope of this deliverable is to make a preliminary reporting of the policy framework in EU and Member States level that foster or inhibit the innovation in Waste Management and Mine Closure. In addition, specific innovation cases are presented and some industry good practices in Waste Management and Mine Closure are identified. Deliverable 5.1 forms the basis for the comprehensive and in-depth analysis of industry cases and their relation to EU MS policy frameworks in Deliverable 5.2. The explicit analysis of relevant policies, innovation cases and good practises with the input from interviews, questionnaires, and the 4th Policy Laboratory Workshop on Waste Management and Mine Closure will feed into a final project report.

Definitions

Deliverable 5.1 innovation categories are in line with those defined in Deliverable 1.1 Min-Guide Common Approach:

1. **Product innovation**: introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses, e.g. a new material or new use for a material (e.g. tailings).
2. **Process innovation**: implementation of a new or significantly improved production or delivery method, e.g. techniques, equipment, software. Also within this broader category we include and highlight input innovation: new sources of inputs (e.g. mining waste).
3. **Marketing innovation**: implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing (e.g. new communication tools for raising awareness and building public acceptability).
4. **Organisational innovation**: implementation of new organisational methods in business or policy practices, workplace organisation or external relations (e.g. environmental management and auditing systems; supply chain management; industrial symbiosis; closer cooperation between different ministries on minerals policy design and delivery).
5. **System innovation**: (e.g. innovations which result in significant improvements in more than one step of the supply chain, or in another sector)

In addition, a short description about the types of Mining Waste and Mine Closure is given below:

Mining Waste: Mining-selected waste (or simply mining waste) can be defined as a part of the materials that result from the exploration, mining and processing of substances governed by legislation on mines and quarries. It may consist of natural materials without any modification other than crushing (ordinary mining waste, unusable mineralized materials or of natural materials, processed to varying degrees during the ore-processing and enrichment phases, and possibly containing chemical, inorganic and organic additives. Overburden and topsoil are classified as waste.

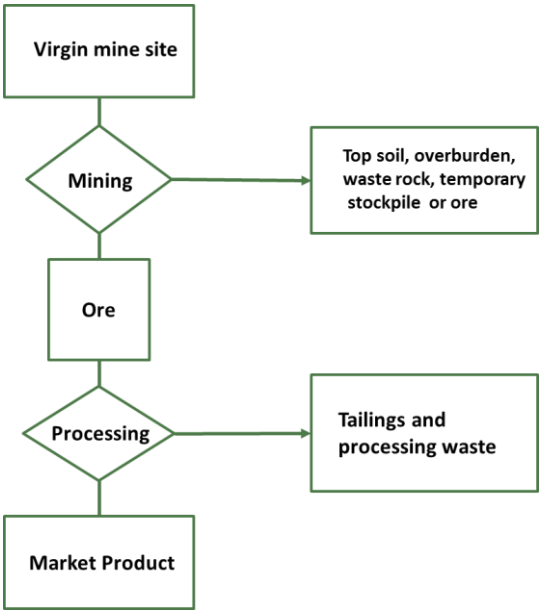

Figure 1.Flowchart of Mining Waste generation

To sum up, WP5 focuses on the wastes produced within the boundaries of the mining and beneficiation activities, while WP4 is dealing with the wastes derived from the processing plants.

Mine Closure: When deposit's resources are depleted or no longer economically viable, the mine ceases operation. At this point, the final stage of site rehabilitation begins. The aim is to remove or neutralize contaminants from the site so that it may begin a new life in a non-mining capacity.

2. Innovations in Waste Management and Mine Closure

The purpose of this chapter is to present a list of relevant innovations reported in the Waste Management and Mine Closure fragment of the raw materials sector value chain. Innovations are categorised for Waste Management and for Mine Closure practises separately and are presented in Table 2 and Table 3, respectively. In these Tables four categories are analysed:

- **Innovation:** Main reference title for the respective innovation
- **Description:** A brief overview of the innovation and the connection to the specific fragment of the raw materials value chain
- **MIN-GUIDE innovation category:** Internal categorisation as defined in chapter 1.
- **Impact:** Main impact category (as defined in D1.1 of MIN-GUIDE) that the innovation introduction had accomplished.

In both categories of Waste Management and Mine Closure, most innovations are related to a Process Innovation category with mainly an impact in environmental and social aspects. Sound waste Management, valorisation of wastes into added value products and introduction of innovative technologies is apparent to lead to better environmental conditions in mining operations with subsequent benefits to social acceptance. In parallel, Mine closure good practises with alternative to conventional approach lead by clear legislation is the key solution to make mining rehabilitation an added value for the sector and additionally keep alive the economy for the local economy and enhance social acceptance.

Table 2 summarises relevant innovations for Waste Management.

Table 2. Innovations in Waste Management

Innovations in Waste Management	Description	MIN-GUIDE innovation category	Impact
Alternatives to cyanide[1]	• Treatment using hydrogen peroxide • SO2/Air detoxification processes • Biological oxidation • Advanced chemical recycling • Catalysis, bio-oxidation and photolysis detoxification	Process innovation	Environmental (i.e Avoid a potentially costly chemical-induced ecological disaster) Social (i.e Public Acceptance)
Passive Mine Drainage Treatment Systems PMDTS[2]	One innovative technique for the treatment of ARD has been the use of natural and artificial wetlands as a biological pollution abatement process. The focus of these passive mine drainage treatment systems (PMDTS) is to apply bio-geochemical water treatment mechanisms	Process innovation	Environmental (i.e Treat the metals and acidity more effectively) Economic (i.e

	at or near the source of the mine drainage to concentrate and immobilize metals and raise pH. Prototype PMDTS have been constructed in Colorado, Pennsylvania, and West Virginia, Canada, South Africa and Australia. The cost and maintenance of a PMDTS is a fraction of that of a conventional treatment system.		Comparable cost with conventional systems)
FLAC 3D Modeling Tool[3]	Development of advanced software in numerical simulation: FLAC3D (Fast Lagranian Analysis of Continua in 3 Dimensions) is numerical modeling software for geotechnical analyses of soil, rock, groundwater, constructs, and ground support. Such analyses include engineering design, factor of safety prediction, research and testing, and back-analysis of failure. Continuum analysis can be applied to engineering design of civil, mining, and geotechnical excavations (e.g., slopes, tunnels, caverns, stopes, etc.) and constructs (dams, foundations, footings, walls, etc.) in soil, intact rock, and rock masses (i.e., heavily jointed rock).	Process innovation	Social (i.e Health and Safety for both workers and local community)
Mine back filling technologies[4]	Mine backfilling can play a significant role in the overall operation of a mine. In the mining industry, when underground ore bodies are extracted, very large voids are created, which must be backfilled. The backfilling strategies deployed often make use of the waste rock or tailings that are considered by-products of the mining operation. This is an effective means of tailing disposal because it negates the need for constructing large tailing dams at the surface.	Product innovation Process innovation	Environmental (i.e smaller environmental footprint) Economic (i.e less constructive cost for Tailings Storage Facility)
Using Hydrometallurgical mining processes instead of Pyrometallurgical methods[5]	Compared with pyrometallurgical processes, hydrometallurgy is much more environmentally friendly. The volume of gaseous pollutants liberated into the atmosphere is only a fraction of what would be generated during pyrometallurgical processes, and emissions of sold particles are comparatively non-existent. So hydrometallurgical mining processes decrease the production of gas and solid pollutants into the atmosphere and maximise the recirculation of solvents at every level of waste water treatment. The extra electrowinning of metal using the circular hydrometallurgical process ensures that the maximum amount of mined metal is recovered.	Process innovation	Environmental (i.e Minimization of Pollution)
High-tech flue gas desulphurization (acid gas scrubbers)[6]	Desulphurization equipment is mentioned as being conventional end-of-pipe remedies. However, the overall effectiveness of scrubbing equipment makes them more of a preventative	Process innovation	Environmental (i.e High environmental equipment

	strategy. Setups use lime slurries that routinely remove 90 percent of SO2 from flue gases and up to 99 percent removal can be achieved by using magnesium-enhanced lime and operating at appropriate pH and liquid-to-gas ratios. In a typical scrubbing process, high temperature combustion gases rise upwards through a smelting tower, and enter the scrubber, which quenches the flue with streams of lime rich solution. The gas then proceeds upwards through a series of spray healers that introduce a uniform liquid flux of droplets. These alkaline slurries, in effect, chemically neutralize the acid gas before it is released into the atmosphere.		efficiency)
Wastewater treatment technologies[6]	An almost equally serious water pollution problem confronting mining operations is contamination from heavy metals. Although trace quantities of these heavy metals occur naturally in the environment, mining and smelting processes increase their "loadings" to toxic levels. The passive approaches (e.g. naturally occurring geochemical and biological processes) that have been traditionally used by the mining industry to tackle these problems have been unable to effectively prevent environmental damages. A number of advanced wastewater treatment technologies, however, have emerged in recent years that more effectively mitigate these water pollution problems. These include: • Electrochemical methods • Plasmotechnologies • Membrane filtration • Evaporation/Crystallization • Biodegradation processes • Chemical precipitators	Process innovation	Environmental (i.e Improved water quality)
"Source Control" Measures[7]	Preventing the formation or the migration of AMD from its source is generally considered to be the preferable, given the axiom that "prevention is better than Cure". • Flooding/ sealing of underground mines • Underwater storage of mine tailings • Land-based storage in sealed waste heaps • Blending of minerals waste • Total solidification of tailings • Application of anionic surfactants	Process innovation	Environmental (i.e Tailings Control measures)

	• Microencapsulation (coating)		

Relevant innovations with Mine Closure are compiled in the Table 3.

Table 3.Existing innovations in Mine-Closure

Innovations in Mine Closure[8]	Description	MIN-GUIDE innovation category	Impact
Multi-layer Barrier	When sulphide minerals are exposed to air and natural elements, they produce acids that penetrate the ground and contaminate groundwater. A capillary barrier covering (multi-layer covering), controls the acid mine drainage emanating from tailings pond by shielding the problem minerals from the elements.	Process innovation	Environmental (i.e Pollution prevention)
Constructed Wetlands	Wetlands have the ability to remove metals from mine site effluents and neutralize their acidity. Since these ecosystems are self-regulating, they may represent a long-term solution to acid mine drainage. Constructed wetlands comprise vegetation (reeds and cattails) and bacteria that uptake contaminants. The construction of these artificial wetlands is a complex process, however and the bacteria require nutrients to perform their function as decontaminators. New methods consist of pouring biodegradable oils and waxes on top of contaminated waters. These waxes and oils provide food for selected bacterial populations, which induce precipitation of minerals at the bottom of the basin.	Process innovation	Environmental (i.e Environmental improvement: biodegradable food the bacteria-decontaminator)
MMS Cyanide Destruction Process (MMS CN-D™ Process)	When gold is very fine-grained, one of the only feasible extraction methods is to mix it with cyanide, a toxic chemical responsible for major incidences of pollution. Cyanide management necessarily constitutes an important factor in all processing operations of this kind. A new cyanide destruction was devised by Maelgwyn Mineral Services (MMS CN-D process), which also allows any remaining gold in the residue to be recovered. The cost of the MMS CN-D process is significantly less than that of competing processes.	Process innovation	Environmental (i.e Important cyanide destruction levels are achievable) Economic (i.e Lower cost in comparison with other processes)
Biodegradable Explosives	An environmentally friendly "biodegradable explosive", was achieved by adsorbing Bacillus subtilis GN spores onto the wood flour, an ingredient of the explosive. The residue from explosives	Product Innovation	Environmental (i.e Biodegradable

	contributes to mine site pollution. To combat this problem, strains of the Bacillus subtillis GN bacterium were selected for their ability to decompose explosives in only a few days.		product)
Georadar	Georadar is a technology that emits radar waves into subsurface. Like an aboveground radar, a georadar unit emits short, high-powered waves in the direction of the intended target. It receives signal echoes that analyzed to determine the characteristics of the object. The depth range is up to several meters below the surface. This method can be used to determine the soil structure, particularly that of permafrost in arctic environments, or to monitor changes over time in underground contamination by using the device to conduct periodic surveys over the ground surface.	Process innovation	Environmental (i.e control measures) Social (i.e Post mine disaster pollution monitoring)
Geotextile Separators	Geotextiles are films composed of a screen, woven or not, made of synthetic material. Their main role is to create a physical barrier between the ground and the materials stored in or used to construct a facility or structure. At a mine site, they are particularly used for ore storage areas. The barriers allow water to flow through, but stops fine particles in the underlying natural environment from entering the storage area. Another application is to prevent clogging in drains and drainage systems. Geotextiles thus act as separators or anti contaminants and they can also be used to protect mine tunnels. Geotextiles can be reinforced by new structural elements that form a semi-rigid lattice.	Product innovation Process innovation	Environmental (i.e Water treatment, reduction of contamination) Social (i.e Health and Safety)
Hydroseeding	A mine site must be landscaped both during production and after it closes. A planting process known as hydroseeding sprays a slurry of fertilizer, seeds, and water onto the ground to make the grass grow.	Process Innovation	Social (i.e Land reclamation)
Solar Panels for Tailings Sites	Mine tailings can cover considerable amounts of land. They are difficult to rehabilitate. Reforestation is the most commonly attempted remediation measure. An innovative idea has been recently developed about using old tailings sites as solar farms. The acid generating waste at the Quest mine in New Mexico is now fitted with 173 solar cell panels that should produce about 1 MW of energy.	Organizational innovation	Economic (i.e Land reclamation for economic reasons)
Peat and Sand Filters	Wastewater can be filtered through peat to reduce acidity and eliminate up to 90% of biodegradable organic matter and 99% of pathogenic organisms (coliforms)	Process Innovation	Environmental (i.e Water treatment)
Geotube	A geotube is a tubular polypropylene bag used for dewatering and sludge drying at water-treatment	Process	Environmental (i.e Water

	facilities. Geotubes come in various sizes (from 5 to 100m long) and are filled via cyclic or continuous pumping, with or without the addition of a polymer flocculant. Dewatering is accomplished by filtration, there by capturing the solids (heavy metals and nutrients) in the bag. Clear water flows out through the pores of the geotubes, and the solids are consolidated through desiccation (drying). Geotubes reduce the volume of waste to be treated by up to 90%.	Innovation	treatment)
Jarofix - secondary raw material production	Processing zinc ores produces a residue known as jarosite. In 1998, CEZInc of Valleyfield developed a process that physically and chemically stabilizes the residue. Once dried, the resulting mixture has a consistency similar to clay. Since Jarofix is compact, easy to dig into, and chemically stable, it constitutes an excellent filler material.	Product innovation	Environmental (i.e Land reclamation) Economic (i.e Turning wastes into valuable secondary raw material)
Reusing Bauxite Waste	Bauxite residues can be processed and transformed into marketable products: Red Sand (used in backfill, road construction, etc.), Red Lime (for neutralizing acidity, controlling pH), Alkaloam (for enriching agricultural soils, quickly lowering soil pH, and reducing migration of soil nutrients into ground and surface water).	Product Innovation	Environmental (i.e new products with environmental implications) Economic (i.e market product)
Neutralization of tailings	To reuse mine tailings, they must first be stabilized. Tailings can be mixed with lime, ashes, wood shavings, cement, or other types of material to make a paste that can serve as a waterproof barrier or as backfill.	Product Innovation	Environmental (i.e reduce the amount of waste)
Reusing Mine Tailings	Some companies use the tailings from active mines to treat contaminated soil. Tailings act as an oxygen barrier and stem the flow of contaminated drainage water by sequestering polluted sediments.	Product innovation	Economic (i.e market product)

3. Innovation and Policy

General Drivers and Barriers in the Waste Management Sector

The role of innovation for economic growth has been acknowledged widely in academic and policy circles. How to best foster innovation, therefore, has been a critical question over recent decades.

Regulation as 'the rules of the game' and the functioning of framework conditions may have a driving, hampering, or neutral function for innovation. Trying to identify the relevant framework conditions for a given problem analysis (i.e., the context of either a specific regulation in relation to its objective or the context of a given problem), enables the policy maker to broaden their view and may be helpful for setting priorities in terms of trying to redesign regulations that are hampering innovation.

Analysing drivers and barriers for the creation of new markets, products and services, there is a longer list of factors that can influence innovation. The factors are classified under four main headings:

- Public policy governance
- Economic and market
- Micro-economic R&D capabilities
- Socio-cultural

Several studies have provided greater insights into the interplay of regulation and innovation.[9]

Table 4.Drivers and Barriers to Innovation in Waste Management sector related with general sector governance

Drivers	Barriers
Innovation procurement	Governance structures (e.g., monopolies, ownership structures)
Standardization	
Demonstration projects (good examples need widespread dissemination)	Lack of coherence with other existing regulations
Tax incentives	
Labelling (awareness raising and information for the general public)	Trade agreements
Prototyping	
Harmonization	Lack of adequate performance/ quality monitoring

Impact of EU Policies on Innovation in the Raw Materials Sector

The EU, recognising the importance of sustainable and secure supply of raw materials for industry aims to address the issue of raw materials scarcity from an innovation perspective. The EIP focuses on the pillars of domestic supply and reducing demand (i.e primary production through recycling). The EIP has accordingly developed a threefold strategy for innovation pathways:

- Alternate or substitute away from scare resources by finding alternative, less scarce materials;
- Recycle more materials already in circulation, or recycle them more efficiently by stimulating innovation in recycling technology;
- Extract more raw materials; increase domestic production and innovate on mining and extraction technologies

EU policies and legislation related to Waste Management and Mine Closure

The aim of this chapter is to identify and report those policies and legislations that fall under the Waste Management and Mine Closure element of the raw materials value chain.

Table 5.European Commission Directives related with Waste Management and Mine Closure

ID	TITLE
Dir. 2006/21/EC	Directive on the **management of waste from extractive industries**
Dir. 92/91/EC	Council Dir. on the minimum requirements for **improving the safety and health protection of workers** in surface and underground mineral-extracting industries
Dir.2010/75/EU	Dir on **industrial emissions** (integrated pollution prevention and control)
Dir.2000/60/EC	Dir. establishing a framework for Community action in the field of **water policy** (EU Water Framework Directive)
Dir. 2014/52/EU	Dir. on the assessment of the **effects of certain public and private projects on the environment** (EU Environmental Impact Assessment (EIA) Directive)
Dir.2002/49/EC	Dir. relating to the **assessment and management of environmental noise**
Dir.2012/18/EU	Dir. on the control of **major-accident hazards** involving dangerous substances
Dir.2006/118/EC	Dir. on the **protection of groundwater** against pollution and deterioration
Dir.2003/4/EC	Dir. on **public access to environmental information**

Dir. 2003/35/EC	Dir. providing for **public participation** in respect of the drawing up of certain plans and programmes relating to the environment

Table 6.European Commissions Decisions related with waste from extractives industries

ID	TITLE
2009/335/EC	COMMISSION DECISION on technical **guidelines for the establishment of the financial guarantee** in accordance with Directive 2006/21/EC of the European Parliament and of the Council concerning the management of waste from extractive industries
2009/337/EC	COMMISSION DECISION on the definition of the **criteria for the classification of waste facilities** in accordance with Annex III of Directive 2006/21/EC of the European Parliament and of the Council concerning the management of waste from extractive industries
2009/358/EC	COMMISSION DECISION on the harmonization, the regular transmission of the information and the questionnaire referred to in Articles 22(1)(a) and 18 of Directive 2006/21/EC of the European Parliament and of the Council on the management of waste from extractive industries
2009/359/EC	COMMISSION DECISION completing the **definition of inert waste** in implementation of Article 22(1)(f) of Directive 2006/21/EC of the European Parliament and the Council concerning the management of waste from extractive industries
2009/360/EC	COMMISSION DECISION completing the **technical requirements for waste characterization** laid down by Directive 2006/21/EC of the European Parliament and of the Council on the management of waste from extractive industries

Table 7.European Commissions extra documents related with Waste Management and Mine Closure

ID	TITLE
Resolution	**Ban on use of cyanide mining technologies** European Parliament resolution of 5 May 2010 on a general ban on the use of cyanide mining technologies in the European Union
Policy Strategy	Mediterranean Action Plan (MAP)
Methodological Guidance Note	**Preparing a Waste Management Plan**[10]
Reference Document	**Best Available Techniques for Management of Tailings and Waste-Rock** in Mining Activities[11]

4. Good Practice examples

One of the fundamental aspects of WP5 is to present and analyse good practises that are being implemented in some EU Member States. In addition, not good practises will be analysed in Deliverable 5.2 in order to recognise the reasons behind that and propose a roadmap for turning the situation in a good practise. The good practises related to Waste Management and Mine Closure are driven either Policy or Industry driven.

- **Policy driven good practices.** Good, transparent and clear legal framework that facilitates the innovation in Waste Management and sets clear rules and innovative approach in Mine Closure practises. Examples like that of Portugal where DGEG formulated a roadmap to rehabilitate all the Closed Mines with a clear description in legal framework and with the establishment of a subsidy company to execute the rehabilitation plan is one of the good practises. Cornwall Mining Heritage in UK, Geopark and Old Mine Science and Art Center in Poland, Cultural and Technological Park of Lavrion in Greece are some of the good practises that will be examined and analysed in depth in upcoming reports of WP5.
- **Industry driven good practices.** Throughout EU there are numerous good practises in Waste Management and in Mine Closure practises bases on the Social Corporate Responsibility of the respective Industry and on their innovation approach. In Table 8 are listed some indicative examples of Industry driven good practices. The list will be enlarged and analysed in depth in the upcoming deliverables of WP5.

Table 8.Good Practices examples in Waste Management and Mine Closure.

Country	Operation	Type	Owner
Ireland	Lisheen Mine	Lead and Zinc Mine	Vedanta Resources Zinc International
Ireland	Galmoy Mine	Lead and Zinc Mine	Lundin Mining Corp.
Germany	Prosper-Haniel Mine	Coal Mine	*RAG-Stiftung* (English: *RAG-Foundation*)

5. Conclusions

The scope of WP5 is to investigate how innovation processes in the waste management and mine closure are functioning in the different EU Member States and on EU level and how they are supported or inhibited by national and European policy and legislation. WP5 encompasses a multi-stage methodology for the compilation of mineral policies and legislation with elaboration of good practices and ways of fostering innovation in the context of waste management and mine closure.

This deliverable provides a preliminary reporting of the policy framework in EU and Member States level that foster or inhibit the innovation in Waste Management and Mine Closure. In addition, specific innovation cases are presented and some good practices in Waste Management and Mine Closure are identified. Deliverable 5.1 forms the basis for the comprehensive and in-depth analysis of industry cases and their relation to EU MS policy frameworks in Deliverable 5.2. The explicit analysis of relevant policies, innovation cases and good practises with the input from interviews, questionnaires, and the 4th Policy Laboratory Workshop on Waste Management and Mine Closure will feed into a final project report.

In this report, a list of relevant innovations is reported for the Waste Management and Mine Closure fragment of the raw materials sector value chain. Innovations are categorised for the Waste Management practises and for the Mine Closure separately and analysed in Table 2 and Table 3 respectively. Most innovations have mainly an impact in environmental and social aspects. Sound waste Management, valorisation of wastes into added value products and introduction of innovative technologies is apparent to lead to better environmental conditions in mining operations with subsequent benefits to social acceptance. In parallel, Mine closure good practises with alternative to conventional approach lead by clear legislation is the key solution to make mining rehabilitation an added value for the sector and additionally keep alive the economy for the local economy and enhance social acceptance.

One of the fundamental aspects of WP5 is to present and analyse good practises that are being implemented in some EU Member States. The good practises related to Waste Management and Mine Closure are driven either Policy or Industry driven. **Policy driven good practises** are those based on a good, transparent and clear legal framework that facilitates the innovation in Waste Management and sets clear rules and innovative approach in Mine Closure practises. Examples like that of Portugal where DGEG formulated a roadmap to rehabilitate all the Closed Mines with a clear description in legal framework and with the establishment of a subsidy company to execute the rehabilitation plan is one of the good practises. Cornwall Mining Heritage in UK, Geopark and Old Mine Science and Art Center in Poland, Cultural and Technological Park of Lavrion in Greece are some of the good practises that will be examined and analysed in depth in upcoming deliverables of WP5. **Industry driven good practices** are those coming from the Social Corporate Responsibility of numerous EU Industries with innovative approach. In Table 8 are listed some indicative examples of Industry driven good practices, where rehabilitation went beyond legislation minimum requirements.

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