MinLand: Mineral resources in sustainable land-use planning

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Topic: SC5-15d - Linking land use planning policies to national mineral policies

Deliverable 4.3 Comparison of mineral land use vs. other land use and their integration

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Content

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1. Introduction into Comparison of Mineral Land Use vs. other Land Use and their Integration

(Katharina Gugerell, Jorge Carvalho and Krzyzstof Galos)

1.1 Objective of the Task

The 4th work package of the MINLAND project is an evaluative work package, synthesizing and evaluating data mapped and collected by the MINLAND partners in the previous work packages 2 and 3. It is considered to provide an understanding about elements of land-use practises and governance mechanisms on different spatial levels (see D.4.2 'Land Use Policies and Valuation of Land') and providing an in-depth analysis of valuation of land, including the valorisation and classification schemes, including environmental and social valuation criteria, next to traditional valuation schemes that are strongly focussing on geological and economic valuation criteria.

The objectives of task 4.3, are the following:

- *Comparison and integration of mineral and land-use policies*
- *Review and compare results from other MINLAND work packages and describe the applicability, efficiency and integration and differences between the requirements and processes of mineral and land-use policies*
- *Comparison of mineral resources valorisation and valuation requirements – and whether they are on equal ground*
- *Success factors for the integration of mineral and land-use policies based on good practise examples identified in WP3 'Case studies of land use planning in exploration and mining'.*

Good Practise Aspects are synthisized, presented and discussed in detail in the Deliverable 6.2 ‚Manual for Good Practise Guidance'**.**

1.2 Data collection and methods

The work conducted in T4.3 'Comparison of mineral and land use policies and their integration' is based previous work conducted in the H2020 MINLAND project. The data forming the basis for this report, were collected in WP2 (Land Use Planning Policies & Practices) and WP3 (Case studies of land use planning in exploration and mining) under the sole responsibility of the contributing partner (see table 1).

The work in this deliverable is closely linked and built up on previous deliverables and tasks from WP2(Land Use Planning Policies & Practices), WP3 (Case studies of land use planning in exploration and mining), WP4 (Land use practices, valorisation and valuation of geological and societal data and civil society impacts), WP6 (Practitioner Guidelines and peer-learning) and WP7 (Land Use Planning Network and Clustering activities).

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WP2	Land Use Planning Policies & Practices	• Mapping and dada collection of land-use and mineral policies throughout Europe, including the institutional framework and policy content; based on policy and document mapping and analysis as well as questionnaires and interviews with selected authorities and institutions
WP3	Case studies of land use planning in exploration and mining	• Case studies of land-use planning in exploration and mining • Stakeholder consultation
WP4	Land use practices, valorisation and valuation of geological and societal data and civil society impacts	• Deliverable 4.1: valorisation and valuation schemes • Deliverable 4.2: Governance mechanism and land-use policies
WP6	Practitioner Guidelines and peer-learning	• GPT: Good Practise Templates: input material for success factors and barriers and for policy integration
WP7	Land Use Planning Network and Clustering activities	• Local Workshops: complementary material for success factors and barriers, and to validate material and data

The data collection was carried out by different MINLAND partners: thus, data sets produced in WP2 (Land Use Planning Policies & Practices and WP3 (Case studies of land use planning in exploration and mining) are the basis of this report. Data collection was carried out by the following partners (see table 1)

Data collection and data provision	**WP2 (Survey) and WP3 (Case Studies)**	**WP6 Good Practise Templates**	**WP7: Local Workshop Summaries**
Austria	WP2 & 3: Montanuniversität Leoben: Katharina Gugerell, Michael Tost, WU Wien: Andreas Endl, Gerald Berger, MinPol: Günter Tiess	MUL & WU: Andreas Endl, Sara Gottenhuber, Katharina Gugerell, Michael Tost	Sara Louise Gottenhuber, Gerald Berger, Katharina Gugerell, Michael Tost
Finland	WP2: GTK: Nike Luodes, Sari Grönholm, Bo Långbacka, Jarmo Rauhala, Pekka Tuomela, Akseli Torppa WP3: GTK	Nike Luodes, Geological Survey of Finland (GTK)	Scandinavia LWS: Ronald Arviddson, Peter Åkerhammar, Nike Luodes, Agnes Raaness, Joacim Jacobsson, Magnus Langendoen, Anders Forsgren
Greece	WP2: IGME GR: Kiki Hatzilazaridou WP3: NTUA, IGME GR	GPT11: Kiki Hatzilazaridou Institute of Geology & Mineral Exploration (IGME Greece) GPT12: Chrysa Panagiotopoulou: National Technical	Chrysanthi Panagiotopoulou, Maria Taxiarchou, Kyriaki

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		University of Athens (NTUA)	Hatzilazaridou, Foteini Halkiopoulou
Hungary	WP2 & 3: Mining and Geological Survey Hungary: Agnes Lauko	-	-
Ireland	WP2: MDB MacCabe Durney Barnes Ltd: Sybil Berne WP3: GSI Department of Communications, Climate Action and Environment & MDB MacCabe Durney Barnes Ltd	Sybil Berne, Jerry Barnes MacCabe Durney Barnes (MDB), Eoin McGrath Geological Survey Ireland (GSI)	Sybil Berne
Italy	WP2 & 3: Emilia-Romagna Region: Christian Marasmi	Christian Marasmi Regione Emilia Romagna	Christian Marasmi, Katerina Adam
Netherlands	WP2: Wageningen Environmental Research & TNO: Theo van der Sluis (WENR), Anouk Cormont (WENR), Irene Bouwma (WENR), Michiel van der Meulen (TNO)	Joris Dijkstra, Tessa Witteman (TNO)	-
Norway	WP2:& 3 NGU: Agnes Raaness	Agnes Raaness, Henrik Schiellerup, Geological Survey of Norway (NGU)	Scandinavia LWS: Ronald Arviddson, Peter Åkerhammar, Nike Luodes, Agnes Raaness, Joacim Jacobsson, Magnus Langendoen, Anders Forsgren
Portugal	WP2 & 3: DGEG & LNEG: Paula Dinis and Maria Figueira (DGEG) Jorge Carvalho, Vitor Lisboa(LNEG)	GPT10: LNEGJorge Carvalho, Vitor Lisboa DGEG: Maria João Figueira, Paula Castanheira Dinis, GPT13: DGEG: Paula Castanheira Dinis Maria João Figueira , LNEG: Jorge Carvalho Vitor Lisboa	José Vitor Lisboa, Jorge Cavalho, Maria João Figueira, Paula Dinis, Augusto Filipe
Poland	WP2 & 3: MEERI PAS: Alicja Kot-Niewiadomska	Alicja Kot-Niewiadomska, Krzysztof Galos, MEERI-PAS	Alicja Kot-Niewiadomska
Spain	WP2 & 3: IGME ES: Pedro Delago	Virginia Rodríguez, Francisco Javier Fernández Naranjo, Julio César Arranz, Geological Survey of Spain (IGME ES).	Virginia Rodríguez Gómez, Julio César Arranz González, Francisco Javier Fernández Naranjo
Sweden	WP2: SGU: Erika Ingvald WP3: Boliden Mineral AB, SGU & LKAB, CAB Västerbotten	Ronald Arvidsson (ronald.arvidsson@sgu.se) Geological Survey of Sweden (SGU), (GPT 1 & 3 – contributor GPT3). Anders Forsgren (GPT 2)	Scandinavia LWS: Ronald Arviddson, Peter Åkerhammar, Nike Luodes, Agnes Raaness, Joacim Jacobsson, Magnus Langendoen, Anders Forsgren

Table 1 Distribution of MINLAND data collection among the involved partners

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1.2.1 Data, Methods and Workflow: Comparison of mineral resources valorisation and valuation requirements – and whether they are on equal ground

The analysis is following a mixed approach, starting with a literature review, discussing the current academic debate, specifically focusing on the academic literature addressing the integration of mineral resources in land use planning, three groups are distinguished:

1. Those aiming at the spatial management of areas already designated for mineral development by providing the background information to detailed land use plan maps (e.g. Carvalho et al., 2018; Falé et al., 2005). From a revision of several similar case studies in Spain, Hernandez-Duran et al. (2014) conclude that there is no universal way to address this issue.
2. Those presenting methodologies for the identification of favourable locations for the mining industry where conflicts with other uses of land are minimal (Gałaś, 2014; Haines et al., 2014; Lamelas et al., 2008; Marinoni and Hoppe, 2006). Their aim is to assess the spatial extent of economically valuable mineral deposits after subtraction of the areas for which land use planning already interdicted either (i) mining activities or (ii) for which strong land use conflicts are expected.
3. Those presenting comprehensive methodologies that seek the valorisation of mineral resources regardless of conflicts that may exist with other land uses. This group refers to the multi-criteria assessment methodologies purposed by Mateus et al. (2017) (2017) and Radwanek-Bąk and Nieć (2015) Their primary objective is to identify mineral deposits deserving to be safeguarded in land use planning and delimit their respective Mineral Safeguarding Areas.

This conceptual foundation provides the framework for a cross-case comparison of mineral resources valorisation and valuation requirements for their integration with land use policies. Material and data to perform this analysis was retrieved from :

- Deliverable 2.3: Safeguarding mineral resources in Europe: existing practice and possibilities
- Deliverable 3.2: Case studies Summary and the respective annexes
- Deliverable 3.3: Synthesis of case studies
- Deliverable 4.1: Existing valorisation and classification schemes and valuation methods for mineral land use practices
- Deliverable 4.2: Land use policies and valuation of land
- Work Package 6: Good Practice templates
- Work Package 7: Local Workshops – protocols

The most valuable data sources have turned out to be Deliverables 2.3 (Safeguarding mineral resources in Europe: existing practice and possibilities) and 4.1. (Existing valorisation and classification schemes and valuation methods for mineral land use practices) For complementary discussion of valorisation and valuation requirements the MINATURA2020 project has proven useful: hence, supplementary information was gathered in deliverables from the H2020 project MINATURA2020 (https://minatura2020.eu/):

- Deliverable 2.1: Exploring options for a harmonised mapping framework (Tiess and Murguia, 2016)
- Deliverable 2.2: Set of qualifying conditions for a harmonised mapping framework
- Deliverable 2.3: Harmonised mapping framework (Tiess et al., 2016)

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The comparative analysis, assessing the valorisation and valuation requirements, followed a three-step approach:

1. Compilation of the known European cases where mineral resources valorisation approaches were implemented for their integration into land use planning processes;

2. Based on the comparative analysis, recommendations were extracted that are addressing possible pathways of mineral resources valorisation approaches, which might serve as effective evaluation tools for safeguarding mineral deposits through land use planning.

It should be emphasized that all known comprehensive approaches to mineral resources valorisation in Europe were applied, as they were limited. As the analysis will show, at present only some of them have partially enabled the safeguarding of mineral resources in land use planning.

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1.2.2 Data, Methods and Workflow: Integration of mineral and land-use policies

The second part of the Deliverable, starting with Chapter 4, is investigating the integration of mineral and land-use policies, resting in particular on the following material

- Case studies, collected in WP3 (Case studies of land use planning in exploration and mining)
- Good Practise templates, compiled and collected in WP6 (Practitioner Guidelines and peer-learning).

Complementary information was retrieved from the summaries from the Local Workshops from WP7 (Land Use Planning Network and Clustering activities) and the descriptive policy networks, developed in the Deliverable 4.2. (Land Use Policies and Valuation of Land)

Chapter 4.1 is illustrating a basic introduction into current debates on policy integration, which serves a conceptual background to which the discussion on policy integration relates to. The raw data, good practise templates and case studies, were studies and discussed in a two-day research workshop in July 2019, mapping and comparing the cases, through the lens of policy integration. Hence, the results are developed in an inductive bottom up approach based on existing material and cases. Following this approach requires the acceptance, that certain aspects might be missing or have not been covered by the cases studies. The final chapters produced by the chapter authors were discussed and validated in a second round by the involved group.

2. Comparison of mineral resources valorisation and valuation requirements – and whether they are on equal ground

(Jorge Carvalho, Krzysztof Galos)

It was long ago recognized (Pendock, M.J, 1984) that securing the long term supply of mineral resources for society, requires the protection of mineral resources from sterilisation during the land use planning process, i.e., the loss of the option to exploit them. Since then, this issue has not remained only modestly discussed in the scientific literature: one the one hand, strong attention was payed to the sustainability of the mining industry and its respective indicators (e.g. Govindan, 2015; Marnika et al., 2015; Petrie et al., 2007; Villas-Boas et al., 2005). Directly related to the discussions on sustainability indicators, several papers focused on assessing the impact of extraction activities through various methodologies, many of them based on probabilistic approaches (e.g. Chen et al., 2015; Gillespie and Bennett, 2012; Mancini and Sala, 2018; United Nations, 2002). Among them, some are directly or indirectly targeted to support decision-making in environmental impact assessment and land use planning processes. Haines et al. (2014) for example, present a broadly applicable framework for the quantitative assessment of mineral resource development impacts (positive and negative) over other land use interests using a probabilistic approach. On the other hand, while repeatedly mentioning that the protection of mineral resources during the land use planning process is a critical issue, the scientific literature has focused on geological, technological and economic discussions about the scarcity and risk of supply of minerals driven by concerns about a growing world population (e.g. Goodenough et al., 2018; Henckens et al., 2016; Lusty and Gunn, 2015; Mateus and Martins, 2019; Meinert et al., 2016; Regueiro et al., 2000; Tilton et al., 2018). Even taking into account that land use planning is the main instrument for securing access to mineral deposits (Wagner et al., 2006), this issue is scarcely addressed in scientific literature. Mostly, it is addressed in policy documents and tools,

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as well as in legislative acts regarding the management of national mineral resources and land use planning. The most paradigmatic example comes from the United Kingdom where Minerals Safeguarding, i.e. the protection of mineral resources from unnecessary sterilisation by other development, regardless of whether or not the resources will ever be extracted, is a concept born on legislative acts for spatial planning. It is being applied as guidance at all planning levels since 2006 (McEvoy et al., 2007; Wrighton et al., 2014). More recent examples include the Austrian Mineral Resources Plan (Weber et al., 2008) and the European policy documents on the need to safeguard minerals in land use planning, as is the case of the "Recommendations of the Ad Hoc Working Group on Exchange of Best Practices on Minerals Policy and Legal Framework, Land-Use Planning and Permitting", emphasising that accessibility to mineral resources in land use planning should remain intact to avoid their sterilisation (AHWG, 2014).

Specifically, regarding scientific literature that focus on the integration of mineral resources in land use planning, three groups can be distinguished:

1. One strand of literature, focusing on the spatial management of areas already designated for mineral development by providing the background information to detailed land use plan maps (e.g. Carvalho et al., 2016; Falé et al., 2005). Based on a crosscase.Study research in Spain, Hernandez-Duran et al. (2014) conclude that there is no universal way to address this issue.
2. A second strand of literature mainly presents methodologies for the identification of favourable locations for the mining industry, where conflicts with other uses of land are on a low level or minimal (e.g. Gałaś, 2014; Haines et al., 2014; Lamelas et al., 2008; Marinoni and Hoppe, 2006).. They assess the spatial extent of economically valuable mineral deposits after subtraction of the areas for which land use planning already either (i) prohibited mining activities or (ii) for which strong land use conflicts are expected.

3. The third strand of the discourse, is illustrating comprehensive methodologies adressing the valorisation of mineral resources regardless of any potential land-use conflicts . This strand of literature refers to the multi-criteria assessment methodologies such as Mateus et al. (2017) and Radwanek-Bąk and Nieć (2015). Their primary objective is to identify mineral deposits deserving to be safeguarded in land use planning and delimit their respective Mineral Safeguarding Areas.

2.1 Different Valorisation Methods

There are only a few mature proposals for mineral resources valorisation methods recognized within Europe. These are:

- Austria – Mineral Resources Plan *(Österreichischer Rohstoffplan),* (Weber et al., 2008) (Weber, 2012)
- Norway – Norwegian valorization of mineral deposits
- Poland – Valorisation of undeveloped rock mineral deposits (*Waloryzacja niezagospodarowanych złóż kopalin skalnych*) (Radwanek-Bąk and Nieć, 2015)
- Portugal – Multi-dimensional methodology supporting a safeguarding decision on the future access to mineral resources, (Mateus et al., 2017)
- Sweden – Deposits of National Interest (*Riksintressen, mineral*) (Häggquist and Wårell, 2016)
- International – Approach proposed by MINATURA2020 project

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2.1.1 Mineral Resources Plan (Austria)

The Austrian Minerals Act (MINROG) is the legislative framework for all mining and extractive activities and distinguishes three types of mineral resources: state owned mineral resources (the property right belongs to the state, no matter to whom was awarded a license to extract and produce them), free-to-mine mineral resources (the holder of a mining license has the ownership of the minerals) and land-owner mineral resources (holder of the land holds the property rights of the minerals, but needs a license to extract them). The management of state-owned and free-to-mine mineral deposits is in the competence portfolio of the federal state, while landowner mineral raw materials are managed at the provincial level.

The Austrian Minerals Act is complemented with policy documents: the Austrian Raw Materials Strategy, which replicates for Austria the strategy of the European Raw Materials Initiative, and the Austrian Mineral Resource Plan (AMRP) as a national plan to secure the long-term supply of mineral resources via land use planning and to serve as a planning basis for future mining activities. Land Use Planning legislation in Austria is embedded on the provincial scale and is cascading down, via regions to the municipal (local) level. For this reason, the implementation of the AMRP regarding landowner minerals is done at the provincial level.

The specific objective of ARMP is to document raw-material deposits and outline areas with minable deposits with low conflict potential with other policy-relevant land-uses such as nature conservation, urban/settlement development, watershed, etc. In this way, the ARMP is a set of conflict-free areas of mineral deposits. It resulted from a Phase 1 of systematic identification and evaluation of mineral deposits with regard to their protection-worthiness, followed by a Phase 2 of subtraction of conflicting land-uses, in order to eliminate any conflicts that could arise from minerals extraction.

In addition to a comprehensive analysis of potential mineral supply risks, Phase 1 of the ARMP involved the survey, documentation and evaluation of all occurrences of mineral raw materials in Austria. Four working groups carried out the work: Geology and Resources, Mineral Economics, GIS Implementation, and Supply Security. Mineral deposits could only be chosen for safeguard if sufficient information on their type, quantity and quality are available.

Valorisation methods were specifically developed to evaluate each of the mineral categories: sand and gravel, solid rocks, clays, metal ores, industrial minerals and coals. According to each mineral category, different valorisation criteria were used, which can be grouped in quality and quantity criteria, the status (active, periodically active, abandoned) and type (open-pit versus underground) of existing mine operations, and the end-use.

From the application of these valorisation criteria, the mineral deposits were classified according to the so-called Suitability Classes, and Mineral Zone areas were delimited.

The task of Phase 2 was to identify at national level all the areas where the extraction of minerals is already interdicted (e.g. settlement areas, transport routes, and national parks), as well as all the other protected areas (e.g. water management priority zones, landscape protection areas, forests, Natura 2000 sites). In a further step, these areas were cut out from the mineral areas identified in Phase 1.

The Austrian Mineral Resources Plan has the legal status of an 'Expert Report' and thus is a documentation / inventory of minable deposits but neither a regulatory planning strategy, master plan or planning tool. Therefore, it is delivered to the provincial land use authorities as indicative for spatial planning activities; thus, the implementation is voluntary and carried out on provincial levels

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through different governance and planning formats. However, this applies only to landowner mineral resources.

2.1.2 Norwegian valorization of mineral deposits

In recent years, the Geological Survey of Norway (NGU) reclassified the Norwegian national mineral deposits databases in order they become more useful for land use planning purposes. INSPIRE compliant nomenclature for mineral occurrence types was used. The definitions adopted by NGU were as follows:

- Deposit: A measured resource or reserve. All deposits should have enough significant information to be assessed and classified (i.e. valorised). The deposits may or may not be in production.
- Prospect: An area with a high probability of finding economically interesting minerals.
- Occurrence: May or may not have a polygon. Amount of geological information varies greatly from nearly nothing to quite a lot.

Taking into account the Raw Material Initiative, the mineral deposits (understood as in definition above) have then been reassessed and reclassified, by shifting from an assessment targeting the qualitative scale of significance to one that is stronger addressing a more quantitative economic value/public importance. Based on a set of criteria, such as in situ value, volume, location, quality, national supply etc., the deposits were classified according to public importance: international (to adapt to use in European scale), national, regional, local importance, and not important or not assessed.

The criteria adopted in such classification were, in short, as follows (table 2):

Level of importance	Metal ores and industrial minerals deposits	Construction materials deposits
International importance	Metals and industrial mineral deposits with documented or estimated resources that may give a significant contribution to international (i.e. European) needs, with in situ value > 10 billion NOK (app. 1 billion EUR)	Potential exports of > 1 million ton p.a.
National importance	Deposits of measured or probable future added value potential, including metal or industrial mineral deposits, with situ value > 1 billion NOK; Deposits of strategic importance or “critical” raw materials (including EU CRM) for future	Production > 100 000 tons p.a. Deposits of unique quality particularly suited for processing industry or as construction materials. exploitation. Deposits of particular interest for national infrastructure
Regional importance	Deposits of measured or probable future added value potential, including metal or industrial mineral deposits, with	Deposits particularly important for regional infrastructure

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	in situ value 100 million – 1000 million NOK	
Local importance:		Deposits that are important for local infrastructure
Not classified		

Table 2 Criteria adopted in the Norwegian valorization of mineral deposits

Mineral deposits and prospects were defined and adapted to county/national land use management tools to better forecast and mediate potential land use conflicts. In this process, the most important adaptation was the transition from a point-based data set to a dataset with polygons, which have had the largest impact with highly increased visibility of the mineral resources data.

These areas are delivered by the geological survey to the mining authority, but also to the land use planning authorities so that they can be included as 'consideration zones' in the land use zoning system at municipal level. The mining authority shall intervene if land use plans do not implement areas of regional, national or international importance. Additionally, the use of land containing deposits of regional, national or international importance automatically release an intervention by the Norwegian Directorate of Mining. Prospective areas are not formally protected in a similar way, but the county will be aware of possible future values and can take precautions, such as requesting additional surveys for better precision in the assessment of resource potentials.

2.1.3 Valorisation of undeveloped mineral deposits (Poland)

In 2011, the proposal of the Mineral Deposits Protection Act *(in Polish original: Projekt Ustawy o Ochronie Złóż Kopalin)* was prepared by the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences and the Polish Geological Institute, on request of the Ministry of the Environment (Radwanek-Bąk and Nieć, 2015). According to that, the basis for such protection should be complex valorisation and hierarchy of the whole set of recognized, but undeveloped mineral deposits, broken down into deposits of various minerals.

The proposed valorisation system of industrial mineral and rock deposits in Poland is based on 4 main groups of criteria:

- geological features (mineral quantity and quality) – identified separately for each mineral type; quality parameters were different for various raw materials, e.g. for crushed stone physical properties, for dimension stone – possibility to obtain large blocks, for sand and gravel – content of grain size above 2 mm, for glass sand – content of silica and iron, for kaolin – iron content, plasticity and whiteness, etc.
- mining attractiveness – taking into account mining conditions (overburden thickness, overburden/deposit ratio, complexity of deposit setting, hydrogeological conditions) and mineral transportation infrastructure and proximity? issues (available roads, distance to end users);
- environmental restraints – due to environmental protection areas, landscape protection areas, protection of aquifers, protection of forests and high-quality soils;

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- housing and industrial land use limitations – mostly due to current land development (permanent buildings, linear structures) and land-use accessibility.

This valorisation methodology does not include social criteria

The significant differences between the individual factors, resulted in the consideration that mixed/integrated evaluation of all factors would not be beneficial. Instead, it was proposed to evaluate the different criteria groups separately and rank each of the criteria groups indicated above by a 3-grade rating designed by respective letters: high, very good, the best (H), medium, good, fair of conditional (M) and mediocre, common (C). In view of such valorisation, each deposit can be described using 4 symbols successively which represent evaluation of the deposit value based on the 4 groups of criteria discussed above: For example: HHMC designates the deposit as being of the highest value in respect to its resources and mineral quality, favourable for mining, without oppressive environmental restraints but with some limitations imposed by existing land utilization.

Proposed range of mineral deposits safeguarding (protection) depends on its general category:

- H class deposits – for the highest safeguarding
- M class deposits – for the medium safeguarding
- C class deposits – for the common safeguarding

Detailed assumptions of this approach are presented in the table below:

Class of deposit	Description	Implementation in Land – Use Plan	Coordination with other policy streams	Remarks
H class deposits – for the highest safeguarding (within LUP)	Absolute priority of mining land use. Each other land use should take into account requirements related to future possible extraction of the deposit, especially regarding other temporary land uses (e.g. conditional temporary building or industrial or infrastructure land use, but with exact time framework of such investment).	to be included in land use and strategic document at country level	Coordination with especially in Mineral policy of Poland (not yet accepted), Energy policy of Poland (recently approved) and Domestic Spatial Development Concept, as well as in land use plans at province and commune levels, with appropriate provisions regarding priority of their safeguarding,	Other than mining land use of areas of such deposits, or exclusion of such deposit from safeguarding would require the consent of the Minister of the Environment, on the basis of opinion of the Polish Geological Survey
M class deposits – for the medium safeguarding	Mining land use should be the main land use	to be included in land use plans at province and municipal levels, with appropriate provisions regarding priority of their safeguarding		Other than mining land use of areas of such deposits, or exclusion of such deposit from safeguarding would require the consent of the Marshal of

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			Province, on the basis of detailed geo-environmental, land use and socio-economic analyses, aimed at finding the optimum compromise; in case of such non-mining land use which excludes future mining land use, opinion of the Polish Geological Survey and approval of the Minister of the Environment required
C class deposits – for the common safeguarding	Mining land use should be the recommended land use, taking into account needs of the nearby municipalities	to be included in land use plans at municipal level	Other than mining land use of areas of such deposits to be consulted with the Marshal of Province, on the basis of socio-economic analyses and opinion of the Polish Geological Survey

Table 3 of mineral deposits safeguarding (protection) depending on the general categories of H, M and C-class deposits

Realized valorisation of explored but as of yet undeveloped deposits of industrial minerals and rocks in Poland done in 2013 has demonstrated that deposits characterized by valuable resources and mineral (rock) quality (H and M classes) make up only a small percentage of the total of all deposits analysed. Out of the total of 7378, only 126 were ranked as of the highest (H) and 512 as high (M) value. It is 1.8% and 6.9% of all yet undeveloped deposits, respectively. According to this methodology these 2 classes of deposits (H and M classes) should be protected in land-use planning as future objects of mining activity (Radwanek-Bąk and Nieć, 2015).

2.1.4 Multidimensional methodology supporting a safeguarding decision on the future access to mineral resources (Portugal)

Portuguese mineral resources are managed by the national mining authority (DGEG - General Directorate for Energy and Geology) which issues and handles three types of mining permits: exploration permits, mining concessions (exploitation permits for state owned minerals), and exploitation licenses (exploitation permits for private owned minerals).

The Land use planning policy framework in Portugal is organised in three main, hierarchical levels:

- the national level defining the strategy and main guidelines,

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- the regional level that adapts the national strategic approach and guidelines to the specificities of each region through Regional Land Use Programs.
- the municipal level (or inter-municipal) that defines the spatial occupation model and establishes land use zoning and respective rules through Municipal Land Use Plans that comply with the higher-level strategies and guidelines.

Furthermore, according to land use planning legislation, the municipal land use plans must identify, delimit and regulate *Areas for the Exploitation of Geological Resources* (direct translation). However, this is usually interpreted as delimiting the areas where mineral activities are already taking place, which, according to the Mining Act, are the ones where mining permits are already issued. Hence, new permits only can be issued if located in those areas (which, *a priori*, are already occupied), or if located in areas for which it is foreseen the compatible coexistence of mining with other activities (i.e. agricultural and forestry areas). Moreover, It does not refer to unknown/hypothetical mineral deposits (on which depends the long term supply of the society) or to the well-documented ones that are not covered by any type of mining permit.

In order to effectively contribute to the safeguarding of minerals by ensuring accessibility to them in land use planning, DGEG, with the support of the Portuguese Geological Survey, began to assist municipal land use planning review procedures by proposing the subdivision of the *Areas for the Exploitation of Geological Resources* in the following sub-categories that are based on the existing level of geological knowledge about mineral resources:

- Potential Areas (Prospects): those with demonstrated potential for the occurrence of mineral deposits, which is why they should not be occupied by uses that could unnecessarily compromise the extraction.
- Exploration Areas: where surveys are undertaken to identify and characterise mineral resources until studies demonstrate their economic interest and feasibility.
- Consolidated Activity Areas: where a significant exploitation activity already exists, for which further development should be addressed according to good environmental standards, as well as the responsible use of the mineral resources. This subcategory includes the legally granted mining concessions and exploitation licences, where the mineral resources are already fully protected
- Complementary Exploitation Areas: where mineral deposits with economic interest are known, adjacent or not to an area of consolidated activity, aimed at overcoming difficulties posed by the exhaustion of available reserves in the Consolidated Activity Areas. In this subcategory there should not be any activities or uses allowed that may unnecessarily prevent the extraction of minerals.
- Areas under Rehabilitation: already exploited areas, where ongoing or planned landscape recovery and/or other remediation actions will subsequently allow other land uses.

This methodology is a voluntary guideline: its implementation is voluntary and has no legal, regulatory status. It has evolved since the elaboration of the first Municipal Land Use Plans in the 90's, adapting to the changes occurred in the mining and land use planning legislations, particularly in the last ten years: the gained experience supported the preparation of a valorization methodology, to assist decision making regarding minerals safeguarding, i.e. on the identification of mineral deposits for which the access should be secured in land use planning, which was developed in 2016, within the framework of the MINATURA2020 project. Although, it does not correspond to the final approved

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version of MINATURA2020, but rather a version-in-use that the Portuguese team deemed most appropriate. Currently it is used as informal, voluntary planning tool when LNEG is taking part in land use planning processes. The most recently approved (05Sept2019) national land use planning strategy discloses, for the most important Portuguese mineral resources, mineral safeguarding areas that have been delimited according to this methodology.

This valorisation methodology (Mateus et al., 2017) is based on the assumption that Minerals Safeguarding does not depend on a specific economic value or any other type of advantage, because it deals with the present and future access to mineral resources and not with their (current or foreseen) regional, national or international economic relevance which relies on natural attributes (tonnage, grade, physical and/or chemical characteristics, etc.) and on the "market behaviour" (particularly, the demand/supply trends – historical, current and projected – safe provision, prices stability, etc.). Furthermore, as this methodology aims to distinguish mineral deposits that deserve safeguarding, it does not need to list temporal or particular restrictions related to legal or environmental specificities, because the access to mineral deposits should be viewed in parity with other natural resources.

This multi-criteria methodology takes into account four main valorisation dimensions:

Criteria	Description
LGK Level of Geological Knowledge (geological dimension)	A measure of the available geological information (not the geological information by itself) of each specific area/tract. It intends to discriminate distinct levels of geological data, information and knowledge at different scales (from regional to local)
Ec Economic Dimension	A general measure of the past, current or foreseen exploitation in each tract, as well as the corresponding impacts on the domestic mineral value chain and trade balance. The appraisal should be based on available results of independent (pre-)feasibility studies, but does not intend to reflect directly specific qualities of the resource (such as grades, tonnages, or other).
Ev Environmental Dimension	A general measure of the impacts in natural systems related to the past, present and/or foreseen mineral extraction activities in a specific tract. It should be grounded by independent studies already accomplished for active or planned operations (e.g. Environmental Impact Assessments)
SDA Social Dimension and Acceptance.	The intention is double: (1) to weigh the communal development triggered by mining/ quarrying operations in a specific tract, including their comparative impact in relation to other (traditional and non-traditional) economic sectors; and (2) to evaluate the community awareness and acquiescence in relation to mining/quarrying operations in a specific tract, as well as the compatibility between these industrial activities with other land uses. The judgements should be supported by independent studies already accomplished in each specific tract where an active operation exists or is being planned. Regularly, these independent studies are not conducted so, for these circumstances, a null value should be assigned.

Table 4 Portuguese multi-criteria valorisation methodology

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For each specific area/mineral tract, the operationalisation of each one of the above-mentioned dimensions are made through their densification by means of a set of independent, but complementary criteria, each one being scored from 0.25 to 1.00.

It should be emphasised that the proposed approach intends to categorize specific areas hosting mineral resources (even prospects where mineral deposits only hypothetically may exist), whose access and use must be safeguarded in land use planning. Therefore, it is not an economic valuation tool.

The available geological knowledge at a given time would be the decisive factor, allowing by itself an evaluation of all kinds of potential specific areas and, particularly, highlighting the deposits that are worth safeguarding. Complementary appraisals regarding the remaining dimensions (economic, environmental and social development and acceptance) would focus only in those areas that enclose active mining/quarrying operations or promising areas for which the compulsory environmental impact assessments, (pre-) feasibility studies and feedbacks on the public acquiescence already exist. Their aim is the discrimination of safeguarding priorities.

Given the criteria involved in the general assessment of Ec, Ev and SDA dimensions, with their consideration together with LGK allow to define a three-level priority scheme:

- Specific areas to be safeguarded in first priority, therefore justifying the primacy of mining/quarrying activities or detailed exploration surveys in that area over any other kind of land use;
- Specific areas to be safeguarded in second priority and the land access/use should be preferentially, but not exclusively, assigned to exploration and/or exploitation works; alternative land uses are thus possible provided that they do not lead to partial or total sterilisation of the identified resources.
- Specific areas to be safeguarded of third priority and the land access/use with different purposes should be planned and managed carefully, favouring the progression of exploration surveys whenever needed and avoiding circumstantial or long-lasting alternative land uses that can jeopardise further endeavours that may guide to viable mining/quarrying operations.

Taking into account the aforementioned sub-categories of areas proposed to be included in municipal land use plans (potential areas, exploration areas, etc.), the main contribute of this methodology is seen in the valorisation of prospects and complementary exploitation areas.

2.1.5 Deposits of National Interest (Sweden)

Sweden has no cross-sector planning for land on the national level (except for maritime planning). The state provides frameworks for the municipal and regional level through national objectives and by identifying claims of so-called national interests. The decisions of national interests form a basis that county administrative boards and municipalities must consider in their long-term planning.

In Sweden the term ‘national interest’ originates from the physical planning process and was firstly presented in the 1970s. This institution was introduced in 1987 in the Planning and Building Act, in which the municipalities were mainly responsible for the planning of land and water areas. When the Environmental Code came into force in 1999 all provisions related to National Interests were

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transferred there. Nowadays, the Environmental Code and the Planning and Building Act form the legal basis of physical planning in Sweden and constitute the major legal framework for the definition and regulation of the Swedish National Areas of Interest. As the main part of all land use planning is conducted by the municipalities, National Areas of Interest are one of the state's ability to intervene in municipal planning The Environmental Code constitutes an 'umbrella' for the Planning and Building Act, as well as for other laws that have an impact on the physical environment.

There are eleven different National Interests defined in Sweden and responsibilities of these are directed towards twelve different authorities. When an area is recognized as of national interest for several incompatible purposes, priority must be given to the purpose best conducive to long-term management of the land, except where defence interests of outstanding importance are involved.

The Swedish Environmental Code states that areas containing deposits of valuable substances or materials that are of national interest shall be protected against measures that may be prejudicial to their extraction. Therefore, valuable mineral deposits may also be of national interest. The Geological Survey of Sweden is responsible for their assessment, outline and appointment after consultation with the National Board of Housing, Building and Planning and the county administrative board. Within such areas where mineral deposits of national interest exist, municipalities and central government agencies may not plan for or authorise activities that might prevent or be prejudicial to the exploitation of mineral resources.

From another point of view, the Environmental Code specifies certain geographical areas that come under direct protection and are regarded as national interests for purposes of tourism and outdoor recreation. The area protection described above, national interests included, is safeguarded insofar as palpable damage can be prevented. Activities, such as mineral extraction, which perceptibly may affect a national interest, are completely forbidden, unless the deposit in itself also constitutes a major national interest. In this case, when there is an application request to use the land covered by different national interests, an investigation to assess the level of conflict between the different interests takes place to determine if it is possible for them both to coexist in the area or if one part should be granted priority over the other. In the decision of which interest that should be given precedence the main factors to be assessed are the economic sustainability, ecological sustainability, and social sustainability. Precedence should then be given to the interest that in the best way ensures a long-term use of the land, water and physical environment. Summarizing, the management provisions in the Environmental Code can be seen as a planning instrument preceding decision on changing land use.

In Sweden, a mineral deposit is considered to be of national interest if it satisfies the following criteria:

- The deposit is of great importance for the society´s need on a national level, or of particular regional importance, in terms of employment, economic development and resource supply in the long term.
- The deposit has particularly valuable properties, as regards e.g. purity, composition, quality, appearance, technical features or volume,
- The area containing the deposit is well defined, examined and documented.

Currently, there are 147 deposits of National Interest already defined in Sweden, and the majority of these are in the categories Ores and Industrial minerals.

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A complete protection of minerals is not possible in Swedish land use planning system. National Interest areas are merely indicative, not corresponding to land use categories. However, in the comprehensive plan, the municipality must present the basic characteristics of its intended use of land and water areas; how the built environment is to be used, developed and preserved; what consideration is to be given to public interests; and what the intention is regarding how national interests and environmental quality standards are to be served. As the definition of mineral deposits of National Interest is only based on geological and economic information, when there is a land use conflict with other interests (e.g. nature protection, social concerns with the possibility of open a mine), then it is up to a court or relevant authority to decide which interest should be given priority.

2.1.6. Mineral Deposits of Pubic Importance

As stressed by the European Commission (European Commission 2011) and a report of the Ad Hoc Working Group (Ad-Hoc Working Group of the RMSG 2010) a comprehensive land-use planning policy that enables the safeguarding of Mineral Deposits of Public Importance (MDoPI) needs to be based on the following elements:

- a digital geological knowledge base;
- a transparent methodology for identification of mineral resources (quality, quantity, local importance);
- long-term estimates for regional and local minimum demand (especially for construction materials, such as sand, gravel, crushed rock), taking account of other sources of materials (e.g. recycled), based on sustainable development principles as a monitoring tool;
- identifying and safeguarding mineral resources to meet minimum demand, taking account other land uses.

Those four elements comprise the basis for - proposed by MINATURA2020 project – a common Harmonised Mapping Framework (HMF) that allows the effective safeguarding of MDoPI. The objectives and the methods underlying these common elements need to be standardised, i.e. the same method is employed, but takes into account site-specific differences.

Having been agreed during the project that a mineral deposit is of public importance where information demonstrates that its sustainable exploitation could provide economic, social or other benefit to the EU (or the member states or a specific region/municipality), the objective of the HMF was to present a common comprehensive approach and methodology to create a coherent European network of MDOPI (similar to the Natura2000 network). Within a HMF, such European MDoPI network would be constructed based on the input by national and regional members, and any MDoPI should be safeguarded via their incorporation into land use planning, e.g. via the delineation of mineral safeguarding areas (MSA), i.e. geographical areas on the surface which overlay mineral deposits and ensure sufficient access for exploration and potential location of the necessary facilities for their future exploitation. In this sense it should be clear that ‘safeguarding’ does not give any policy support for "extraction" – therefore, safeguarding does not expose any sensitive land use (e.g. protected areas for nature conservation) to any greater risk of extraction. In other words, safeguarding an area important for a potential mineral development does not necessarily mean that the mineral resource will ever be extracted.

It has been suggested that, in order to create a flexible HMF that can be implemented by all countries and that can address and accommodate the heterogeneities previously described, any HMF should:

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- be at high level;
- be simple and understandable by a wide range of professionals;
- not require new data (requiring financial resources that may not be available);
- not demand large efforts nor means to be a significant burden for the implementing public authorities;
- be capable of adoption in all countries (recognising the wide regulatory and socio-cultural diversity across the European Union) without significant changes in legislation or procedures.

A simple Harmonised Mapping Framework that allows the identification of MDoPIs and the delineation of Mineral Safeguarding Areas in each jurisdiction should subsequently (not in parallel) follow 6 steps:

Step 1: **Analysis of the mineral policy, mineral demand forecasts and economic context**

Each jurisdiction (EU, national or regional) should prepare in a first instance a concise description of the mineral policy and of the economic context of the jurisdiction, including current and future mineral demand forecasts (at least for aggregates). The mineral policy description can be based either on a central written document or on different policies applied by regulatory authorities to ensure the minerals industry can remain competitive. The economic context description should allow understanding the importance of the different minerals to the economy of the jurisdiction, e.g. of aggregates for the local building/construction industry. The mineral demand forecasts should also reflect whether estimations foresee an increasing or stable demand in the coming years, which also adds another dimension to understand the need for minerals in the local, regional or national economies.

Step 2: Identification and classification of MDOPIs

In each jurisdiction, the society, respectively experts (interdisciplinary groups) and the National Contact Point should first discuss and agree which mineral deposits (within the national or regional mineral inventory) have the potential to be eligible as MDOPI.

Once a preliminary number of mineral deposits are classified as “eligible”, the stakeholders should execute a multi-criteria methodology to identify which deposits are considered MDOPI. As previously mentioned, an attempt to find a common multi-criteria methodology is being pursued in the Consortium, but were this not to be the case, the MINATURA2020 will only provide recommendations and each jurisdiction needs to apply the most suitable methodology to identify and classify MDOPI.

Even though each jurisdiction may use its own methodology to designate MDOPIs, it should be done in a standard way using the same categories for the classification. All MDOPIs should be classified as MDOPI-EU (European Level), MDOPI-CL (Country Level) or MDOPI-RL (Regional Level). When classifying MDoPI, the classification at different levels should be non-exclusive, i.e. an MDoPI could be classified as a European and National MDoPI at the same time if the minerals are of importance at both levels (e.g. tungsten in Portugal).

When classifying MDOPIs, each mineral deposit should contain information as to which of the following categories it belongs to:

- Mineral potential areas (prospective areas with only hypothetical resources or promising exploration results);

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- Mineral deposits with resources only;
- Mineral deposits with reserves ;
- Mining wastes (areas of inactive mines with waste potentially recoverable);
- Mineral deposits with mining rights/licence (being exploited as quarries/mines) and areas adjacent to them (extension of the activity).

Step 3: Analysis of alternative land uses (current and future)

An analysis of the current access to land hosting mineral tracts (either primary or secondary mineral deposits) should be performed (or a pre-existing analysis should be used) The analysis of other land uses allows identifying which MDOPIs will likely be conflict-free and which others might face constraints from other land uses, requiring the finding of compromises or trade-offs. MINATURA2020 Consortium also recommend (as optional) conducting an analysis of future potential changes in the land uses. The main advantage of such an exercise is that it refines even more (into the future) the level of potential conflict that may arise against a potentially designated MDOPI. A level playing field for the other land uses should be considered, as well as different options/mechanisms to reconcile alternative interests (e.g. prior extraction).

Step 4: Create a proposal for MSAs for each MDoPI

Based on the list created in Step 2 the stakeholders participating in the Council should define, for each the mineral deposits classified as MDoPI, a spatial extension (physical extent), i.e. a polygon demarcating their extension on the surface.

Step 5: Validation of MDoPIs and MSAs

An iterative deliberation process of validation with further stakeholders (e.g. the wider public) should be implemented by the Council of Stakeholders of each jurisdiction (national or regional) to find common grounds on the MDOPIs selected and their spatial extension, as well as for their regularly update. The Council of Stakeholders needs to define the MSA taking into account current and future competing land uses around the area which holds the MDOPI. This step may be skipped if sufficient multi-stakeholder participation was ensured during the Steps 2 and 4.

Step 6: Inclusion of MSAs in local spatial planning documents

The Council of Stakeholders should advocate and push for the integration of MSAs in local spatial planning documents. However, without a legal piece, this should be voluntary, or at least each country should see if it could make it compulsory that MDOPIs are legally recognised.

MDoPI safeguarding practices need to be included into the member states' regulatory frameworks. However, it seems that requesting the authorities of Member States to go through all six steps may represent a too high administrative burden compromising the feasibility of such an approach. The implementation could be problematic and it depends on the internal conditions of a given country. This is because the authorities of each Member State have different levels of information, capacities, staff and budgets available, which makes the situation heterogeneous. Therefore, such six steps will be offered only as a guidance to Member States, but their full implementation will not be requested. The steps that will be requested to Member States will be only steps 2 and 4, i.e. identifying MDoPIs according to basic common criteria and the implementation of safeguarding procedures.

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2.3 Comparison and discussion of analysed approaches of mineral deposits multi-criteria assessment

The presented methodologies for mineral deposits multi-criteria assessment present very different approaches, regarding at least:

- Subject of assessment,
- Main elements of assessment,
- Their usefulness regarding mineral deposits safeguarding practices and possibilities in land use planning of various European countries.

Most of the approaches are only focused on discovered mineral deposits, but only some of them are focused also on undiscovered mineral deposits (table 6). It is especially the case of Portuguese approach, while in Austrian case sometimes also mineral potential areas with serious premises for documenting mineral deposits are taken into account. A broad approachfocusing on both, undiscovered and discovered, mineral deposits is also acknowledged in the presented MINATURA2020 approach.

Country	Undiscovered deposits	Discovered deposits
Austria	YES, to some extent	YES
Norway	NO	YES
Poland	NO	YES
Portugal	YES	YES
Sweden	NO	YES
International (MINATURA2020)	YES	YES

Table 5 Application of the proposed multi-criteria assessment methodologies for undiscovered and discovered mineral deposits.

The list of elements taken into account in such mineral deposits' assessment is quite extensive and detailed parameters are commonly very different. The most important groups of assessment criteria related to:

- Geological characteristics of the mineral deposits (quality parameters of minerals, volume of resources, etc.);
- Economic importance of deposit, assessed at various scale (international, domestic, regional, local);
- Environmental protection issues;
- Aspects related to social licence to operate;
- Possible conflicts with other land uses.

In Austrian Mineral Resources Plan, at a first stage of assessment, geological characteristics and economic importance are taken into account. Then, in a second stage, other land uses, together with environmental limitations are analysed with the aim to identify "conflict free mineral zones".

In Norwegian valorisation approach, geological characteristics and economic importance are of key importance. Detailed criteria are related to type and size of deposits and their distance to markets. This methodology does not directly consider environmental and land use aspects, but they are assessed in separate process, having vital importance in the entirety of these processes. Social aspects are only to some extent 'hidden' in land use planning processes.

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The Polish valorisation approach, three groups of criteria are of primary importance: (i) geological characteristics, (ii) economic importance and (iii) environmental limitations. Additionally, to some extent current state of land use is also taken into account. Social aspects are not directly analysed in this approach.

The Portuguese multi-dimensional methodology of assessment seems to be the most comprehensive, as it takes into account geological, economic, environmental and social issues. However, the concept of "conflict free mineral zones" is not included here because MSAs should only protect the access to land, not directly involving the possibility of acquiring mining rights and because it considers that mineral resources should be taken in parity with other resources. Hence, the decision on the land use should be the result of a fair weighing process during LUP, whatever other land use interests may exist.

In the Swedish concept Areas of National Interests, geological and economic criteria play the main role, together with assumption that mineral deposit areas are well defined. Prospective areas and not well-documented deposits are not taken into account and for safeguarding purposes the process of weighing against other land uses (also with other National Interests) is done during land use planning processes

The MINATURA2020 approach is not a strict methodology, but kind of a framework, describing a sequence of incremental steps to delineate Mineral Deposits of Public Importance (MDoPI) and their implementation in land use planning processes. In general terms, it postulates the use of all mentioned above types of criteria for all types of mineral deposits (from mineral potential areas to mineral deposits with mining licence), with final aim of implementation of outlined Mineral Safeguarding Areas in local land use plans. However, the conceptual approach foresees that the EU Member States develop their tailor-made methodology to do so.

The usefulness of proposed methodologies regarding mineral deposits safeguarding practices and possibilities in land use planning varies in the examined European countries. In the case of Norway and Sweden, they were implemented in accordance with their assumptions. In Austria, the proposal of the Mineral Resources Plan presented at federal level, but requires the implementation on provincial level when it comes to aggregates (landowner raw materials). The Portuguese approach was tested on the example of several groups of raw materials giving interesting results and currently is applied by the Portuguese Geological Survey when contributing to the safeguarding of mineral resources in land use planning. Nevertheless, proper success will depend on the effects of cooperation between the geological survey, the mining authority and land use planning authorities. In Poland, implementation of proposed methodology can be successful only if Mineral Policy of Poland will be finally approved, and – then – appropriate mechanisms of selected mineral deposits safeguarding will be introduced in the Polish legal system. Introduction of Harmonised Mapping Framework proposed in MINATURA2020 project will depend on decision of European Commission to introduce such framework system (or at least the most important elements of it) within EU and its Member States.

More detailed analysis of the main criteria of mineral deposits assessment in relation to challenge of mineral safeguarding within land use planning, is presented in Table 6.

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2.4 Conclusions on mineral resources valorisation and valuation requirements for their integration with land use policies

Lessons learned from previous work in the MINLAND project, as well as from the previous MINATURA2020 project, are that the valuation of mineral deposits (mineral resources) can be done through the valuation in monetary terms, as well as through their valorisation utilising multi-criteria assessments(approach).

Mineral deposits valuation in monetary terms was developed for business purposes only, with Australian (VALMIN), Canadian (CIMVAL), and South African (SAMVAL) Codes as the most common ones that are used on a global basis, including different in EU MS. They report economic value together with the basic economic parameters (e.g. Net Present Value), which are applying mostly for deposits with extraction licence and measured mineral reserves, which, in practice, are already protected. Thus, it is not relevant to consider this kind of valuation when dealing with the safeguarding of minerals in land use planning.

Valorisation of mineral deposits is the process of assigning value (but not monetary value) to mineral resources by using a criteria set (geological, economic, environmental, social, etc.) aiming to raise their importance in a given context. Ultimately, the obtained results may be targeted for equally weighting the use of land for mining activities against other possible uses. Hence, the valorisation of mineral deposits can be a tool to promote minerals safeguarding and it should be applicable not only to discovered mineral deposits, but also to potential ones hosting undiscovered resources.

Until now, there is a scarcity of methodologies for mineral resources valorisation, which is a significant obstacle in objective parameterization of land uses, often leading to the so-called mineral resources sterilisation through preventing their use when needed. The valorisation of mineral resources through multi-criteria assessments is still rather uncommon in the EU and other European MS. Only some European countries have introduced (Sweden, Norway, and Austria – to some extent) or are trying to introduce (Poland, Portugal) such approaches, with the main aim to distinguish the most important mineral deposits, to which should be granted the access in land use planning processes.

Methods of mineral deposits valorisation may be prepared separately by each European country, depending on its internal conditions, policies, and institutional framework. However, each such methodology should contain at least some geological, economic, environmental, and – to some extent - social criteria of assessment, though detailed criteria and their weighting can vary significantly. Eventually, existing or potential conflicts with other land uses could also be assessed to evaluate if the deposit is worth mining. If possible, not only discovered mineral deposits, but also undiscovered ones should be evaluated for such purposes, though until now it was really rare case (e.g. Portugal).

General framework of mineral deposits valorisation (with indication of so-called Mineral Deposits of Public Importance - MDoPI) for their inclusion into land use planning system, should consist of 6 steps proposed in MINATURA2020 project, i.e.:

1. Analysis of the mineral policy, mineral demand forecasts and economic context
2. Identification and classification of MDoPIs (various methodologies possible, but importance classified at three levels: European, country, regional)
3. Analysis of alternative land uses (current and future)
4. Creation of a proposal of Mineral Safeguarding Area (MSA) for each MDOPI

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5. Validation of MDOPIs and MSAs
6. Inclusion of MSAs into local land use planning documents

In each EU Member State, this six steps procedure should be a significant guidance, while steps 2 and 4, i.e. identifying of MDOPIs according to basic common criteria and initiation of safeguarding procedures through assigning of MSAs, should be requested.

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Table 6 The main criteria of mineral deposits assessment in relation to challenge of mineral safeguarding within land use planning, in five selected countries

Analysed criteria	Sweden	Norway	Poland	Portugal	Austria
Is the protection or safeguarding of minerals mandatory, optional or not addressed, in the land use planning process? If it is optional, please describe what influences the decision and who makes the decisions	Complete protection or safeguarding of minerals is not possible in land use planning. In the comprehensive plan, the municipality must present the basic characteristics of its intended use of land and water areas; how the built environment is to be used, developed and preserved; what consideration is to be given to public interests; and what the intention is regarding how national interests and environmental quality standards are to be served. The plan must also indicate how the municipality intends to take into account national and regional goals, plans, and programmes of significance for sustainable development within the municipality. Assigning areas of national interest is done dynamically, no specific time frame given, allowing for fast changes at need, e.g., when a new mine is being established. The only actual safeguarding is done for the area given for the mining concession and later when the process is ready for mining.	Local municipalities have the final decision on land use in their area. The most recent National Expectations (2017) states that mineral resources must be taken in account. It also includes consideration zones for mineral resources. Well-documented and classified deposits (i.e. of regional, national or international significance) are safeguarded, and the Directorate of Mining may make objections when the plans consider areas of quantifiable resources, classified as national/international or regionally important. There are no safeguarding of undocumented mineral resources or less documented and unclassified deposits, prospects and occurrences.	The safeguarding of recognized mineral deposits is mandatory in the land use planning process, but there are not enough legal tools to ensure this.	Protection of exploitation permits and temporary (1-5 years) exploration permits are mandatory because these are public administrative easements. Usually, safeguarding is not addressed.	There is no enforcement power on national scale to force provinces to implement and safeguard mineral deposits, however the Law on Sustainability determines that the Austrian Republic (federal state, provinces, municipalities) commit themselves to ensure sustainable extraction and production of natural raw materials, domestic sourcing and to provide supply security. Constitutional laws are outlining public interest, consequently they are a guideline for all downstreamed legal documents, policy making etc. Provinces have voluntarily implemented safeguarding of mineral deposits in their legislation or policy making,
Is the designation of areas for minerals equivalent	No. Areas of particularly valuable mineral substances may be declared national interests by the Geological Survey of	No. Areas that are designated for extracting mineral resources are not equal to the	No. it is not always synonymous with their protection.	No, there is no equivalence. According to LUP legislation it is mandatory to delimit spaces for	If priority zones for mineral extractions are designated, other land-uses that might

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to mineral protection or safeguarding areas?	Sweden (SGU). The provisions on national interests are found in the Swedish Environmental Code. It states that areas containing deposits of valuable substances or materials that are of national interest shall be protected against measures that may be prejudicial to their extraction. Within such areas, municipalities and central government agencies may not plan for or authorise activities that might prevent or be prejudicial to the exploitation of mineral resources. So, it is a tool to be used to select the land use that gives the optimal sustainability, in terms of ecological, social and economic values, and as such is not really a safeguarding tool, but rather instrument that allows for dynamical and rational decisions regarding land use. True safeguarding of minerals exists when an exploitation concession has been granted.	safeguarding areas. The latter is based on geological assessment by the Geological Survey, while the areas that are designated for extraction are defined in zoning plans and local land use plans. Their extensions are usually smaller than the geologically assessed areas being the source of the mineral safeguarding areas.		the exploitation of geological resources. Therefore, in LUP are protected areas with permits and licenses issued, because they are public administrative easements. Unknown mineral resources or mineral resources whose value is not known or whose extents are not spatially delimited are not protected.	hinder or exacerbate mineral extraction in the future must be omitted
Does land use planning consider the possibility of coexistence of multiple land uses relatively to the different stages of the minerals value chain?	The ambition in all land use is to facilitate coexisting of different interests as often as possible. In the mineral value chain this is most often accomplished in the pre-exploration and exploration stages. Prospecting is often done where forestry or agriculture is pursued. Claims of areas of different national interests is so structured that land uses coexist and overlap each other. If multiple areas of national interests cannot coexist, priority	Ideally, the government strive for coexistence between various interests and this is a resolved problem early in the process, but this requires that all affected parties are in dialogue and agrees. If this is not the case (such as one party refusing to be in dialogue or cooperate), level of conflict is prone to rise.	Local spatial planning documents define the boundaries of mining area and of mineral deposit. Moreover, potential exploitation possibilities and directions of post-mining land reclamation are indicated. Sometimes	Yes. Portuguese land use legislation considers the possibility of multiple uses in rural soil and foster a land use planning policy which clearly include geological resources in harmonization with other uses of rural soil, avoiding conflicts, and preventing uses that might compromise the current and future access to known mineral	No

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	shall be given to the purpose or purposes that are most likely to promote sustainable (economically, ecologically and socially) management of land, water and the physical environment in general. The final weighting is made in each trial when applying for permits (e.g. exploitation concession). During the exploitation of mineral deposit co-existing is often limited concerning the mining area.	In general, local agreements between different users of the same areas will make land use conflicts smaller in all stages.	the boundaries of the mineral potential areas are also indicated.	resources. However, 3 different situations should be considered: 1. Spaces primarily assigned to exploitation of geological resources (equivalent to spaces for protection of known mineral resources/administrative easements). 2. Spaces primarily assigned to agriculture, livestock or forestry. There is no incompatibility with the safeguarding of mineral resources and their future exploitation, unless the normative rules at municipal level explicit that there is incompatibility with extraction of mineral resources. 3. Rural spaces primarily assigned to environmental protection, nature conservation, recreation and tourism are sometimes incompatible with mineral resources protection.	
Which kind of tools and at which level safeguarding of minerals in land use planning are performed? (Rules, zoning, both?)	See above. Typically at least the mining concession area is zoned as mining area (possibly even larger area). Also the land use plan contains instructions that define the land use on each specified area.	Safeguarding of mineral resources is mentioned in National expectations and Planning and Building Act (consideration zones for mineral resources). When there are conflicting interests, classification is important such as national vs regional significance. For active mines,	Known undeveloped deposits should be stated (with their boundaries) in land use documents, in particular, those formulated by the municipalities: the Study of Conditions and Directions of Land	Municipal land use plans use rules and zoning for the protection of known mineral resources. Rules are included in a main document - Regulation Document. It explains what are the permissions and the interdictions in the category of soil areas. It also contains the rules for Spaces for Exploitation	National level: Rohstoffplan , zoning Provinces level: Spatial Planning Law - Rule based Regional level: Regional Development Plans - Zoning (if implemented and used), Sectoral Plan - Zoning and Rules

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		having zoning plans and local land use plans that safeguard their future resource are crucial.	Use Management of Commune (obligatory) as well as the Local Land Use Management Plan of Commune.	of Geological Resources. Zones / spaces are presented on two other main documents: the Planning Map and the Constraints Map.	Municipal: Zoning (zoning plans/land-use plans)
Does the land use planning process designate areas for minerals considering the value of the minerals? And which values are considered?	SGU may, after consultation with the National Board of Housing, Building and Planning, the county administrative board and the municipality, decide that a certain mineral deposit constitutes an area that is of national interest regarding valuable substances or materials. Thus far, SGU has decided that 147 deposits of valuable substances or materials are of national interest (i.e. mineral deposits of national interest). Of these, 89 have been demarcated in detail and marked on maps, while the others have been positioned using a centre coordinate. Evaluation has only been done for prospected and mined areas.	The designation of areas for minerals in land use planning process does not consider the value of the minerals, but recent classification of deposits (by NGU) do consider the value of the minerals. Classification is based on one or more of these criteria: in situ-value, life time of mine, annual production, quality, location, export and national supply.	Designation of mineral areas during the land use planning process does not consider the value of the minerals. The most common factor determining the designation of deposit areas in the land use designation is the environmental conflict of a given deposit.	No	Yes, value of the minerals
Are there different levels of reflecting the knowledge of the minerals (i.e., is an area prospective (might have valuable minerals), is the deposit delineated, is it prospected etc.)?	When applying for an exploitation concession the mineral resources must be estimated according to international reporting codes for classifying mineral resources, the categories “Indicated” and “Measured” resources can be used in the estimation. The information is confidential outside the Chief Mining Inspector.	Knowledge reflects whether an area is a well-documented and quantified deposit, a prospect (unquantified) or an occurrence (level of knowledge may vary from a lot to almost nothing).	Four different levels reflecting the level of knowledge: perspective area (without estimated resources), prognostic area (with inferred resources), undeveloped mineral deposits (with mineral resources), and mineral deposits with extraction licence (with mineral reserves)	No	It depends on Province. E.g. in Styria economic valuation of different land-use options is not facilitated, it does not help in the discussions for the decision making because in land-use planning different interests must be integrated. In Tyrol valuation is addressed in terms of balancing different interests and between competing land-uses, including public interest.

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For prospected deposits are they determined according to the international reporting codes for classifying mineral resources?	The industry has up-to recently used the Fennoscandian Review Board (similarities to JORC) but has now adopted PERC code	Where international reporting codes (JORC, CRIRSCO etc) are publicly available, this has been taken into consideration when assessing in situ-value and life time of mine during the classification process by NGU.	Known mineral deposits – according to the Polish Code, but also can be in JORC or UNFC. Prospective and prognostic deposits (mineral potential areas) are not determined according to the international reporting codes for classifying mineral resources.	Yes. JORC.	Austria has implemented a country specific code: Klassifikation von Vorkommen fester mineralischer Rohstoffe ÖNORM G 1050: 1989 04 01. However, information is very dispersed.
When planning, is land designation for minerals weighted and evaluated against other land uses? How important are mining/mineral issues as compared to other local policy priorities?	Areas claimed as areas of different national interest can overlap and are indicative for land-use planning. The final weighting is made in each trial when applying for permits. The county administrative boards are involved in the weighting in a trial for an exploitation concession. However, the instrument of mineral areas of national interest should be used in all planning processes also to safeguard that important deposits are not being used for other "deemed less important purposes".	Yes, but only when the mineral deposit is quantified to be big enough to be of regional, national or international significance. Unquantified resources are not considered. Other competing land use may be weighted similarly. Nature protection and conservation are very strong in Norway.	No	No	It depends on Province. E.g. in Styria weighing and evaluation of different land-uses is happening as part of the decision-making process. Based on location and case by case decided within the planning/decision making process. Different land-use options are weighed and against each other in the discursive negotiation process (no indicators, but the goals outlined in the spatial planning law that must be met).

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3. Good Practise Example: Permitting and Land Use

(Nike Luodes)

The chapter addresses the permitting phase

-first referring to the challenges relative to permitting process that had been individuated internationally before and during the project activities WP2 (Land Use Planning Policies & Practices) and WP3 (Case studies of land use planning in exploration and mining),

-then pointing out the practices answering those challenges, as described in the MINLAND cases studied.

Within the chapter are evaluated the relation of permit towards land use plans, and good examples of permitting and extractive activities addressing protected land and specific groups, environmental performances and social acceptability.

Deeper analysis of good practices elements are addressed in WP6 (Practitioner Guidelines and peer-learning) reports.

3.1 Permitting Practises within the MINLAND Cases

Permitting and licencing procedures are compulsory and regulated parts of the process for the extractive industry in order to operate on a selected plot of land. The particular procedures, authorities involved and time needed to bring forward applications were investigated in detail in the MINLEX (MinPol, 2016) and MinGuide (Endl et al., 2018) projects, addressing the institutional and legal framework. MINLAND's deliverables D2.1 (A review of policies and practices throughout Europe on mineral resources and land use) and D2.3 (Safeguarding mineral resources in Europe: existing practice and possibilities) includes information relative to normative on permitting for exploration and exploitation stages, while the MINLAND case reports also present the actual practises adopted during permitting phase, which are described on a case basis (see D3.2 Case Studies Summary) covering different commodity types and life cycle phases. Speaking of commodities, the Dutch, Greek and Spanish cases are relevant for aggregates focusing on policy and integration of minerals into land use plans, while the other cases are focussing on industrial and metallic minerals.

The cases on mining activities might have historical background and might have started according to different legislation than those active nowadays. D3.2's case description (Case Studies Summary) and survey tables and D3.3's (Synthesis of Case Studies) depict the activities undertaken during the development of the case, their context and the actual state. From these are extracted information on authorities, co-authorities and stakeholders involved in exploration's and exploitation's permitting process of different commodities.

The data collected and completed with MINLEX (MinPol, 2016) information is summarized in table 1 and 2(see annexes).

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3.2 Challenges relative to permitting process

Challenges have previously been pointed out in projects such as MINLEX (MinPol, 2016), MinGuide (Endl et al., 2018), STRADE (Schüler et al., 2018) and the AHWG emphasizing the importance of the quality and availability of geological data, transparency, need of one stop shop and parallel progress of applications during permit/licencing assessment (AHWG, 2014, 2010). MINLAND has built on these results in the survey design for WP2 (Land Use Planning Policies & Practices) and WP3 (Case studies of land use planning in exploration and mining). The cases generally showed good practices but in certain rate have also brought up problematic related to these topics, here are reported parts of the summary tables compiled in D3.2 (Case Studies Summary) on aspects that can affect permit processes (table 7):

Case-country	Challenges
Sweden, Fäbotjärn, Botnia	*Need of several interconnected permits and even requirements to assess infrastructures in early stage of mineral extraction development plans might cause delay in case there are changes in the plan. Changes in the plans cause reiteration of the process*
Ireland	*Lack of One-Stop-Shop for Permitting - process can be perceived as lengthy and costly* Aspects affecting the phase of public participation: *Concerns regarding environmental and ecological impacts and additional concern regarding mining tailings which are infrastructures triggering worries on the local level/local residents* *'Resources Nationalism' and distribution of benefits; some persons or organisations are more inclined to object to the private development of mines as they believe that the resources should be developed for the benefit of the Irish State and not a private enterprise. Similarly, other people perceive a lack of distribution of benefits at local levels. Although this may not be agreed by all parties.*
Poland	Generally, the case has not presented challenges and tensions, except the *delay of the environmental impact assessment procedure, owed to the location - extraction occurred near Kraków Valleys Landscape Park.*
Finland	Conflict of land use with reindeer herding and leisure activities, challenging Ni emissions levels requested by permitting authority
Italy	*Problem in relation to private ownership of closed mining area* for the further utilization as industrial/geological heritage site
Portugal	Affecting public participation: *NIMBY effect (Not in my Backyard)-Because the municipal political power has a 4 year mandate and does not want to contradict the popular will, there is a great aversion to include spaces for the exploitation of geological resources in municipal LUP*
Hungary	Safeguarding of Tokay wine region as a cultural heritage area determined attempts to reduce the impact of quarrying and degree of exploitation moving quarrying to other parts of the country if possible. Affecting public participation: Significant awareness/fear of people about industrial activities because of historical practises Activity Contrasted by Global environment and heritage protection tendencies

Table 7 Challenges during the permitting process which were mapped out in the MINLAND cases

These refers at similar extent to delay in procedures because of land use conflicts and requirements during permitting activity, and to social acceptance and public participation. Several cases not

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centered on permitting and workshops brought up challenges relative to permitting towards land use planning (see WP7 'Land Use Planning Network and Clustering activities'):

- possibility to access protected areas for extractive activities (exploration and exploitation) might be possible but with long and complex procedures
- relation towards other land uses might prevent mineral development as not all the countries foresee the possibility of its co-existence with other activities.

3.2.1 Challenges of Permitting in Relation to Land-Use

As seen within the survey of WP2 (Land Use Planning Policies & Practices) and WP3 (Case studies of land use planning in exploration and mining) and from table 1 exploration phase of state-owned mineral /metallic minerals/industrial minerals require permits from an authority responsible for mining activity in the analysed countries. Exploitation activities require permit application that might be involving several co-authorities depending on the expected impacts of the activity and the land affected as described within the cases and as pointed out in the MINLEX (MinPol, 2016) report . The MINLEX report stresses that in some cases a notable number of co-authorities (e.g. nature protection, watersheds, etc.) on different administrative levels might be involved. In Finland for example permitting for mineral resource exploitation in Natura 2000 areas, also includes the government decisions and European level authorities (European commission declaration), while exploitation in other conflict free zones can be handled at national and subnational level.

Land use authorities at local or regional level are involved in permitting processes if not for zoning aspects, relatively to building permits as visible from table 1 and 2 according to the life cycle stage of mineral development (exploration /exploitation). During exploration's permit procedure municipalities are informed or consulted in Norway, Finland and Portugal. Mining permit application see local/regional land use planning authorities involved in Norway, Sweden, Finland, Ireland, Portugal, Italy and Greece. Permits for aggregate and construction minerals development activities are generally applied to regional /local level as visible from table 2.

3.3 Good aspects

Within the case-sample only a few explicitly address good practises on permitting, which are further analysed in WP6 (Practitioner Guidelines and peer-learning): Ireland, Poland and Sweden. Some essential aspects that affect permitting process are pointed out within the cases:

3.3.1 Expertise within decision making level

The project mapped also expertise in decision making processes related to development of minerals – need, presence and role- and their relation to land use planning and maps. External geological experts are used by land use planning authorities when there is no internal expert available.

- Relatively to inclusion of mineral into land use maps and valuation of minerals, involvement of expertise is advocated by the Spanish case, but this as other cases does not address specifically permit procedures.

Expertise by the permitting authorities has been addressed within good practices in the Irish and Finnish case:

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- Expertise and independence of authorities in permit decision making has been one good practise pointed out by the Irish case, where adequate assessment of aspects need involvement of the most qualified authorities.
- The Finnish case, addressing enlargement of mining activities in an area where environmental aspects are high priority, illustrates within the good practice aspects that expertise of the permitting authorities can drive up-take of technological development, allow economical activities and increase environmental performances, promoting acceptance of the mining industry.

3.3.2 Geological Data and its accessibility

The MINLAND survey showed necessity of having reliable geological data (ref. D3.3 Synthesis of Case Studies). The Geological Surveys from MS generally possess geological knowledge and are able to answer to this need, playing an important role for data provision (INSPIRE compliance) and also improving on quality. Behond MS's borders Eurogeosurveys might play an umbrella role at EU level.

Geological data's accessibility by land use planners and co-authorities involved in permitting processes differs within the MS. The case descriptions depicted the procedures in act in the relative MS. For example, the Spanish case shows that data is stored but it is not updated and generally not used by co-authorities. Finnish, Swedish, Norwegian and Polish case show that it is stored and implemented.

Good practices relevant to accessibility proposed by the Spanish, Swedish and Norwegian cases are addressing:

- tools that support the implementation of mineral information into land use plans, including maps which are outlining potentially exploitable resources and abandoned quarries (to adequately cope with market requirements) (Spanish case-study);
- LUP processes relying on mineral information for land use valuation and development of the activities (e.g. Sweden and Norway); in that cases mineral deposits are valued based on their economic and strategic importance

3.3.3 Transparency

Relatively to transparency, this can be seen as transparency in the processing of the permit application and document required for permit application, and in terms of transparency of the mineral development activities towards the public and stakeholders. The survey and case selection included also aspects as social acceptance, conflict management that are focus characteristics when addressing permitting process (D 3.2 Case Studies Summary, D 3.3 Synthesis of Case Studies, D6.2 'Manual for Good Practise Guidance'). Social aspects are developed in detail in WP6 (Practitioner Guidelines and peer-learning) and WP4 (Land use practices, valorisation and valuation of geological and societal data and civil society impacts). Statutory public consultation measures during permitting processes include public and stakeholders into the decision-making process (for more detail, please see D4.4 Civil society`s influence on land use practise across Europe, D6.2 'Manual for Good Practise Guidance').

The cases show that early involvement of stakeholders, at prospecting and exploration stages, facilitate development of mineral exploitation activities, minimization of conflicts and acceptance of the mining operations.

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- The Swedish case of Mertainen mentioned the importance of early involvement of stakeholders to avoid conflicts and addressed both its need for the EIA process and for building trust and acceptance.
- Dialogue, communication and public engagement that goes beyond the statutory obligation of early stakeholder engagement, are emphasized as good practise aspects in the Norwegian and Irish case-studies.
- The polish case, showing enlargement of the mining activities affecting protected confining areas and competing activities mentioned the importance of early stakeholder communication since the company has worked through stakeholder consultations and promoted dialogues from an early stage in the project. This leads to successful results for the project like necessary purchase of land.
- The Greek case show that public participation in the country can affect permits and the progress of the activity even after the permit is granted.

Cases where permitting has been affected by early engagement are also recalled in the next section. A detailed discussion of transparency of good practise aspect is provided in the D6.2. 'Manual for Good Practise Guidance'.

3.3.4 Zoning related to mineral resources- pros and cos and Good practises examples

The cases considered systems in which zoning happens at project development level according to the needs and other systems where exploration and exploitation projects can be applied only to predefined areas where mineral development is foreseen.

Zoning vs. non zoning. In previous EU projects such as MINLEX (MinPol, 2016) and MINGUIDE (Endl et al., 2018) the zoning of land in land use plans where mineral development can happen has been valued as a conflict mitigation solution, identifying during land use planning stage conflict free areas where development of mineral would be possible.

Some countries, as Portugal and Greece (for aggregates) and Spain as proposition of new land use methodology, have individuated in the land use plans areas that can be dedicated to mineral development activities.

- Portugal's land use planning policy carries two sets of main land, rural or urban land. The rural land is within which the mineral extraction is normally residing.
- The Greek case on land use plan provides conflict free zones for extraction of aggregates.
- The Spanish case shows an assessing methodology where the impacts of potential extractive activities are valued and introduced into land use plans in order to reduce conflicts during development of the operations. The exploration can be performed on the defined areas. The permitting process for exploitation can interest the designated areas and include further evaluation of the land use against environmental -socio-economical values on project level.
- In Austria the mineral resources plan has been implementing mineral resources and safeguarding these within specific areas deemed suitable for exploitation. The main objective is to document raw-materials deposits and outline which have a low conflict potential with other land uses such as nature conservation.

In the systems where land use is changed according to project implementation, conflicts generally are handled at permit application level.

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- In Finland the land use is zoned according to project needs, the minerals enter the land use plans when their implementation is foreseen. At an administrative level, minerals are valued during regional land use planning, otherwise up-to-date mineral information is stored by the geological survey for the mining authority.

Cases show that resolution of conflicts might happen in land use planning activity without constraining in zoning. Some countries (Norway and Sweden) do not zone mineral development areas on land use plans directly, but have created mineral plans, valued mineral resources for their "importance". The value is compared towards other land use values and used as base for conflict management during permitting processes (ref GPT Norway).

- Norway has integration and valuation of all types of mineral resources (deposits and prospects). Land use zoning is performed on project base in order to protect well documented and classified deposits.
- Sweden denominates "Areas of National Interest" - strategic land uses within these is mineral land use – that are incorporated into the comprehensive land use planning. These are employed at several levels of the land use process and compared with the other national interests in a weighted process: included into the so-called comprehensive land use planning, in the decisions for permit accordingly to the minerals act, the concession permit, for the final mining permit which is the environmental permit. In these cases, exploration permit does not require change of land use in the land use plan even if local authorities are involved and informed of the activities.

Accessibility. In all the MS exploitation happens in areas zoned for extractive activity, while exploration is regulated according to the system and might be more or less restricted. The accessibility of land for exploration activities is considered an important aspect in the MINLAND case studies and within the project. The need for land's access for mineral development has been addressed during the project also within the workshops (WP7 Main conclusions on the first Network workshop). The Nordic countries workshop pointed out that systems that restrict exploration activities through zoning diminish the possibility to increase mineral knowledge, base for mineral development. Moreover, the Portuguese workshop pointed out that the typology of pre-defined land use zoning coupled with the impossibility to change land use zoning outside the revision periods is a strain for mineral developing activities.

The case-studies in Finland, Norway, Sweden advocate that they can perform exploration as required by legislation without affecting land use zoning. Also, in Ireland land use is zoned when all the other permits granting exploitation are gained. During permit approval procedure the activity is valued for environmental -socio-economic interests and impacts on project level.

3.3.5 Good Practise Examples about EIA and environmental commitment

The permitting process for exploitation activities includes several kinds of permits implemented into MS from EU directives (Emission permit, chemical safety, dam safety, …). One part of the permitting is the EIA (Environmental Impact Assessment) according to the legislative requirements on MS level. In Greece, Poland, Cyprus also exploration permits require EIAs, while in other MS exist legislative

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procedures to evaluate the need for EIA during exploration permit process (Austria, Finland, Hungary, Ireland, Italy (EmRo), Netherlands (for aggregates), Slovenia)

EIA is an important part of the permit application as it includes scenario proposals for uses of the land. EIA assessments also include public consultation processes (see D 4.4 Civil society`s influence on land use practise across Europe). Within Nordic countries mineral development projects might affect Sami and reindeer herding activities and their consideration and participation is regulated. Guidelines for assessment of the impacts have been compiled (Guide to examining reindeer husbandry in land use projects).

Besides the requirements from environmental agencies, the performances and actions of the companies towards the environment and the ecosystem support the social acceptability of the industry. Environmental commitment has been seen as a good practice in several cases:

- Polish case: reclamation of post-mining land has been done, while advancing mining activities, on land where mining has finished and has included compensation areas for new sensitive areas taken into use with extended mining. The enlargement of the mine had affected a protected natural area.
- Finnish case: up-taking of technological development to operate reducing emissions.
- Portuguese case: *Somincor* mine operating underground in a Natura 2000 area where compensation measures have been taken in order to increase biodiversity in the region mitigating impact upon sensitive nature.
- Swedish cases address not only environmental aspects but also relation with Sami and reindeer herders. LKAB and Boliden companies have a comprehensive strategy for mitigation of impact upon other land uses such as sensitive nature for which a tool box with compensation areas for impacted land. Mitigation can also include compensation to reindeer herders for changed movement patterns of reindeers

3.3.6 Good Practise Example: Relation towards specific land uses and possibility of co-existence

Statutory consultation and involvement of *Sami, Skoll* communities and reindeer herding association is defined within acts ruling mining activities for the Nordic countries. Cooperation between Nordic countries and between stakeholders and authorities supported the creation of guidelines for exploration in specific protected areas and continuous development of methodologies that would diminish environmental impacts of operation in delicate environments.

- The Norwegian case mention possibility of co-existence solutions between exploitation activities and seasonal reindeer herding, using the land in different periods of the year by each of the competing activities. The Norwegian case also mention the possibility of co-existence of wind mills and mining operations as activities that can use the same land.

Operation within Natura 2000 and heritage areas are visible by the Portuguese and Greek case.

- Somincor mine operates within protected Natura 2000 area since considers mining as a temporal activity which may be developed in coexistence with other land uses. This has been part of decision in the EIA.
- The Greek case shows that the bauxite mine has been designed in order to accommodate for other land uses: underground mine design and extractive areas were geographically delimited

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to avoid disturbing mining activities. The case also point out that e.g., protection of archaeological and cultural sites are deemed important and taken into consideration so that the extractive sites should not cause any adverse effects on them.

4. Policy Integration and Coordination between Mineral and Land-Use Policy

The following chapter investigates policy integration and coordination between mineral and land-use policy streams based on the MINLAND cases. Additionally, conditions that are supporting coordination efforts, such as capacitiy/willingness are addressed. The chapter starts with a general introduction on policy integration and coordination and is followed by a contextualising discussion of the MINLAND cases.

4.1 Introduction and Background on Policy Integration and Coordination

(Katharina Gugerell)

The search for improved policy coherence has gained increased attention. Challenges such as environmental considerations, public engagement, climate change – emissions, or pursuing the attainment of the SDGs has increased the role and importance for innovative policies, policy processes and the integration/coordination between different policy streams. Additionally, interdependencies between spatial 'issues' and coordination/integration challenges have become more apparent, as the case of managing mineral resources illustrate.

From an EU perspective policy integration and coordination refers to the mechanisms and efforts between the Member States (MS) and the EU Institutions to coordinate and integrate policies to achieve its goals. On the level of the MS policy integration and coordination addresses horizontal mechanism and practises and vertical adjustments, involving the different administrative levels (municipal to national). Up until the 1970s it was the predominant expectation that well-designed policies, plans or strategies will meet the outlined goals and deliver the envisioned objectives (Matland, 1995; Schofield, 2001). Only then research started illustrating that processes of delivering policy goals and implementation occurred much fuzzier than initially expected. Since than a rich discourse evolved elaborating the importance of balancing high-level goals, local discretion, policy learning, necessary capacities and capacity building, willingness, policy communities, governance and networks into the spotlight of attention.

Policies are purposeful courses of strategy and action that are followed by a sequence of more or less related actions and measure, which policy networks (government, businesses, civil society) pursue to attain, or move towards, policy goals that are addressing particular 'wicked' policy problems. Those problems might be considered as gaps between the existing and the expect or Attempts dealing with such wicked problems are resulting in cyclic processes of policy making, policy implementation and evaluation which are difficult to govern and manage. Complex policy problems are referred to as 'ill-structure', 'wicked' or even 'super-wicked' problems (Crowley and Head, 2017; Levin et al., 2012; Peters, 2017; Ritchey, 2013; Rittel and Webber, 1973). Complex policy problems do not only contain a substantial number of variables (that would be complicated policy problems) but also involve a broad range of actors and stakeholder with different perspectives, opinions, values and agendas, that make the policy development difficult to predict (Gerrits, 2012; Klijn and Koppenjan, 2016). Uncertainty or conflict is rooting in different perceptions of the problem or solutions and who shall deal with it – but

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complexity also emerges out of different information and knowledge on the issue and consequences emerging out of different policy trajectories. Institutional and administrative fragmentation, unclear roles and duties, coordination deficiencies between and across administrative levels and policy streams (departmentalism) or the lack of willingness and ability have been acknowledged as problems for lower policy delivery.

Societal Agreement on the problem (system knowledge) and goals (target knowledge)	**Certainty on scientific knowledge**	
	Large	Little
Large	**Technical Problems** *Consensus regarding values, knowledge, technic → technical solutions are appropriate, developed or easy to develop*	**Untamed technical problems** *Everybody agrees they must be solved → technical solutions are missing or contested, expert knowledge might compete → knowledge conflicts emerge (e.g. industrial research for company profits)*
Little	**Untamed Political Problems** *Technical solutions are available but their application is critical or contested or obstructed by values; technical solutions are controversial*	**Wicked problems** *Uncertainty on knowledge (system, target), conflict on values and frames, conflict on and multiple problem perceptions*

Table 8 Types of Policy Problems based on Klijn and Koppenjan (2016)

Table 8 illustrates that planning and policy problems are not 'objective' problems that can be discovered and managed like other more technical oriented problems. They are individual and/or collective (groups or whole society) social and societal perceptions. Policy perceptions are difficult to change, since they are embedded in a larger framework of values, ideas, norms and part of each person's socialisation. Different authors (Jenkins et al., 2013; Sabatier, 1988) are pointing out, that policy communities are actor groups that share a belief system and similar values and norms. Thus, sharing value and belief systems within actor and stakeholder groups eases policy design and policy delivery, but might be inappropriate and result in policy failure in case of untamed political or wicked problems, which are characterised by differing or conflicting values and contested technical solutions. In the MINLAND report Land Use Policies and Valuation of Land (Gugerell, 2019) we are showing that mineral policy and planning problems related to mineral resources are such wicked or untamed political problems. One possible approach dealing with such problems are approaches that include different actors and stakeholder and provide high levels of engagement to include and incorporate different perspectives into the planning and policy process to avoid and/or manage conflict (see D 4.4 Civil society`s influence on land use practise across Europe). Consequently, policy problems – and also policy integration – are positioned on the interface of analytical activity as well as socio-political and planning interaction processes (Klijn and Koppenjan, 2016).

Policy integration is advocated to promote more sustainable policies and delivery of policy goals. Policy integration is often associated with environmental objectives (Jordan and Lenschow, 2010a; Lafferty and Hovden, 2003a), the energy transition (De Boer and Zuidema, n.d.; Stremke, 2012; Wu et al., 2017) or the climate policy integration (Steurer and Clar, 2015; Uittenbroek et al., 2014) or or sustainability more in general (Berger and Steurer, 2009) . Integration is referring to 'bringing things

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together' and position them in a broader context (Runhaar et al., 2009). Jordan and Lenschow (Jordan and Lenschow, 2008) are defining policy integration as "process through with 'non' environmental sectors consider the overall environmental consequences of their policies, and take active and early steps to incorporate an understanding of them into policy making at all relevant levels of governance".

Three main approaches of policy integration can be distinguished:

a) Policy coordination: avoiding or mitigating contradictions of sectorial policies, considered as rather low-level integration
b) Harmonisation: bringing objectives (e.g. mineral resources) on equal terms with other sectorial objectives based on synergies of the different policies
c) Prioritisation: giving priority to certain objective in sectorial policies

Policy coordination and integration are often used as interchangeable terms. While in practise they are often used as synonyms, some authors are differentiating them based on the degree of e.g. (i) interaction and (ii) results. Authors, such as Meijers and Stead (2009) stress, that for policy integration a stronger degree of inter-sectoral interaction and collaboration is needed than for coordination approaches. Coordination mainly addresses the mutual adjustment of sectorial policies to establish or improve mutual enforcement, while policy integration aims for joint policies of different involved sectors (e.g. mineral policy stream + land policy/land-use planning). However, policy coordination is the first step towards policy integration, which can't be achieved without the first one. Overall, policy integration demands more efforts, resources, communication and collaboration and requires from involved stakeholders and actors to give up or at least share autonomy, responsibilities and power.

4.1.1 What should be integrated and when?

What should be integrated in what, is a significant question in policy integration. Runhaar et al. (2014) illustrate, that integration can be both, bottom-up or top-down oriented processes. Which pathway integration takes is depending on the issue to be integrated (Runhaar, 2016). Several authors (Runhaar et al., 2014; Wejs, 2014) suggest, that careful framing of the objective that is expected to be integrated is important, clearly identifying possible synergies with other sectorial policies and objectives. Investigating and pinpointing those synergies creates leverage and support for integration actions. Framing integration objectives can be either framed as 'policy problems' or as chances and possible action for adjacent policy issues: "*For example, climate adaptation can be considered as a problem that requires investments or can be framed as an opportunity for sustaining an attractive and safe city"* ((Uittenbroek et al., 2014, 2013). Although, we are addressing public policy, integration and implementation is not limited to the public domain, but can be achieved by a wider policy network (e.g. companies) or along entire supply chains (e.g. minerals), which is probably one of the most challenging approaches in policy integration (Brand, 2012; Driessen et al., 2012; Vermeulen and Kok, 2012).

Policy integration can take place at different moments and/or periods of the policy cycle: either in the policy design and –development process, implementation, evaluation or in the re-design or update of a policy (Kivimaa and Mickwitz, 2006). Prior research advocates the policy design and decision-making phase might be better suited for policy integration than later stages of the cycle, such as the implementation (Jordan and Lenschow, 2010a; Uittenbroek et al., 2013). Two lines of arguments are supporting that consideration: a) early integration efforts are assisting the consideration of other actors/stakeholders' interests and policy objectives in the policy design and the development of implementation actions and measures, b) administrative procedures and routines of other

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administrative units might differ and thus sufficient time for coordination and administrative and pre-information is needed. However, the implementation phase and implementation actions and measures are the ones were the actual impact of integrated policies is created (Kohlhoff et al., 2016).

4.1.2 Horizontal, vertical and diagonal coordination and interaction

Linking different policy streams (e.g. mineral resources, land-use planning/land policy) can be achieved by policy integration and/or coordination can be positioned along a vertical and horizontal axis. Horizontal coordination and integration refer to the processes and mechanism between different policy streams, policy arenas or sectors. Vertical policy coordination and integration refers to processes and mechanisms among different policy levels which mostly correspond with different administrative levels (e.g. national, regional, local/municipal) but not crossing boundaries of policy streams. Horizontal and vertical policy coordination are interdependent: e.g. horizontal policy integration only appearing on the top level (e.g. national) but is not diffusing or trickling down to lower levels of government is likely to remain fragmented and at risk to remain unsuccessful. When the coordination efforts are crossing policy streams and administrative level, one speaks of horizontal policy integration: such cases can become apparent in strongly decentralised or federal systems, where setting the policy goals and their implementation is dispersed over different levels of government and policy sectors. Steurer and Clar (Steurer and Clar, 2015) are stressing, that in such settings early agreements and commitment between the different administrative levels and the actors who are actually responsible for the implementation are involved and participated in the policy design and goal setting.

Policy coordination and integration, particularly horizontal and diagonal, are facing different challenges such as departmentalized administrations. Public administrations are organised along their sectorial responsibilities rather than in an integrated fashion. Hence, policy silos are not only existing on the content level, but also on organisational one (organisational silos), facing increasingly complex policy problems within their own policy silo but often neither acknowledging or taking into account neighbouring or related policy problems and aims. Administrative policy silos are still considered when dealing with policies, with integrative policies and strategies (integrating different individual and societal claims and interests with a spatial dimension and/or impact) such as land policy and land-use planning. Managerial approaches in public administration, facilitated by New Public Management, have furthered the compartmentalization in public policy and public administration, by launching and disaggregating public administration into additional agencies. It shows an increase of overall performance and effectivity but have significantly exacerbated inter-departmental and inter-organisational collaboration and exchange, which is crucial for linking different policy streams to coordinate or integrate them. Overcoming fragmentation and policy silos is one of the major goals of governance (network governance, multi-level) approaches. Governance approaches are acknowledging the wickedness and interrelatedness of policy problems and responding those challenges by advocating coordination between interdependent but relatively autonomous actors (such as in different departments) (Sørensen and Torfing, 2005).

4.1.3 Tools for integration

In this section, we will mainly draw on EPI (Environmental Policy Integration) research done by Runhaar (2016), which has a long tradition and has produced a strong body of knowledge on policy integration (e.g.). Runhaar (2016) distinguishes four types of integration tools:

(1) Regulatory tools (restricting/allowing certain options, actions and behaviour),

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(2) Information tools (steer by providing information and guidance)
(3) Economic tools (e.g. change cost-to-benefit ratios)
(4) Organisational tools (organisational conditions such as capacity/willingness, procedures, etc.)

Regulatory tools are regulating choices: they are restricting or allowing certain options, action or behaviour either in a formalised structure (e.g. legal obligations) or in a more cooperative, voluntary way (e.g. compliance with certain principles or good practises). Regulatory tools typically comprise legal requirements and procedures (e.g. EIA or SEA, which are tools for environmental policy integration). Ruhaar (Runhaar, 2016) also introduces regulatory tools relying on interactive governance modes (e.g. voluntary agreements, covenants). Voluntary agreements are criticized for their limited capacity to unfold implementation and integration pressure, due to too much flexibility and ambiguity (room for interpretation), lack of enforcement mechanisms, limited compensation measures (Glasbergen, 1998; Wu et al., 2018).

Information and voluntary tools are considered to drive behaviour through learning and grants the addressed audience with a large freedom of discretion and freedom to act on the provided information. Voluntary usage of indicators (such as environmental indicators) is challenging in practise, due to language asymmetries (e.g. planners/policy makers) or insufficient involvement of planners (or other end-users) in the indicator development, which subsequently results in limited, fragmented or no application later onwards (Brown, 2003) or a mismatch between indicator scale and user-needs (Graymore et al., 2008). However, there is also research that proofs that voluntary EIA and SEA processes result in greater effect and associated with the operator's willingness and openness towards environmental values (ARTS et al., 2013). Technical mismatches (mismatch of planners needs and capacity of the tool) and if a tool strongly relies on administrative procedures and lacks sensitivity towards political aspects, might also result in insufficient integration. Runhaar (2016) is stressing, that for assessing the capacity of Dutch planning tools integrating climate adaption policies, that the tools *"seem suitable to support municipalities (…) particularly for acquiring knowledge. However, the tools in itself are often not suitable for incentivizing adaption planning and for the actual implementation of adaption actions. A main reason for this is that the tools are not specific enough."* (p 83). Hence, incentives to trigger and push policy implementation seem to be essential.

Typical incentive structures are economic tools. Economic tools include subsidies, taxes, tradable permits, financial rewards or other support actions in the economic sector (e.g. supporting bankability). Economic tools are supporting integration by either setting financial incentives, rewards or punishments. They are on the interface of top-down steering and voluntary behaviour: they might be put in place by higher levels of administration or government but depend on the voluntary behaviour (by contracting) of the involved actors and stakeholder. In EIP different studies have shown the effectiveness of market-based tools: their effectiveness depends on the financial reward and the enforcement power and possible trade-offs with other policy objectives and issues. EEA emphasizes that economic tools should only be one part of a broader package and toolset that steers policy integration (EEA, 2005)

Organisational tools are stressing the importance of organisational structure and organisational practises, as well as the establishment of partnerships and networks that are supporting integration in different stages of the policy cycle. However, also those partnerships are assessed critically by stressing that they "seem to solve some problems but also create new ones". Partnerships and

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networks are long-term voluntary engagements that need trust building efforts and the willingness to share duties and responsibilities (Klijn and Koppenjan, 2016).

4.1.4 Capacity

Capacity and willingness are two central characteristics that are influencing policy integration and implementation (Fleurke and Hulst, 2006; Wu et al., 2018; Zuidema, 2016).

Capacity (ability) refers to an organisation's or unit's capacity to perform certain tasks and objectives. Prud'homme (Prud'homme, 1995) explains, that it cannot be assumed that (local) units are in command of all technical and managerial expertise and skills to perform certain tasks. This observation is important considering mining and mineral extraction a very specific and technically sophisticated topic. Zuidema (Zuidema, 2016) is emphasizing so called 'economies of scale' where larger (e.g. central government) units might have greater resources or the ability to attract and/or allocate resources to handle broad and complex policy issues. Also, Ostrom (Ostrom, 2015) is noticing the importance of the central government to support local (and regional) authorities to handle and overcome possible challenges and hinderances.

Capacity is complemented by willingness, which is covering two main levels: a) individual willingness based on intrinsic or extrinsic motivation, and b) organisational willingness, acknowledging that groups and organisational units (such as departments in public administration) function differently. Organisational willingness might be triggered and driven by organisational or political cultures, administrative practises and routines which are structuring the administrative and group behaviour. Those organisational 'preferences' are complemented by the diverse set of individual motivations of the individuals working in that organisations and groups. Thus, willingness is expected to differ between different organisational units and involved individuals: while one group might be supportive for specific policy goals or objective, another group might be less supportive or even resist due to various reasons (e.g. political). Stoker (Stoker, 1998) illustrates that this complex organisational structure is amplified through lobby groups, NGOs and other stakeholder that are somehow involved or impact policy making. Wu et al (Wu et al., 2018) explain the importance to assess which group is doubtful or resisting and how it relates to other groups. Willingness might also differ on the different administrative scales involved: it might be the case that mineral policies enjoy a high level of importance and willingness on national level, but exhibit a much 'weaker profile' on regional and local level where other policy goals might be prioritized over mineral policy which might be considered not urgent in local or regional setting and thus is omitted from the regional or local agenda setting (Andrews-Speed, 2012). Prior work on policy integration regarding renewables show, that lower level governments and administration might be reluctant unless there is a clear benefit or external incentives are put in place. Willingness and ability, understood as general conditions for the entire policy cycle, deliver important knowledge for designing, implementing and evaluating policies (see figure x). Understanding the conditions for policy implementation and integration can support the decision making on how the policy and measures are designed.

The following chapters are presenting the results of policy integration and coordination in the MINLAND projects and case studies.

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4.2 Results: Policy Tools for Minerals and Land-use Integration and coordination in MINLAND

(Sara Louise Gottenhuber, Andreas Endl)

Bridging two diverse policy streams (minerals and land-use planning) is a complex public policy task, not only due to differing objectives, goals and agendas but also due to the involvement of a diverse set of stakeholders and authorities on various levels of government. The intricateness of the task at hand, further nuanced by type of governance regimes (centralised, decentralised, federal, etc.), thus necessitates the application of multiple instruments and policy mixes (Endl et al., 2018). Such policy tools are often a mixture between regulations, fiscal instruments, information-based instruments and/or national strategies. Following a mapping of the MINLAND case studies (14) the following policy tools were outlined for their role in integration of minerals and land-use planning policies (Runhaar, 2016):

- **Regulatory:** demanding compliance equally, steering predictability of governmental decisions (rule of law) and often followed by sanctions for non-compliance.
- **Economic or fiscal instruments:** designed to encourage investments into exploration and access to raw materials, e.g. tax rebates for research activities (prospecting and exploration).
- **National strategies/ suggested policy guidelines:** proposing a framework and/or identifying suggested criteria for consideration of minerals in e.g. land use planning.
- **Information-based instruments:** maps, data and tools to be utilised (on a voluntary or regulated basis) for the integration of minerals/land-use plans.

On the one hand, policy instruments can be considered 'hard tools', instruments which, if not implemented, may lead to sanctions. On the other hand, governments can opt for 'soft-policy tools' such as voluntary and/or suggested guidelines, information-based instruments and grander or more targeted strategies often indicating the direction or agenda of specific topics on a national level. Naturally, the application of instruments of different characteristics warrants and demands different types of policy integration mechanisms. Policy integration, and type of instrument applied, also strongly relates to the type of national governing system e.g. federal, decentralised or centralised systems and the type of mandates that comes with it.

Following the compiled information from the MINLAND case studies, integration of minerals and land use policies can manifest in national regulations (horizontal integration), from national to regional policies and plans (vertical), and where mandates for policy-making and land-use plans lie on regional/local level also on these levels (horizontal). Based on the case studies compiled, the type of policy instruments applied were either regulatory (on a national or regional level (depending on centralised or decentralised system) or informative/ guiding principles. A handful of cases revolved around a type of 'informative tool' set out to promote integration of minerals and land use policy, often regarding the topic of safeguarding, this instrument was identified in countries with both centralised and decentralised regimes (with varying degree of regional implementation). Below the different categories and the cases they relate to are further described.

Regulatory tools: Regulatory policies and tools for integration of minerals and land-use policy, or rather regulatory policies with varying degree of integration between the two policy streams were identified in Finland, Ireland, Italy, Austria, Norway and Sweden. Although bearing similarities in their regulatory nature, the policies were quite different in scope and level of 'coerciveness' in

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implementation. For example, in Norway the national planning and building act requires local land use planning processes to consider mineral resources, and if a deposit is valorised to be of regional, national or even international significance the Norwegian Directorate of Mining may intervene if a competing land use is suggested in the planning. Similarly, in the centralised system of Finland, the National Land Use Guidelines stipulates policy streams and strategic goals in a top-down approach although the regions can contribute to such goals and objectives through setting their own priorities. In Ireland the Planning and Development Act sets out the regulatory framework in a hierarchical 'top-down' system; complemented by a National Planning Framework the integration of minerals is envisaged through a policy objective that addresses rural development through the sustainable and economically viability of extractive industries, bio-economy and accelerating other sectors whilst protecting the natural landscape and heritage vital for rural tourism. The general objectives of the framework are then translated into regional and county level plans. In Sweden, the integration of land-use policy and minerals resources is translated into a 'holistic' system of National Interests (where mineral deposits can be considered a national interest). Similar to the Norwegian system, but with the difference that the weighting and prioritisation of actual land-use (in the planning) lies with the municipalities in Sweden. However, the national level can still intervene if municipal plans does not take areas of national interest into account in their planning.

In Italy, although the national level is responsible for preparing the legislative framework governing the mining sector, the decentralised system implies that the regional governments are responsible for setting up legislative framework for integration of land-use planning and mineral policy. The region of Emilia-Romagna (MINLAND case 9), was the first in Italy to implement a mining law and 'wide-area mining planning' thereby ensuring regulatory integration of minerals and land-use planning in the region. In Austria, the spatial planning is constitutionally embedded on the provincial level (federal states), mineral resources (excluding free-to-mine materials) are regulated on a national level; thereby driving and guiding spatial planning on a provincial level through policy objectives in certain areas such as mineral resources. Hence, the integration of minerals into land-use plans is regulatory on a national level for 'state-owned' minerals, whereas integration tools for free-for-mine resources into planning and policy is entirely vested with the federal states and seen in 'provincial development plans' which includes strategic objectives and outlines sectorial policy integration. See table 9 below for an overview of the main characteristics of regulatory integration identified in the MINLAND case studies.

Table 9 Characteristics of Regulatory Integration

Country	***Characteristics of Regulatory Integration***
Norway	*Nationally regulated: land use planning must consider mineral resources.*
Finland	*Nationally regulated: National Land Use and Building Act - top-down strategic goals, regional discretion for realising objectives.*
Ireland	*Nationally regulated: National Planning Framework stipulated objectives for mineral policy integration translated into regional and county plans.*
Sweden	*Nationally regulated: inbuilt weighing of 'national interests' both nationally and regional (municipal) discretion for implementation.*
Italy	*Decentralised regulated: Regional integration by regulation 'mining planning'.*
Austria	*Nationally regulated: 'state-owned' minerals.* *Provincially regulated: Provincial Development Plans – strategic objectives and integration of sectorial policies.*

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Fiscal Policy Tools: Often mentioned as an incentive to encourage investment into a certain sector in the form of e.g. tax rebates, fiscal or economic instruments are not very prevalently used in in the raw materials sector. For example, the MIN-GUIDE project identified national fiscal or economic incentives related to minerals policy in only four European Union Member States (Endl, et al. 2018). The MINLAND cases display a similar trend. The case of Austria describes how a no-royalties policy concerning 'free-to-mine' and state-owned raw materials are considered a fiscal incentive to support policy. On the other end of the spectra, in both Italy and Portugal taxes and royalties from extractive practices were considered an important aspect of ensuring both remediation (Italy) and to create incentives for mining companies to invest in local social, environmental and research programs (Portugal). If such instruments contributed or hindered integration of the two policy streams of land-use and minerals was not further elaborated in the MINLAND cases.

National strategies/ policy guidelines:One trend that is worth noting is the construction of 'national strategies' or 'guidelines' that often seek to bridge the gap between perceived policy silos and establish a coherent approach in a specific target sector. Strategies, such as for example a National Minerals Strategy (advocated by the EIP), can be seen as an indication of a government's commitment to establishing a strategic policy framework for minerals policy and ensure coherence of policy integration (Endl, et al. 2018). Establishing an agenda (Norway) or providing guidelines (Finland and Austria) can thus clarify the need, and provide incentives, for bridging objectives of two or more policy streams beyond direct, regulatory, tools for integration. Although this was not specifically described in the MINLAND case studies, it may be worth noting that, out of the case studies used for this report, Finland, Portugal, Greece, Austria, Norway and Sweden all have National Minerals Strategies in place (Endl et al., 2018).

Informative Tools: A visible trend concerning the integration of land-use and minerals policy is the design and application of informative methodologies in the form of planning tools and/or maps with the objective of enhancing knowledge of potential land use, mitigate land use conflicts and/or integrating minerals into land use processes. These tools are characterised by including assessments of land and mineral deposits (in some cases also including feasibility measures for extraction/exploitation). The tools range in target audience – from being an internal repository for voluntary use (Austria) to being available for an array of stakeholders, including industry (Norway). Five out of the 14 MINLAND cases elaborated described good practice aspects related to the design and application of an informative instrument. In Portugal, a soft-policy instrument named 'land use planning methodology for mineral resources (LUP-MR) was developed with the objective to achieve safeguarding through introducing sub-categories of land into a policy-making process of the whole mining value-chain (from undiscovered/hypothetical mineral resources to extraction and exploitation). As an informative tool, the LUP-MR is not legally binding, although the Portuguese case study clarified that many municipalities adopted the suggested land-categories in their municipal land use plans, increased information on the importance of safeguarding (from the national authorities) were directed towards municipalities which did not adopt the LUP-MR methodology.
The Austrian case regards the design and implementation of a voluntary soft-policy tool with the aim of safeguarding mineral resources on a national level and acts as a policy instrument that facilitates integrated minerals and land use planning policy implementation on a provincial level. The Austrian policy instrument (Austrian Mineral Resources Plan) assesses and determines raw-material deposits and assess their conflict potential with other land-use option, as a voluntary tool, the ARMP can be utilised by the federal states and different paths to implementation and realisation was documented

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in the MINLAND case study (e.g. differences between the federal states of Styria and Tyrol). Similarly, to the ARMP, the MINLAND case from Greece described a national level policy tool for safeguarding the exploitation of primary aggregates, with focus on the framework applied for delineation of (land-use) conflict free aggregates extraction areas. Unlike the cases from Portugal and Austria, the policy instrument in Greece is implemented as a top-down approach as it provides a national framework to be incorporated in regional and local spatial plans.

The case study from Norway contained a pilot study where mineral resources and prospective areas in Nordland County were spatially defined and classified and included in the county and national land-use management tool – in an effort to mediate potential land-use conflicts and safeguard mineral resources of possible current and future value. As the responsibility for planning (according to the Planning and Building Act) lies with municipal councils and regional authorities and the case of Nordland was used as a pilot, actual usage of the informative instrument has thus far been larger on a national than on a regional level. However, the case study showed that that, in general, the instrument had contributed to increased awareness of mineral safeguarding on all levels of governance.

Much like the previously described informative policy tools, the MINLAND case from Spain outlined the development of a mining-environmental planning map with the intention of being used as a 'starting point of the definition of mineral and mining strategies' in local land-use planning. However, as pointed out by the case study, given the decentralised planning system and challenges of vertical integration the uptake and utilisation of the methodology has yet to be transferred to regional levels. The potential implementation of a voluntary tool in decentralised systems, as seen from the case studies, thus seem to come with a different set of challenges regarding coordination and implementation (see *Chapter 3.2.6 on coordination and communication*) as opposed to the informative tools applied in top-down regimes. (See table 10 below for an overview of the information-based instruments identified in five out of the 14 MINLAND cases).

Table 10 Characteristics of Informative Integration

Country	***Characteristics of Informative Integration***
Austria	*Austrian Raw Materials Plan (ARMP). Soft-policy informative tool designed on a national level to avoid land-use conflicts and ensure mineral safeguarding.*
Norway	*National land-use management tool with the objective of mediating potential land-use conflicts and safeguarding mineral resources of possible current and future value.*
Portugal	*National voluntary instrument (land use planning methodology for mineral resources – LUP-MR) designed to be implemented by municipalities as a way to achieve safeguarding of mineral resources in municipal land-use plans.*
Greece	*National level policy tool for safeguarding the exploitation of primary aggregates – focus on framework applied for delineation of conflict free (land-use) aggregates extraction areas (quarrying areas – QA).*
Spain	*National informative and voluntary instrument of mining-environmental planning map intended to be used as a starting point of defining mineral and mining strategies in regional land-use plans.*

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4.2.1 Vertical and Horizontal Policy Integration

Policy integration can be understood as "the replacement of specific elements of existing policy 'mixes' or 'regimes' – the goals and objectives and calibrations of existing policy tools and goals – by a new policy mix, in the expectation of avoiding the counterproductive or sub-optimal policy outcomes that arise from treating interrelated policy regimes and components in isolation from one another"(Rayner and Howlett, 2009, p.99). As outlined in Chapter 3.1 on a Member State level, policy integration and coordination address horizontal mechanisms and practices, as well as vertical adjustments, involving different administrative levels (national to local). Empirical studies in e.g. environmental policy integration show that, in order to achieve efficient policy integration (cross-sectoral and cross-level) both dimensions of horizontal and vertical governance mechanisms are needed (Jacob and Volkery, 2004). *Horizontal policy integration* is often understood as pertaining to organisational and institutional interactions across distinct sectors or, the extent to which a central authority has developed a comprehensive cross-sectoral strategy (Di Gregorio et al., 2017; Lafferty and Hovden, 2003b). *Horizontal policy integration* can thus be seen in converging two (or more) policy streams to obtain a coherent approach, as policy streams with conflicting goals and objectives may undermine long-term alignment of overarching objectives across sectors (Nilsson, 2005). Horizontal policy integration is particularly addressed as paramount in 'naturally' cross-sectoral topics such as Environmental- or Climate Policy Integration (Di Gregorio et al., 2017; Jordan and Lenschow, 2010b; Nilsson, 2005; Lafferty and Hovden, 2003b) but also for minerals and raw materials policy (Endl, 2017; Clausen and Mcallister, 2001). *Vertical policy integration*, on the other hand, takes place among different levels and hierarchies across political administrative levels and/or territories (Endl, 2017). Hence, vertical policy integration involves actors from different levels of government such as, for example, national ministries, regional authorities and local governments. Vertical policy integration can involve processes of devolving responsibility to local levels, and can foster coherency, consistency and learning between different levels of government (Nilsson, 2005).

In the scope of the MINLAND project, the MINLAND case studies (14) were assessed for horizontal and vertical minerals policy and land-use policy integration. Furthermore, following the structure of chapter *3.2.1 Policy instruments*, vertical and horizontal policy integration were grouped according to: (i) integration in strategies and regulatory instruments, or; (ii) integration through informative policy instruments.

4.2.2 Vertical Policy Integration

Addressing vertical policy integration, the cases allowed for a differentiation between:

- *Partial integration* – National voluntary or non-mandatory tools addressing minerals (often related to safeguarding objectives).
- *Full integration* – Consideration of minerals in land-use planning (input into land use planning originates from other levels of governance).

In Sweden, Finland and Ireland the cases dealt with national land use guidelines (Finland), national planning framework (Ireland), and the definition of 'areas of national' interests (Sweden). In Finland and Ireland minerals interests outlined in the national guidelines and planning frameworks directly fed into regional and local planning documents, thereby indicating full vertical integration. In Sweden, the regional level (municipalities) preside over the discretion to weigh the 'areas of national' interests

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(defined through horizontal/sectorial integration) with their regional land-use objectives thereby signalling this as a partial (and flexible) vertical integration. See table 12 below for an overview.

Table 11 Vertical policy integration in strategies and regulatory instruments

MINLAND *Case*	***Policy instrument***	***Aspect of Vertical Policy Integration***	***Level of Integration***
Finland	National land use guidelines stipulate policy streams and strategic goals (including mining and deposits) in a centralised approach.	Top-down implementation in the regions – although regions can contribute to goals and objectives through setting their own priorities.	*Full integration*
Ireland	Planning and Development Act complemented by a National Planning Framework (addresses objectives of minerals policy horizontally on a national level).	Top-down regulatory framework – general objectives are translated into regional and county level land-use plans.	*Full integration*
Sweden	System of 'national interests' (horizontal/sectorial) definition of land-use interests and objectives.	Local levels responsible for land-use plans, system of 'national interests' can be weighed (partial vertical integration) on a local level and chief mining inspectorate or national levels can be involved if conflict arises.	*Partial integration*

Austria, Portugal and Spain all have devised a type of informative and voluntary 'soft-policy' tool in the form of a raw materials plan (Austria), a land use planning methodology (Portugal), and a mining-environment planning map (Spain) (see *Chapter 3.2.1 on policy instruments*). These tools are all subject to challenges of vertical integration as they are designed on a national level but with the intention to support minerals policy (and safeguarding) integration in local and regional land-use plans in federal or decentralised systems. All cases discussed, to a varying extent, the need for coordination and communication between national and regional/local levels of government in achieving 'uptake' and integration of the tools on lower levels of government (see *Chapter 3.2.6 on coordination and communication*). A specific challenge that was brought up in the cases was the need to involve regional/local authorities already in the design-process of instruments as this would ensure 'ownership' and thus, willingness to integrate the tool or outcomes thereof in regional/local land-use plans. Two more MINLAND cases addressed the design and implementation of an informative policy tool (from a national to a regional level), similar to the cases outlined above. In Greece the tool was implemented in a centralised (top-down) manner thereby ensuring integration of the tool in to spatial plans. In Norway the case study of Nordland showed that the integration of the land-use management tool was successful in this county (full integration) and the pilot will now be extended to other municipalities and regions (no integration currently known). See table 13 for an overview of vertical policy integration in informative policy instruments.

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Table 12 Vertical integration in Informative policy instruments

MINLAND ***Case***	***Policy instrument***	***Aspect of Vertical Policy Integration***	***Level of Integration***
Greece	National level policy tool for safeguarding the exploitation of primary aggregates – focus on framework applied for delineation of conflict free (land-use) aggregates extraction areas (quarrying areas – QA).	Top-down implementation of national safeguarding policy (aggregates) in regional/local land use planning (spatial plans).	*Full integration*
Norway	National land-use management tool with the objective of mediating potential land-use conflicts and safeguarding mineral resources of possible current and future value.	Responsibility of planning lies with municipal council and regional authorities. Nordland case used as a pilot; the instrument contributed to increased awareness of mineral safeguarding on all levels of governance and is set to be implemented in all municipals and regions.	*Full integration*
Austria	Austrian Raw Materials Plan (ARMP). Soft-policy informative tool designed on a national level to avoid land-use conflicts and ensure mineral safeguarding.	Local levels responsible for land-use plans – consultations between different levels occur in the form of checks and balances, review of the proposed plan on regional level and partly on national level if related to responsible department.	*Partial integration*
Portugal	National voluntary instrument (land use planning methodology for mineral resources – LUP-MR) designed to be implemented by municipalities as a way to achieve safeguarding of mineral resources in municipal land-use plans.	Municipalities responsible for land-use planning, some have used the sub-categories of land proposed by the LUP-MR. National authorities approach municipalities not adopting the LUP-MR in an effort to increase understanding of the importance of minerals safeguarding.	*Partial integration*
Spain	National informative and voluntary instrument of mining-environmental planning map intended to be used as a starting point of defining mineral and mining strategies in regional land-use plans.	Challenges of vertical integration in a decentralised system were regional levels are responsible for land-use plans. Implementation met with challenges and is yet to be seen.	*Partial integration*

The cases addressing vertical integration point out the importance of coordination and communication between different levels of government, perhaps foremost so in decentralised and federal systems where involvement of lower levels of government early on in the design of tools and policies were mentioned as key to ensure integration and implementation (see e.g. the case study of Nordland County in Norway or the case of Ribera Del Ebro in Spain). It was apparent that full vertical integration of minerals policy into land-use planning was more prevalent in centralised systems where regulatory tools demanded integration of objectives or goals in lower levels of government planning. Interesting to note is the mandate of local authorities to prioritise (Sweden) or identify own pathways to realising national goals and objectives (Finland), which also gives flexibility of prioritising local

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interests and may increase legitimacy and ownership of policy and responsibility over connected challenges (Nilsson, 2005).

4.2.3 Horizontal Policy Integration

Regarding horizontal policy integration the cases dealt both with integration on a national level (strategies, regulatory documents – primarily in centralised countries) and where mandates for policy development and land-use planning were vested with lower levels of government (decentralised or federal) on a regional or municipal level. The cases allowed for a distinction between:

- *Partial integration* – Land-use (or mineral) issues integrated into minerals (or land-use) planning documents, primarily in ex-post or in the implementation stage
- *Full integration* – Plans, policy or tool that considers minerals in preparation or design stage of land-use plans/ zoning documents or considers land-use planning in minerals planning documents.

Most commonly, minerals policy was integrated into land-use plans through regulation, strategies, informative instruments or during the implementation stage (land use planning or zoning). Where minerals policy, or mineral issues were integrated at a design stage (of land-use planning or a policy) this was considered to signal full horizontal integration. On the other hand, where minerals issues were considered (more ad-hoc) in the implementation stage this was considered to be evidence of partial horizontal integration. The information in table 13 outlines strategies and regulatory policies that address horizontal integration of minerals resources in land-use policy (or vice versa) and the different characteristics thereof.

Table 13 Horizontal integration in strategies and regulatory instruments

MINLAND *Case*	***Policy instrument***	***Aspect of Horizontal Policy Integration***	***Level of Integration***
Finland	Regional development strategies	Preparation phase of regional land use plans considers minerals exploitation via regional development strategies, during this preparation consultation is conducted and regional strategy zoning updated/proposed.	*Full integration*
Finland	Flexible zoning plans	Land use planning processes allows for re-evaluation of land use zoning according to new development possibilities. For example, re-evaluation can be conducted based on company plans for exploitation (and new discovered deposits).	*Full integration*
Sweden	System of 'national interests'	National interests determined through sectorial integration – minerals and other land use interests determined through mechanisms of horizontal integration (respective authorities and actors involved).	*Full integration*
Norway	Planning and Building Act (National)	Revised to include mineral resources as a specific topic (design) in the Norwegian land use	*Full integration*

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		legislation, mineral resources must be considered in the land use planning process.	
Italy	Regional land-use and minerals strategy / municipality mining plan	Mapping geological heritage, flora and fauna with the intention of modifying the current planning instrument to consider e.g. touristic possibility of geological heritage.	*Full integration*
Ireland	Planning and Development Act complemented by a National Planning Framework 2040	One policy objective of the national planning framework addresses 'rural development through the sustainable and economically viability of extractive industries, bio-economy and accelerating other sectors whilst protecting the natural landscape and cultural heritage. *The case still indicates that the integration of minerals policy in land-use planning appear modest.*	*Partial integration*

As can be discerned from the case studies, some concern instruments that weigh different land-use interests in the design phase of the policy on different levels of government, for example in Italy this was done on a regional level whereas in Sweden this was done on a national level. Some cases also showed evidence that mineral resources have been fully integrated into national land use regulations (Norway), or partially integrated (Ireland). The MINLAND case from Finland also included an aspect of having flexible zoning plans that allowed for 'reformulated' strategies and land-use processes if new deposits were discovered (thereby integrating minerals into land-use plans in a flexible and on-demand basis). The cases thus, shows that horizontal integration of minerals land-use planning policy can take different shapes and forms and occur on different levels of government.

A commonality in some of the MINLAND cases that was discussed above in the section on vertical integration was the design and implementation of informative policy instruments. As outlined above, these instruments were met with varying degree of vertical integration success in the different member states. Utilising the aspect of full horizontal integration as pertaining to integration in the design of the policy instrument, the majority of informative instruments were considered to achieve full horizontal integration as they often accounted for different land-use and societal interests already in their inception form. In one case, the informative instrument integrated aspects of already existing policy streams to achieve coherency and compliance, this was thus considered partial instead of full integration (Austria).

Table 14 Horizontal integration in informative policy instruments

MINLAND *Case*	***Policy instrument***	***Aspect of Horizontal Policy Integration***	***Level of Integration***
Greece	National Policy (tool) for Minerals Safeguarding (Quarrying Areas).	Designed for vertical integration into regional spatial plans this policy tool considers minimisation of environmental footprint, the national spatial strategy, socioeconomic factors and protection of archaeological and cultural heritage.	*Full integration*
Spain	National mining-environmental mapping *(voluntary informative policy tool)*.	Early phases of environmental land use assessment: territorial analysis factoring in environmental inventory, exploitable resources, cultural heritage, socioeconomic factors and visible impacts on landscape.	*Full integration*

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Portugal	Land use planning methodology for mineral resources (LUP-MR)	LUP-MR refers to the practice applied by the mining authority (DGEG) when contributing to Land Use Planning review processes of municipal land use plans. Full-integration of minerals safeguarding into land-use plan processes on a national level but modest implementation on sub-levels of government (vertical).	*Full integration*
Austria	Austrian Raw Materials Strategy (ARMS) and Plan (ARMP)	Coordinating parts and components of other policies such as Land-Use and Nature Protection into a Raw Materials Plan. *Intention to contribute to vertical integration (although this remains modest).*	*Partial integration*

The information from the cases points to horizontal (sectorial) integration occurring in nationally developed tools with the intention of integrating mineral resources into land-use planning policies. However, there appears to be a deficit in vertical integration of such tools in systems where regional and local levels of governments have land-use planning mandates, as seen in the examples from Portugal and Austria. This suggests that although full integration can occur on a horizontal level there are still challenges that needs addressing in order to achieve vertical integration in such systems. As seen from literature regarding policy integration, this again strengthens the notion that both dimensions of horizontal and vertical mechanisms are needed to achieve 'full policy integration' needed (Jacob and Volkery, 2004).

4.3 Results: Communication and Capacities to Support Policy Coordination

(Katharina Gugerell, Chrysanthi Panagiotopoulou)

Coordination is taking place when decision-making, either in policy making or LUP, takes into consideration decisions made by other policies or plans with the intention to avoid conflict and support both service and effective policy delivery. To do so, organisations are called to find ways and means to cooperate and coordinate with the objective to find solution spaces, bridge policy and identify implementation gaps that possibly were not considered in the first place. Peters (Peters, 2018) presents in an overview reasons for limited coordination and remaining in policy silos:

(i) specialisation, as a value of governmental performance in itself;
(ii) power: limited information sharing and holding of information is discussed as powerplay between governmental departments, even when performance could be enhanced;
(iii) performance management: new public management show negative effects in coordination, due to performance targets on organisational/departmental level, thus collective goals are quickly ignored;
(iv) turf: defending budgets;
(v) beliefs: certain beliefs or organisational cultures can limit the willingness to coordinate;
(vi) party politics: coalition politics results in the distribution of ministries, and thus policy streams, to different parties, which can also impact coordination efforts;

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Coordination can be established or enhanced via (i) formal or informal networks (i) collaboration and (ii) hierarchy (Peters, 2018). Coordination through networks can be formalized (e.g. committees) or occur as informal network practises e.g. regular interactions between civil servants either due to regular collaboration or through social/professional interactions from another context. Coordination through collaboration is aggravated if organisations or the involved actors have very different perspectives and ideas about policy, problem perspectives and the pathways to respond to those problems and implementation. Establishing at least a basic joint problem perspective and agreement on the issue is required to establish and support the linking up of different policy streams. Peters (Peters, 2018) stresses the difficulty to improve coordination through collaboration by deeply embedded policy perspectives and organisational cultures and require individuals that are willing and flexible enough to negotiate definitions and policy in collaborative settings; individual and organisational willingness then must be complemented by capacities needed to achieve that coordination through collaboration.

Different MINLAND Cases and GPTs are addressing communication and coordination between actors from different administrative levels (vertical) and involved policy streams and sectors (horizontal) as an important ingredient for establishing or improving the linkages between mineral policy and land-use planning and support their integration. The cases pose some limitations on this task, since most of the investigated cases are elaborating on communication within a policy stream or addressing communication and coordination in a single tool (e.g. regulatory permitting), while cross-scale and cross-sectorial communication and coordination is only modestly mapped and addressed. Also, the subsequent chapter map manifestations of coordination and communication as described in the MINLAND cases and the GPTs; but is not assessing the effectiveness, role and success for policy integration since the mapped material is not providing sufficient information to perform that analysis

Motives and goals for different coordination activities are achieving ‘the correct balance’ (GPT Ireland) of different policy streams and demands requires horizontal integration or at least coordination efforts. The MINLAND cases show, that those horizontal linkages can be established on different levels of government (national to local), different moments of the policy and planning cycle (e.g. policy design, implementation) or in different processes (e.g. LUP planning, SEA). Those processes can be institutionalised or informal coordination processes. Horizontal coordination and communication are crucial to establish or improve connection and linkages between different policy streams, in MINLAND with a particular focus on linking mineral resources and land-use planning. Table 2 illustrates, horizontal coordination activities related to (i) involved actors and (ii) in LUP processes and sectorial policy making (coordination and communication activities between public authorities and with the public are addressed in MINLAND Deliverable 4.4. Civil society`s influence on land use practise across Europe).

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Table 15 Coordination activities to linke mineral and land use policy, MINLAND cases studies

Case	Description		LUP / Sectorial Policy	Horizontal	Vertical
Finland (GPT)	Companies present their plans to LUP authority	Companies-PA	LUP	x	
Portugal (GPT)	Advisory committee: each municipal land-use planning reviewing process has an advisory committee that includes public entities involved in the process, multidisciplinary team DGEG is responsible for feeding into the LUP proposals on municipal level → DGEG coordinates different involved stakeholders	Public Authorities	LUP	x	x
Greece (GPT)	8-members' Committee with representatives from different authorities, including a representative from the Hellenic Survey of Geology and Mineral Exploration	Public authorities	LUP	x	x
Italy (GPT)	All relevant authorities must be involved in the process: especially also those that are responsible for the implementation Fundamental is to work with local stakeholder	Public Authorities	LUP – Regional Planning	x	X
Austria	Involving different stakeholder and public administration unit's policy design of AMRP, Administrative debate must be complemented with political discourse: inclusion of policy makers, politicians and public administration is crucial in the design process	Public Authorities – Industry	Sectorial Policy making	X	X
	Informal coordination between different governmental departments to weigh and integrate different land-use interests and policy needs	Public authorities	LUP	X	
Fäbotjärn	Various national governmental agencies are required to furnish particulars of areas judged to be of national interests	Public authorities	Sectorial Policy Making	x	
Norway	(i) part of the planning process, there are meetings between different governmental institutions to reduce level of conflicts for different land uses	Public authorities	LUP	x	
	(ii) integrated planning programme – directorate of mining may object when the plans consider areas of quantifiable resources classified as national/international or regionally important				x

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Coordination activities between public sectors or departments from public administration are taking place to mitigate possible conflicts (Norway), discuss, weigh and negotiate different land-use options (Greece, Portugal, Austria). Those coordination activities take place either through informal practises (Austria) or are institutionalised via Advisory Boards (Portugal) or Committees (Greece) in which the coordination is taking place. Those committees can be considered as attempts to establish networks for coordination: regular collaboration of the same actors results in decreasing transaction costs and better coordination efforts, since network actors are repeatedly collaborating over longer time periods, which supports the establishment of joint problem perceptions, mutual understanding (or acceptance) and joint capacity building to negotiate possible solutions. Responses from Portuguese project partners (DGEG) are illustrating that much effort especially in the first years of network formation and building are necessary but improves the collaboration and decision quality in later years.

The cases and GPT also illustrate coordination activities within the field of sectorial policy making: the case of Fabotjan shows the coordination to different national governmental agencies to evaluate national interests, while the Austrian Case of the AMRP (Austrian Mineral Resources Plan) illustrates coordinative activities during the policy development of the AMRP: this case also shows, that horizontal and vertical coordination activities are complementary, especially in federal or decentralised structures, where policy making and policy implementation are dispersed among different levels of government and policy sectors (mineral policy – LUP). In such settings coordination and communication between the different involved actors and government departments is important to support policy implementation. Vertical coordination supports the integration of different policies or instruments across different levels of authority, between subnational (provinces, regions, municipalities), national (MS) and trans-national (e.g. EU level). Institutionalised process of vertical coordination are e.g. institutional consultation processes between different levels of government to ensure that policy goals or other standards are considered in the policy design or plan making (e.g. Austria) or to assess different national interests (Norway). The Italian GPT is referring to multi-level processes, as policy arenas for horizontal integration, as success factor. Hence, the case is illustrating a success factor on the interface of horizontal and vertical coordination

Other MINLAND GPTs are emphasizing on coordinative activities with the public as success factors (e.g. Finland, Ireland) and subsequently integrating different needs and interests in LUP processes (Finland). Public consultation in the development of plans and policies is regulated via the SEA directive and is implemented throughout the MS (see MINLAND Deliverable 4.4. Civil society`s influence on land use practise across Europe) demanding communication procedures with the public. Those communication processes can be interpreted as horizontal processes of communication in order to integrate needs, aspirations and requirements from different stakeholder (e.g. mining industry, local community, NGOs) into LUP strategies or instruments (such as zoning plans). The Finish MINLAND GPT illustrated the coordinative role of LUP as a success factor: *"During preparation of the regional land use plan (no National land-use plan exists), consultation is conducted and, according to regional development strategies (…) this case the region consider mining activity and economical driver but at a regional land use planning stage respects the areas belonging to the Sami homeland, northern most areas and Skoll community."* (GPT Finland). The case shows, the integrative character of LUP strategies and instruments, with the need to coordinate a broad variety of policy streams and needs of local/regional communities or tribes (see also 4.4, e.g. for FPIC) as well as mining issues related to LUP (e.g. change of zoning/land use types). Thus, public participation and civic engagement processes

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are means to support horizontal policy coordination by considering the needs and aspirations of the public as another legitimate 'policy stream' in the policy and LUP process.

4.3.1 Capacities for Policy Coordination and Integration

Technical and managerial capacities are necessary to support and perform coordination and policy integration. Technical capacity is referring to content-specific knowledge and skills, existence of other supportive policies (e.g. project subsidies, rewards, regulatory instruments); managerial expertise is referring to sufficient expertise regarding integrated policy approaches and/or expertise and skills for collaboration and working across departmental and governmental organisational borders.

The responses from the case studies illustrate a differentiated perception regarding ability and capacities of involved actors, covering the entire scale from perceived low to high capacity. While respondents with geological and/or mining background consider LUP technical capacity in general rather low (e.g. Spain, Finland, Norway): *"LUP with competence in geology are rare"* (Norway) or like in Spain the brief response regarding capacity was *"Low in Navarra"* (Spain), respondents from LUP practise and public authority asses their technical capacity as sufficient to handle topics on mineral resources appropriately (e.g. MINLAND case studies Austria, Greece, Italy): *"LUP authority has all the competence and knowledge on mineral resources."* (MINLAND casestudy Italy). On the other hand, MINLAND project meetings are illustrating a rather modest LUP knowledge (objectives, approaches, tools etc.) from many involved actors affiliated with geology or mining. This situation emphasizes the importance of projects like MINLAND, to establish platforms for capacity building, knowledge sharing and as meeting space for involved parties.

Mapping the cases illustrates, that the availability of data for GIS and the necessary skills and knowledge for the integration of provided GIS data into LUP practise is given in the planning departments and LUP authorities (see table 18); GIS applications are standard applications in GIS practise; hence suitable interfaces and low-threshold download options with the necessary data provide a suitable base for LUP activities and supports the integration of mineral resources in LUP practise (e.g. Austria).

Table 16 Technical skills reg. GIS and Information Systems for mineral resources and LUP, outlined in the MINLAND case studies (WP3 Case studies of land use planning in exploration and mining)

Country	GIS tools and skills
Portugal	GIS tools assisting planners, all data in GIS systems
Austria	GIS processing tools are in full use, interface
Greece	Sufficient expertise and tools
Sweden	GIS data sharing
Italy	Specific data base is existing, assisting the mining and LUP
Finland	Each organisation relies on their GIS resources
Hungary	Data provided for GIS applications & National or Regional Development and Spatial Planning Information System

There are differences regarding the general availability to mining experts and/or geologists in public administration and for immediate availability for LUP authorities: while in some cases geologists are available in public administration on regional or provincial level (e.g. Austria/Styria/Tyrol) in other

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cases they are not (e.g. Poland). Minerals, quarrying and mining is considered a delicate topic with very specific questions, which cannot be covered in house but experts are needed: “We have some capacities in house. But some topics are so specific we get external help.” (Ireland, PA2) and “There is not enough expertise in house. But in reality, there are so few cases, there is also no point having somebody full time to look after mining cases. Some impacts can be difficult to assess (…) We hire experts to help us on cases. We also refer cases to departments and agencies like the Department of Communications, Climate Actions and Environment or the Fisheries (…) Staff available to advise Planning Authorities would be very helpful” (Ireland PA2). The MINLAND cases show, that for authorities it is not always possible to have an expert on site, but it becomes clear that they either collaborate with experts or with geological survey to tackle specific and complex questions they cannot cover by themselves (e.g. Ireland, Spain, Sweden).

Thus, the MINLAND case studies indicate that for particular questions experts are needed and appreciated to consult public authorities. Support, exchange and capacity building is considered particularly important for that municipalities and regions where “mining comes into town/region” as a new primary industry and where public authorities and public administration were not engaged with mining earlier (e.g. cases Spain, Austria/Styria). Aligning with Zuidema (2016) and Ostrom (2015) we can see that the support of the central government or higher levels of government are needed to provide such resources and that smaller units (e.g. regions, municipalities) often do not have the capacities to utilise such resources (e.g. hired geologist): *“It is indispensable. It is important because the regional and national administrations are able to organise meetings or inter-territorial conferences in which experiences are exchanged, helping the municipalities where there is no mining tradition to understand the issues related to that activity. On the other hand, regional administrations have in their workforce mining experts who can offer support to local entities.”* (Spain, local workshop). The cases of Sweden and Austria show, that geological surveys like *SGU* or *Geologische Bundesanstalt* are providing support, in the case of Sweden (Boliden case) it is stated that SGU provides particular support for the industry. Hence, it is important to note, that for consulting public administration un-biased consultancy is needed apart from lobbying activities for industry, since LUP is expected to weigh, value and integrate various needs, expectations and policy streams.

Capacity building and experiential learning from other public authorities was mentioned as other important option to build up and improve knowledge on the topic by learning from practises and experiences from other LUP authorities and practitioners.

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5 Lessons Learned, Success Factors and Policy Recommendations

The following chapter illustrates take away lessens and discusses success factors and recommendeations for policy making and planning practise.

5.1 Lessons learned and Policy Recommendations for the Valorization of Mineral Deposits

(Jorge Carvalho, Krzyzstof Galos)

Mineral deposits safeguarding (minerals safeguarding) takes place during Land Use Planning.

It is the process of ensuring that areas containing or potentially containing mineral deposits are not needlessly occupied by other uses that may prevent their future extraction, including the places for installing mining/quarrying infrastructures. It relates to the Mineral Sterilisation concept, which is the unnecessary loss of the option to explore mineral deposits.

It is widely accepted that resources with an already known economic interest are those that will supply the society in a near future, and many of the areas where they occur are already protected by some kind of land use planning restriction (e.g. mining concessions). Therefore, the long-term supply depends on the undiscovered or poorly defined resources (e.g. Briskey et al., 2007; Meinert et al., 2016; Nickless et al., 2015) which will only be mineable if the areas containing them are also protected from unnecessary sterilisation, which is why areas potentially containing mineral deposits (prospects) should also be taken into account in land use planning.

Safeguarding mineral deposits is equivalent to grant the access to them through the land use planning tools, but it does not guarantee that they will be exploited because other land uses may be considered more relevant. Therefore, safeguarding mineral deposits also means that no other land uses should preclude the access to them without a fair and equal assessment process.

In this way, the process of qualifying mineral deposits for their safeguarding in land use planning should be performed through their multi-criteria assessment valorisation. Their monetary valuation is not relevant for that purpose.

Methods of mineral deposits valorisation may be prepared individually by each European country, with different detailed criteria and weighting depending on country's internal conditions and policies. However, the assessment should be based on geological assessments and include economic, environmental and social criteria and it should be applied for discovered and undiscovered mineral deposits. In order to have a qualitative judgment on the worthiness of mining, conflicts with other land uses could also be assessed.

General Framework of Mineral Deposits Valorisation

A general framework of mineral deposits valorisation, with indication of Mineral Deposits of Public Importance to be included into land use planning system through Mineral Safeguarding Areas, should be based on the 6 steps proposed by the MINATURA2020 project:

1. Analysis of the mineral policy, mineral demand forecasts and economic context
2. Identification and classification of MDoPIs (various methodologies possible, but importance classified at three levels: European, country, regional)
3. Analysis of alternative land uses (current and future)
4. Creation of a proposal of Mineral Safeguarding Area (MSA) for each MDOPI
5. Validation of MDOPIs and MSAs

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6. Inclusion of MSAs into local land use planning documents

The implementation of this procedure may be problematic as it depends on the specificities of each country. For this reason, these six steps act as a general guidance, but the implementation of steps 2 and 4 should be obligatory, i.e. identification of MDoPIs according to basic common criteria and initiation of safeguarding procedures through assigning of Mineral Safeguarding Areas (MSAs).

5.2 Lessons learned and Success Factors for the Policy Coordination and Integration of Land-Use and Mineral Policy (Katharina Gugerell, Michael Tost)

Policy Tools and Policy Mixes

The MINLAND cases show, that policy tools are assembled to policy mixes combining regulatory, economic (fiscal) tools, (national) strategies and guidelines and information-based instruments. One challenge of introducing new policy tools is their evalution in the context with the existing policy regime, and how the different tools (see chapter 4.2.) work and fuction together. Existing research (e.g. Howlett and del Rio, 2015; Rayner et al., 2017) points out, that the mere adding or replacing of policy tools can result in the situation that the policy tool and/or the entire policy mix cannot unfold its expected performance and/or can lead to underperformance and inefficiencies (e.g. resource expenditure)

To support the integration of land-use and mineral policy, tools and instruments for minerals planning (e.g. multi-criteria assessment, safeguarding) should be adapted to the land-use planning system and a good fit with the actual processes on the ground. Successful policy integration and implementation depends on horizontal and vertical – in particular cases also diagonal coordination and a policy mix that is 'fit for purpose'.

Early involvement of lower levels of government

The MINLAND research illustrates, that especially in decentralised systems and systems where policy design and implementation are dispersed among different levels of government the collaboration between higher and lower levels of government is important to support later policy implementation. An early and serious collaboration that goes beyond a mere consultation mechanism appears important already in the policy design process and for the development of implementation tools and instruments for the implementation and integration of land-use and minerals policy.

Horizontal and vertical coordination

An improved Integration of mineral and land-use policies demands an improved collaboration between the two sectors on different levels of government. The MINLAND project itself shows, that the communication and coordination between the two policy sectors is challenging, which appears to be at least partly owed to notably different epistemologies and ontologies. To attain coherent approaches and alignment between those policy streams regular cross sectorial cooperation and trust building actions are necessary. Those coordination activities can either unfold as informal practises (soft tool), to establish informal networks that support the development of a joint problem perception, common language and joint capacity building to negotiate possible solutions or options. Responses from the project (e.g. Portugal) illustrate that in particular the first years of such network

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building need notable effort, time and patience but improves horizontal collaboration and coordination as well as solutions and decision making quality in later years.

Willingness and Capacity

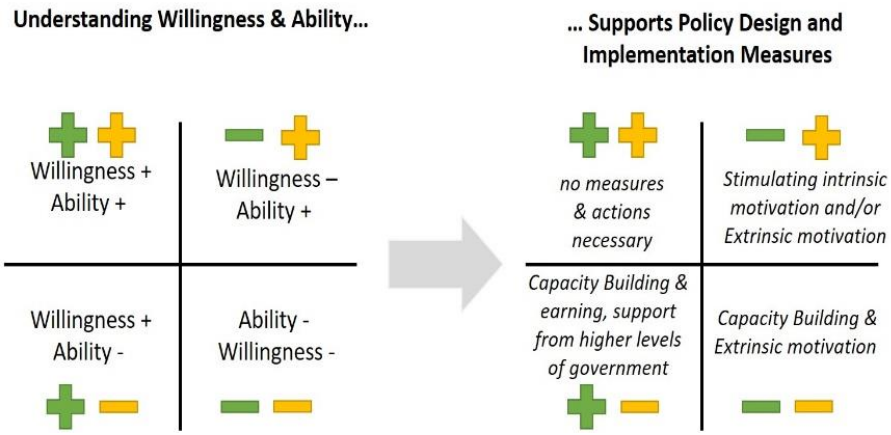

Figure 1 Willingness and ability/capacity should inform policy making and result in supportive action to assist policy integration and policy implementation

Willingness and capacity play a crucial role for policy integration and implementation, which should be considered in the policy design and its translation into policy instruments. Lower levels of willingness can be stimulated by extrinsic motivation and incentives to trigger coordination and implementation activities. However, research shows that extrinstic motivation and incentives need long term support to achieve actual adaptations and improvements in the current practises instead of temporal adjustment to a funding or incentive scheme. Willingness for vertical and horizontal coordination is accompanied by capacity and ability: in cases of lower technical and managerial expertise offers and opportunities for capacity building are needed.

That does not only apply for land-use planners but also for geologists and mining experts to build up basic capacities and knowledge in the other sector. In practise, there are often so called 'economies of scale' associated with implementation or coordination, where larger governmental units (central) might show greater ability to handle policy issues and attract specifically trained stuff for specific questions or policy sectors. Nevertheless, to some extent, central governmental units can support lower levels of government to manage policy challenges: they can support lower levels of government through provided expertice, capacity building activities and create platforms where the different policy sectors can meet.

5.3 Lessons learned and Success Factors for Permitting (Nike Luodes)

Early Involvement of Stakeholders to include stakeholders aspects during mineral development planning process, understand and address measures to lower the specific impacts and produce proposals that might promote acceptance during the public participation process.

Expertise of authorities seen under two aspects: ability to assess impartially the impacts of the activities according to the three aspects of social – economic and environmental values and expertise

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of authorities to support technological up-take improving environmental performances along the value chain and building trust in the activity.

Ability of the company to produce good quality documentation in due time and commitment of the industry to be proactive in their improvement of performances and ecological compensation measures

Co-existance of land-uses - to allow the co-existence of activities favour development of mineral activities in exploration (seen as a low impact activity that creates mineral and geological knowledge essential for future development) and in exploitation (underground mine in protected areas)

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ANNEXES MINLAND Deliverable D4.3 Comparison of mineral land use vs. other land use and their integration

Table 1

The following tables, based on informations collected rom WP3 (Case studies of land use planning in exploration and mining), schematize the basic stakehdolers and authorities involved in the permitting for exploration.

EXPLORATION	Norway	Sweden	Finland	Ireland	Hungary	Poland	Portugal	Italy
application to	Directorate of mining	Mining Inspectorate that consults the CAB about areas of national interest, protected areas etc in the applied area. exploration permit	Mining authority for reservation for an exploration license (valid 2 years), exploration permit (valid 4+3+3+3+2 years)	Ministry? for Prospecting licence	Mining Departments of Government Offices.	Minister of the Environment - licence (from 3 to 50 years)	DGEG (mining authority) for exploration permit (max 5 years)	Concession
give notice to /involve in	both to land owners, the municipalities and county municipality/governor.*	Plan of operations (work plan)- validation involves holder of exploration permit, landowners and holders of special rights to the land	other authorities, landowners and other stakeholders, including reindeer herders. An application affecting the Sami homeland also requires a statement from the Sami parliament **might be needed a light version in certain areas		MBFSZ (Mining and Geological Survey of Hungary) is responsible for preparation of the concession tenders and implementing of concession bids		DGEG involves municipalities and other authorities (environment, land use planning, forestry, nature conservation, etc.	
env. application						environmental decision (EIA)		

*Special rules apply to exploration in Finnmark. In Finnmark, an exploring party shall in addition give written notice to the Sami Parliament and the relevant area board and district board for reindeer management and whenever practically possible, the siidas (local Sami communities). The notice shall contain a plan for the work to be carried out and for access to and within the exploration area, and an account of any damage that may be caused and the measures that are to be implemented to prevent such damage.

For pilot extraction requires special permits from the Directorate of Mining as well as agreements with the landowner for all mineral types. Special regulations apply for Finnmark, particularly for the State-owned minerals.

**areas defined in the mining act

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Table 2 Exploitation activity

EXPLOITATION	Norway	Sweden	Finland	Ireland	Hungary	Poland	Portugal	Italy	Greece	Spain
	Directorate of mining (notification for > 500 m3 of matter, operating license > 10,000 m3 of matter and extraction of natural stone. An operating license may only be granted to a party that holds an extraction permit.	Mining Inspectorate (Chief Mining Inspector) for exploitation concession (25 years that can be prolongued)	Mining authority for mining permit...AVI for env. permits	State Mining Lease to develop State-owned minerals. For planning permission apply to the local planning authority	Regional Mining Departments of Government Offices. co-authorities (environment, nature conservation, soil protection, and cultural heritage inspectorates), or asks for further statements. + Government Office approve „Technical Operational Plan" (TOP)	Minister of the Environment -licence (from 3 to 50 years)	DGEG Experimental Exploitation permitting DGEG mining concession (whom discovered the resources during one of the previous stages) (max 90years)	Province for licence. areas for exploitation are individuated by the mining plan	Issuing of permits depends on the mineral type (metallic or quarry minerals), the phase of the activity (exploration/exploitation), the type of the project/activity (A1, A2, or B), any land use peculiarities of the area of intervention (e.g. frontier area, protected area) and the status of the land ownership (private, municipal or public).	Mining concession entirely located in a particular Autonomous Community needs authorisation from Regional mining authority and the Regional environmental authority (if activity needs EIA). Mining concession located in two or more Autonomous Communities, the competent authorities are the National Mining authority (Ministry of Industry) and the National Environmental authority (Ministry of Environment).
Application to	Both to land owners, the municipalities and county municipality/governor. *	In the initial stages of the assessment process, consultation from all potential stakeholders (landowners and holders of special rights - agencies and the public) - opportunity to submit comments. CAB decide if mining is the best land use in the area. If conflicts between CAB and Mining inspectorate go to government for final decision	Other authorities, landowners and other stakeholders, including reindeer herders. An application affecting the Sami homeland also requires a statement from the Sami parliament, Skolt community if affect their area	Environmental authorities are consulted at scoping stage, these are the Environmental Protection Agency (EPA), the Minister for Housing, Planning and Local Government (HPLG), the Minister for CCAE, the Minister for Agriculture, Food and the Marine, the Minister for Culture, Heritage and Gaeltacht and any adjoining Planning Authority. In the case of AA, the National Park and Wildlife Service is to be consulted with.	MBFSZ (Mining and Geological Survey of Hungary) is responsible for preparation of the concession tenders and implementing of concession bids.		DGEG consultations with other authorities	All the competent authorities	Mining Authorities, Department of Natural Environment, Forest Directorates, Archaeological Authorities, Water Management Departments, Regional and Municipal Councils) and other stakeholders	
Give notice to/involve in										
presenceof a one-stop-shop	No. There are several independent governmental bodies working in parallel with	No. Different legislations (Minerals Act, Environmental Code, Planning- and Building Act etc.) are applicable and	No. Such system is being constructed, so called Luova-authority but the eventual schedule and implementation is unclear	No. Three authorities required for mining development: The Minister for Communications, Climate	Since April 2015 'Mining Departments of Government Offices'. Mineral exploration/exploitation	NO exist	Yes, at DGEG.	The authorities has one-stop-shop that manages the documents and an office that organise the data's gis.	No. The national legislative and regulatory framework regarding the permitting of extractive activities despite recent developments	No. The main obstacle is the diversity of public agencies and laws involved in the permitting processes

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the Directorate of Mining on different issues.	handled by different authorities.	for the moment being. However mining authority will not be part of this one-stop authority	Action and the Environment, the Planning Authority or An Bord Pleanála and the Environmental Protection Agency	permission -statements of co-authorities (environment, nature conservation, soil protection, and cultural heritage inspectorates etc.), or asks for further statements. If the exploration/exploitation is conditional, the Government Office informs the operator. If the operator accepts the conditions, the Government Office designates the exploration area/mining plot. The operation can be started only if the Exploration Plan/ "Technical Operational Plan" (TOP) is approved by the Government Office. The operation can be suspended for a certain period based on the permission of the Government Office or closed down.	towards its simplification, remains complicate, time consuming and bureaucratic, comprising "multiple stops" not necessarily running always in parallel.

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County administrative board (CAB)

* Special regulations apply for Finnmark as described in table1's note

EXPLOITATION	Hungary	Poland	Portugal	Italy	Greece	Spain	Austria
application to	Regional Mining Departments of Government Offices. co-authorities (environment, nature conservation, soil protection, and cultural heritage inspectorates), or asks for further statements. + Government Office approve „Technical Operational Plan" (TOP)	Minister of the Environment -licence (from 3 to 50 years)	DGEG Experimental Exploitation permitting DGEG mining concession (whom discovered the resources during one of the previous stages) (max 90years)	Province for licence. areas for exploitation are individuated by the mining plan	Issuing of permits depends on the mineral type (metallic or quarry minerals), the phase of the activity (exploration/exploitation), the type of the project/activity (A1, A2, or B), any land use peculiarities of the area of intervention (e.g. frontier area, protected area) and the status of the land ownership (private, municipal or public).	Mining concession entirely located in a particular Autonomous Community needs authorisation from Regional mining authority and the Regional environmental authority (if activity needs EIA). Mining concession located in two or more Autonomous Communities, the competent authorities are the National Mining authority (Ministry of Industry) and the National Environmental authority (Ministry of Environment).	
give notice to/involve in	MBFSZ (Mining and Geological Survey of Hungary) is responsible for preparation of the concession tenders and implementing of concession bids.		DGEG consultations with other authorities	All the competent authorities	Mining Authorities, Department of Natural Environment, Forest Directorates, Archaeological Authorities, Water Management Departments, Regional and Municipal Councils) and other stakeholders		
Presence of a one-stop-shop for permits	Since April 2015 'Mining Departments of Government Offices'. Mineral exploration/exploitation permission -statements of co-authorities (environment, nature conservation, soil protection, and cultural heritage inspectorates etc.), or asks for further statements. If the exploration/exploitation is conditional, the Government Office informs the operator. If the operator accepts the conditions, the Government Office designates the exploration area/mining plot. The operation can be started only if the Exploration Plan/ "Technical Operational Plan" (TOP) is approved by the Government Office. The operation can be suspended for a certain period based on the permission of the Government Office or closed down.	NO exist	Yes, at DGEG.	The authorities has one-stop-shop that manages the documents and an office that organise the data's gis.	No. The national legislative and regulatory framework regarding the permitting of extractive activities despite recent developments towards its simplification, remains complicate, time consuming and bureaucratic, comprising "multiple stops" not necessarily running always in parallel.	No. The main obstacle is the diversity of public agencies and laws involved in the permitting processes	One-stop-shop model if project needs EIA procedure: The administrative authority is the environmental authority of the state government, which deals with all relevant specific laws relating to mining, environment, forestry, etc. - environmental permit is granted – relevant autorities control fullfillment. The central and provincial government is involved - cooperation between central and provincial governments/auhorities The EIA process is formalized ie the government (cooperation between central and provincial governments) has issued a guideline on how to conduct "EIA procedures relevant for mining" This guideline also includes 'resolution mechanism' and is successfully applied in Austria.

*In Hungary all minerals are "state owned minerals" that after paying royalties mining enterpreneurs have the ownership. Closed areas correspond to ores,energy minerals,….

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Table 3

Private owned minerals

EXPLORATION

Exploration	Norway	Sweden	Finland	Portugal	Hungary	Poland
application to				mining authority: Voluntary exploration permitting(1 year +1 year) if mining activity compatible land use planning.	Mining Departments of Government Offices for exploration licence in OPEN AREAS (in case of aggregates and industrial materials)	District Head, licences for open-pit mining without explosives at the level of up to 20,000 m3py in the area of up to 2 ha, Province Marshal issues remaining licences
agreement	landowner		permit agreement with the land owner.	NA because only land owner can apply		

Norway:Special rules apply to exploration in Finnmark. In Finnmark, an exploring party shall in addition give written notice to the Sami Parliament and the relevant area board and district board for reindeer management and whenever practically possible, the siidas (local Sami communities). The notice shall contain a plan for the work to be carried out and for access to and within the exploration area, and an account of any damage that may be caused and the measures that are to be implemented to prevent such damage.

For pilot extraction requires agreements with the landowner. Special regulations apply for Finnmark also for exploitation activities

EXTRACTION

Extraction	Norway	Finland	Ireland	Portugal	Italy	Hungary	Poland
notification to	Directorate of Mining if Extraction of more than 500 m3 of matter						
application to	Directorate of Mining for operation licence, if extraction of mineral deposits totalling more than 10,000 m3 of matter and any extraction of natural stone	municipality for permit (valid for 10 years)	State Mining Licences to develop privately owned minerals	mining authority or the municipality for licence depending on dimension (unlimited time)	municipality (1 stop shop) for licence for exploitation	Mining Departments of Government Offices of the 'Technical Operational Plan' (TOP)	District Head, licences for open-pit mining without explosives at the level of up to 20,000 m3py in the area of up to 2 ha, Province Marshal issues remaining licences
agreement	landowner	permit agreement with the land owner.		NA because permit is asked by the owner of the land (or by who has a lease agreement with the owner).			
env. application	EIA area >25ha	EIA area >25ha (check)		EIA area >15ha and >25ha	EIA depnding on projects		

Norway (state owned or private owned). An operating license may only be granted to a party that holds an extraction permit. Special regulations apply correspondingly to the processing of applications for operating licenses in Finnmark.

A mining/quarrying operation exceeding excavation of 550 000 tpa (or 25 ha open pit) requires a completed EIA prior to the mining concession being granted, as descried for state owned minerals.

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