CIRAN

D2.1 Description of good-practice case studies

Views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the granting authority

Funded by the European Union

Disclaimer

Report Information

Grant Agreement / Proposal ID	101091483
Project Title	CrItical RAw materials extraction in enviroNmentally protected areas
Project Acronym	CIRAN
Project Coordinator	International Raw Materials Observatory
Project starting date / end date	January 2023 / December 2025
Related Work Package	WP 2
Lead Organisation	Geologian tutkimuskeskus (GTK)
Document title	D2.1 Description of good-practice case studies
Submission Date	29 April 2024
Dissemination level	Public

How to cite this report

Nike Luodes, Hannu Panttila, Toni Eerola, Vitor Correia, Ludwig Hermann, Sybil Berne, Jerry Barnes, Marasmi Christian, Nole' Marcello, José Mário Castelo Branco, Marcelo Pereira, José Carvalho, Ariadna Ortega, Rafael Jordá Bordehore, Emma Medina Sanchez, Luis Lopes, Ronald Arvidsson, Anna Apler, Magnus Johansson, Julian Hilton, Malika Moussaid-Hilton, Eberhard Falck (2024). Description of good-practice case studies. Deliverable 2.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

Quality verification

Prepared by	Checked by	Verified by	Approved by
Nike Luodes	Vitor Correia	Project consortium partner organizations	Vitor Correia
Hannu Panttila	Sybil Berne		
Toni Eerola	Julian Hilton		
Project consortium partner organizations			

The document is based on case reports prepared by project consortium partner organizations, the following authors participated, by country:

Austria: Ludwig Hermann;

Finland and Norway: Nike Luodes, Hannu Panttila, Toni Eerola;

France and Ireland: Sybil Berne, Jerry Barnes;

Italy: Marasmi Christian, Nole' Marcello;

Portugal: José Mário Castelo Branco, Marcelo Pereira, José Carvalho, Vitor Correia;

Spain: Ariadna Ortega, Rafael Jordá Bordehore, Emma Medina Sanchez, Luis Lopes;

Sweden: Ronald Arvidsson, Anna Apler, Magnus Johansson;

UK: Julian Hilton, Malika Moussaid;

Australia: Eberhard Falck.

Revision History

Revision	Revision Date	Changes	Authorised	Function
1	11/01/2024	Draft	Nike Luodes	Partner
2	25/03/2024	Draft	Julian Hilton	Partner
3	29/4/2024	Final		

Executive Summary

The report presents 15 cases on extractive activity projects covering all life cycle stages from exploration to post closure. These focus on Critical Raw Materials (CRM) but include also examples of strategic or more general industrial minerals. They consider specific mine sites, clusters of activities and regional scale planning and permitting procedures and all have in common locations in or proximity to or interaction with specially and/or environmentally protected sites.

The emphasis is on Natura 2000 protected sites, but some have also significant cultural heritage as for example recognised by UNESCO. The cases all demonstrate good practices in terms of spatial, mineral and environmental governance, attention to whole project lifecycle management including end of mine or project life provision, and continuous stakeholder engagement and communication.

Project-related depth of knowledge of the deposits and their high social and economic significance is a common denominator for case selection for inclusion. Regional planning and knowledge of the location of the resources has been relevant for land use planning decisions. Operational mining activities in the areas examined have often been in place long before the designation of the site as protected on or close to which mining and processing is carried out. These activities include sampling and testing, active mining and exploration of new areas within the same protected site, or close by. Planning or regulatory authorities'' requirements take into consideration the proximity of the protected site as well as the protected area itself. Responsible operating companies often operate at higher standards than the minimum mandatory level as required by regulation, in some cases fostering innovative actions to implement their performance, both in environmental and social respects.

Continuous stakeholder communication and engagement is now axiomatic for all projects. But what this means in practice evolves over time and must be kept current. Even if companies have operated in the past with transparency (which has not always been the case), using multiple stakeholder engagement and information dissemination tools, they have still encountered criticism from some interest groups, sometimes with good reason, sometimes simply on principle. In some cases examined in this report large, long-established, operative mines have contributed to, or even driven, the socio economic development of the areas over many years, even shaping the landscapes in which they work over generations. They are now understandably deeply embedded in the community culture and heritage and nowadays they are even prized for their excellent social, environmental and cultural performance.

The Report documents examples of good practice that, even though by definition they are contextualised in particular time and place, lessons learned from their successes and failures can offer invaluable insights, practical tips, and even inspiration to enhance and maintain project acceptance over time. Mining projects can and often do co-habit fruitfully and interact constructively with both the social communities and the environmentally protected areas where they are located.

This is witnessed by the successful transformative quarry project in the Parque Natural das Serras de Aire e Candeeiros, Portugal, visited by the CIRAN consortium in January 2024. As presented by the Mayor of the Ourém Municipality, this grassroots project has engaged 100 or more local quarries all of which have been operating in or close to the natural park long before it was designated as a protected area. By stakeholder dialogue and consensus, the quarries have all modernised their quarrying practices to align with the new status of the area as a natural park. After a transitional period funded by the EU and national authorities, the initiative has now been fully integrated into the quarry operational culture and is supported longer term by financial contributions from all the participating quarries. In the transition process to this new point of sustainable environmental-economic equilibrium, innovative quality-driven more profitable business models have emerged, meeting local, regional and national needs and priorities and setting a new standard as to how to refashion and safeguard social acceptance.

Best of breed projects such as this demonstrate that fruitful coexistence and both economic and eco-systemic synergy is a measurably beneficial outcome for people, their environment and the mines they host. A just, robust, adaptable and sustainably profitable social resource contract between all parties and their advocates is achievable providing good transparent governance across successive lifecycles of a mining project.

Table of Contents

1 Introduction

1.1 Objective

This deliverable (D2.1) of the CIRAN project examines mining and mineral exploration case studies in protected areas (PAs) across the European partner countries. The objective is to show how viable corporate strategies and the good practices they develop can adapt and successfully respond to a range of different socio-economic and environmental conditions as well as to different national and local legislation, permitting and public consultation procedures. The good practices observed in the case studies chosen for inclusion in this report are highlighted for consideration and emulation by other mining communities across Europe, notably within the challenging framework of the 2023 EU Critical Raw Materials Act.

1.2 Framework

According to a study of Social and environmental impacts of mining activities in the EU (Mononen et al., 2022), extractive activities may result in a wide range of social and environmental impacts. These may affect, water quality, public and occupational health, infrastructure, the socio-economic and cultural interests of the local communities, as well as land and property values and prices, both publicly and privately owned. The highest intensity of impacts is likely to happen when mining activity conflicts with socially, environmentally sensitive or protected areas.

The assessment of potential mining operations in protected areas may involve site-related legislative, environmental, and socio-economic aspects, which may all be interconnected. Throughout the EU there are worked examples of mine operators systematically applying good practices that can be taken as operational benchmarks for delivering high quality industrial performance. But these have to be contextualized against a fast-changing and often unpredictable background.

As Kivinen et al (2020) point out, at any one time, a specific “critical” or “strategic” material may attract a higher, or lower, level of attention or concern than another depending on multiple factors. For example, forty-four petitions against mining activity were collected for the Global Atlas of Environmental Justice (EJAtlas) from 13 EU countries (Bulgaria, Belgium, Czech Republic, Finland, Germany, Greece, Hungary, Poland, Portugal, Romania, Slovenia, Spain, Sweden and UK) where metal resource projects had 43% of conflicts that arose compared to 13% related to more general industrial minerals. Of the metal projects listed, 47% were in the initial exploration/permitting stages.

In 2019, a Guidance document (European Commission, 2019) on non-energy mineral extraction and Natura 2000 sets out a framework for assessing the likely compatibility between the needs of a proposed extractive project and those of the host protected area itself. This details the potential types of effect on sensitive habitats, such as eco-system degradation or biodiversity loss, species disturbance and displacement, land clearance, changes in water quality and habitat and significant extraneous factors such as noise, dust, and vibration. How to evaluate and report on interaction and co-existence of extractive activity and Natura2000 areas is set out in the study “Non-Energy Mineral Extraction In Relation To Natura 2000“, prepared by the N2K Group EEIG and the Institute for European Environmental Policy for the European Commission (2019). This paper collects 15 cases, including one related to a metal mine, while others cover industrial minerals, stone, sand, and aggregate production. All the cases selected demonstrate stakeholder cooperation, impact assessment together with mitigation actions and rehabilitation measures combined with strategies for improving species conservation.

Aggregate and sand production have widely shown good performance within the EU. The European Aggregate Association (UEPG) monitors 321 cases of good practices worldwide on the three pillars of sustainability: environment, social and economic aspects (UEPG Case studies - database). The Sustainable Development Awards 2022 (UEPG, 2022) illustrated 67 examples of extractive activities representing good practices on environment, social progress, economic contribution, communication and biodiversity. Ecological performance was improved by the adoption of innovative technologies and techniques, while simultaneously developing symbiotic activities for ameliorating and diversifying the use of the resource in

balance with restoration actions and programs. Good practices in mining are already widely adopted within EU countries. But as may be expected given its recent rise to prominence in 2022-23, the published literature to date covers only a handful of studies of Critical Raw Materials (CRM) extraction. The release of the first draft of the proposed EU CRM Act in March 2023 has changed the paradigm and CRMs have since been very much at the centre of attention. The CIRAN project was set up in anticipation of such a change and as a result has been able quickly to respond to it.

Hence the cases selected for detailed scrutiny within the CIRAN project are aimed at understanding the legislative framework of the countries addressed in the cases covered in this Report, highlighting the successful use of the existing administrative and permitting framework in place, but also how these can be adapted to respond to the new priorities of the CRM Act. The baseline of following good practices remains intact and is much a critical dependency for meeting CRM Act priorities as it was under the existing framework, but at a level of detail some good practices will need modification without prejudice to the underlying objective of maintaining commitment to protecting sensitive areas.

Case Study Selection

The CIRAN cases are mainly selected for their focus on CRMs, but these are complemented by a small selection of cases on industrial minerals which retain their value as best of breed benchmarks. They collectively address different land use instances, both by typology of mine (open pit, or underground), consider on both single mines and complex multi-mine regional plans and cover the whole life cycle of the extractive activity. The cases have been compiled by the project consortium partners using a CIRAN survey template (see Annex 1) and the sections shown in this document are summaries of much more detailed studies conducted by the CIRAN partners. Full case studies may be requested from the CIRAN consortium authors and their organisations.

What all the case studies summarised here have in common are the 4 interdependent pillars of sustainable extractive activity: i. spatial governance, ii. mineral governance, iii. environmental governance, iv. stakeholder engagement and communication.

1.3 Glossary of core (but not formal) concepts adopted in the report:

Core Concepts

COMPETENT AUTHORITY: a government agency or agencies designated by a Member State, responsible for performing the duties arising from its regulatory requirements.

CONSERVATION: management of nature and natural resources and of human interactions with these aiming at maintaining the potential to meet the needs and aspirations of future generations.

CRM: List of critical raw materials for the EU, created by the European Commission, that include raw materials of high importance to the EU economy with high supply risk. The list is subject to a regular review and update

DISPOSAL: The permanent disposition of materials, including extracted materials, for which no further beneficial use can be foreseen

EXPLORATION: Activities aiming at determining the presence and quantifying the amount of minerals in certain areas

EXPLOITATION: Integrated extraction, processing and refining of mineral resources to produce mineral raw commodities.

GOVERNANCE: All formal and informal arrangements and institutions to establish, implement and monitor policies and legislation.

LAND USE PLANNING: The act or process of regulating the use of land.

LEGISLATION: The action or process of making governmental (national, federal, regional or local) laws, regulations, decrees, etc. aiming at the relationships within the administrative public institutions and between those institutions and the individuals by establishing rules, obligations, procedures, etc.

MINERALS: The same as Mineral Resources when referred to in policy and economic contexts.

MINERAL RESOURCE: A concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. It includes undiscovered and identified resources. Their relative economic interest may be classified according to specific schemes of common usage (UNFC, PERC, JORC, etc.).

MINERAL RESERVE: the economically mineable part of a Mineral Resource.

MINERALS VALUE: It refers to the intrinsic value of the mineral resources, in terms of valid environmental, social, techno-economical, market and other components, which are the Modifying Factors in the Mineral Resources classification codes. It is not applicable to undiscovered mineral resources.

MINING PROJECT: Ref to UNFC classification (UNFC GUIDANCE EUROPE-FINAL_0.pdf (unece.org))

NATURA 2000: European Union network of sites designated by Member States under the birds directive and under the habitats directive (Source: EEA)

NATURAL RESOURCE: A feature or component of the natural environment that is of value in serving human needs, e.g. soil, water, plant life, wildlife, etc. Some natural resources have an economic value (e.g. timber) while others have a "noneconomic" value (e.g. scenic beauty) (Source: EEA).

NEEI: Non-energy extractive industry.

ONE-STOP-SHOP: A public administration facilitating a full-service operation, allowing multiple authorisation and permitting requirements are met in one place.

POLICY: Public documents where the principles and/or strategic governmental approaches (national, regional or local) for a specific topic are presented. It must be taken into account that some countries distinguish between Policy and Legislation (e.g. National Strategy for Sustainable Development is a policy document. Legislation related to environmental protection, land use planning, etc., must comply with that policy).

PROSPECTING: term referring to activities carried out to search mineral deposits of economic value, including sampling, bulk sampling, drilling and trenching, but excluding any works required for the development of such deposits, and any activities directly associated with an existing extractive operation.

POND: a natural or engineered facility for disposing of fine-grained waste, typically tailings, along with varying amounts of process water, resulting from the treatment of extracted minerals and from the clearing and recycling of process water.

PUBLIC: one or more natural or legal persons and, in accordance with national legislation or practice, their associations, organisations or groups.

REHABILITATION: Any measures that may be carried out to reduce the risk from existing extractive facilities or extractive waste management facilities with a view to minimise environmental contamination or risks to humans and the environment. The measures may be applied to contamination itself (the source) or to the exposure pathways to humans.

According to EWD (2006) 'rehabilitation' means the treatment of the land affected by a waste facility in such a way as to restore the land to a satisfactory state, with particular regard to soil quality, wildlife, natural habitats, freshwater systems, landscape and appropriate beneficial uses.

REMEDIATION: see rehabilitation

RESTORATION: see rehabilitation

SITE: land at a distinct geographic location under the management control of an operator

SPATIAL DATA: The same as geospatial data or geographic information. It is the data or information that identifies the geographic location of features on Earth.

TAILINGS: the waste solids or slurries that remain after the treatment of minerals by separation processes (e.g. crushing, grinding, size-sorting, flotation and other chemical and physico-chemical techniques) to remove the valuable minerals from the less valuable rock

TREATMENT (process): the mechanical, physical, biological, thermal or chemical process or combination of processes carried out on mineral resources, including from the working of quarries, with a view to extracting the mineral, including size change, classification, separation and leaching, and the re-processing of previously discarded waste, but excluding smelting, thermal manufacturing processes (other than the burning of limestone) and metallurgical processes.

WASTE: any substance or object which the holder discards or intends or is required to discard as defined in Article 3 of Directive 2008/98/EC

Acronyms

Acronyms are defined following first occurrence in the text. Some more frequently used acronyms are listed here.

AA: Appropriate assessment

CRM(s): Critical Raw Material(s)

EC: European Commission

EEA: European Environmental Agency

EEIGT: European Economic Interest Group

EIAR: Environmental Impact Assessment Report

EIT: European Institute of Innovation and Technology

ENGO: Environmental Non-governmental Organization

E(S)IA: Environmental (and Social) Impact Assessment

EU: European Union

NGO: Non-governmental Organization

PA(s): Protected Area(s)

SAC(s): Special Areas of Conservation

SPA(s): Special Protection Areas

VR: Virtual Reality

2 Case studies

The Case Studies examined in this report focus on CRMs and cover the different lifecycle phases of the extractive activity (see Table 1). Each case has an impact on, or connection with, one or more environmentally sensitive or nature protection areas. These operational sites typically overlap with a national park or a similar category of protected area but may also be located in the buffer zone(s) between protected or sensitive sites.

Table 1 – CRM Case Studies by country location, protected site and lifecycle.

Case /typology/ mineral extracted	Country Location	Protected area implicated	Lifecycle phase
Mittersill / underground / tungsten	Salzburg, Austria	Adjacent to the National Park "Hohe Tauern"	Active
Sakatti / N.A. / Cu, Ni, PGE-group metals	Sodankylä, Finland	Natura 2000	Exploration
Rompas-Rajapalot / N.A. / gold, copper	Ylitornio/ Rovaniemi Finland	Natura 2000	Exploration/ opening
Emili/ Beauvoir Lithium Mining Project / Lithium (CRM)	France	Adjacent to Nature protected area, designated SAC	Exploration Planning & Design
Blackstairs Lithium / N.A. / lithium-bearing pegmatites and aplites	Wicklow/Carlow, Ireland	EU designation (SAC), National (natural heritage area)	Exploration
Monte Tondo / dual / gypsum	Emilia-Romagna, Italy	Natural Park – UNESCO heritage candidate	Active/ under new assessment
Nussir ASA / underground / copper, gold, silver	Hammerfest, Norway	Seiland National Park	Opening/active
Neves Corvo/underground / copper, zinc, and lead	South Portugal	Area covered by Birds Directive & Habitats Directive	Active
Serra Candeeiros region / dual / limestone	Leiria, Portugal	National Nature Park. Extraction of dimension stones and industrial	Active (≥380 quarries, 770ha)
Barruecopardo / open pit /tungsten	Castilla y Leon, Spain	Natura 2000	Reopening
N. Sweden regional case / N.A. / Polymetallic	Västerbotten/ Norbotten, Sweden	Permitting in and adjacent to protected areas	Exploration/ opening
Våmb quarry/open pit/ Limestone	Sweden	Adjacent to protected areas	Active
Hemerdon Tungsten / open pit / tungsten-tin	Devon, UK	Historic environment record designation	Reopening/ operational
Redmoor / underground / tin-tungsten	Cornwall, UK	UNESCO cultural heritage area	Reopening/ exploration
Alligator river / open pit / uranium.	Northern Territory, Australia	Kakadu National Park (World Heritage site RAMSAR Conv.)	Rehabilitation

The location of each European case is shown in Figure 1.

Figure 1 – European case studies by geographical location (Basemap ESRI).

2.1 Austria: Mittersill

The Austrian case concerns a Tungsten mine, Mittersill, in the Salzburg region adjacent to the "Hohe Tauern" National Park.

The Mittersill Scheelite deposit was discovered in 1967. It is located in the central Eastern Alps at ~2000m elevation and runs transverse to the Felber valley (Felbertal), near Mittersill resulting in two ore zones, one on each side of the Valley, designated respectively East and West. Open pit mining began in 1975 in the East zone under the management of the company Wolfram Bergbau- und Hüttengesellschaft. Operation was initially seasonal, as determined by the harsh Alpine winter conditions including risk of avalanches. A few years later underground mining commenced in the West zone on the opposite side of the Valley with an initial emphasis on exploration. By the late 1970s, a plant for processing scheelite concentrate had been built a few kilometres distance.

The mill itself is located 3km away and is connected underground to the mine, as are all other mine facilities to minimize impact on the nearby National Park. Ore extraction in the open pit area ended in 1986. While underground mine operations were stopped briefly in the 1990s, for the remaining time the mine has been operating continuously.

To date, the mine has produced 9.6 Mt of ore (0.4-0.5 wt% WO_3) at a typical rate of 0.4 Mt at 0.4 wt% WO_3 per year. It was until recently the largest operational tungsten mine in Europe.

Table 2 – Mittersill - Case study overview.

Operator Name	Felbertal[1]
Country	Austria
Region	Salzburg
Type of mineral resources: primary raw materials, particularly critical raw materials, commodities, and associated commodities?	Scheelite ore
Open pit or underground mine	Underground
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	In operation
Period of activity	1975 – today
Companies involved	Wolfram Bergbau und Hütten AG
Environmental protected area designation: International (e.g. World Heritage Site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	National Park "Hohe Tauern"

[1] Felbertal Tungsten Mine, Austria https://en.wikipedia.org/wiki/Mittersill_mine#:~:text=The%20Mittersill%20mine%20(also%20known,southwest%20of%20the%20capital%2C%20Vienna.

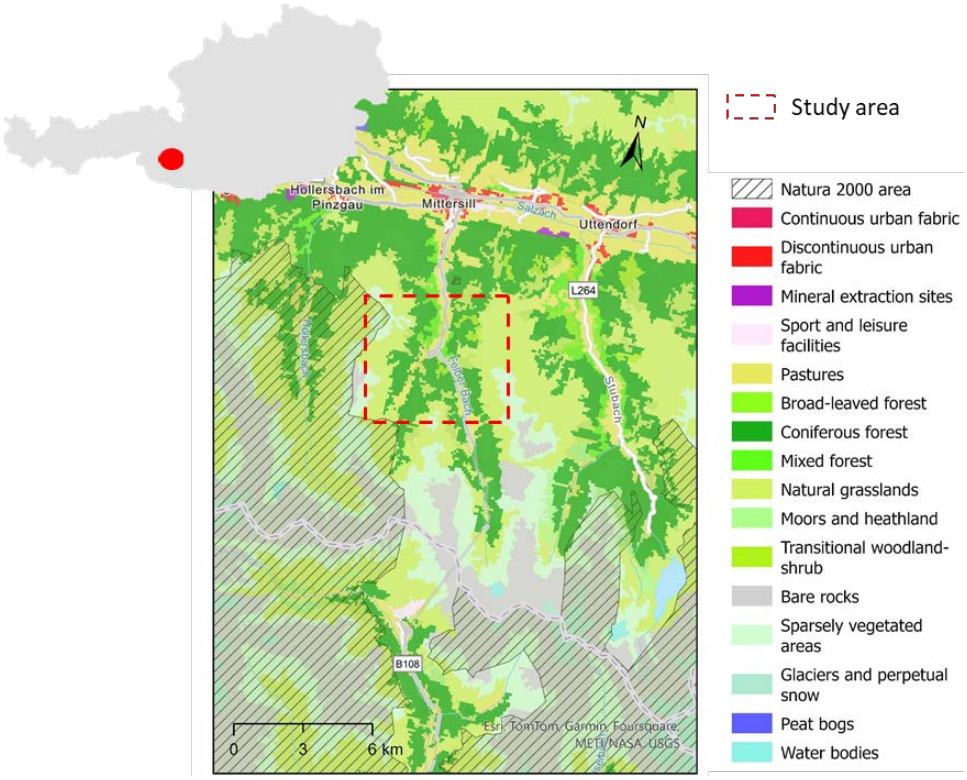

Figure 2 – Map of the mining area. Overall geographical localization. Corine land use 2018 map + Natura 2000 map and extractive area (EEA).

2.1.1 Spatial planning

The Austrian Federal State is composed of nine provinces, each with own legislative and executive bodies. Different land use plans exist between the provinces.

Austria has a national masterplan for mineral resources that cover the Austrian mineral resource endowment. This policy document, the Masterplan Raw Materials 2030 is designed to ensure security of Austria's supply of mineral raw materials. It identifies areas with ore occurrences of economic value, excluding areas where mining is forbidden by law as residential zones or national park, and conflict zones, as Natura 2000 areas. Some 250 metallic ore areas have been identified and are safeguarded by regional governments. It is possible to mine also outside the boundaries of the identified specified areas but within the identified areas the criticalities have already been solved.

Table 3 summarizes the responsibilities and duties of governance levels in spatial planning.

Table 3 – Spatial planning organization.

Level	Duties
National government	It handles the spatial structure of the country. *Austrian spatial development concept* defines policy objective and actors involved. Also elaborated *Federal sectoral Plans*- Masterplan Raw Materials 2030.
Federal states	Planning and framework legislation for spatial and land use planning happens at this level. *State development concepts - State spatial plans* (do not exist in State Vorarlberg) + *regional/sub state plans* (not in Vienna) are created.
Municipalities	Municipalities are in charge of *Local planning* comprising land use plans showing local zoning, *concept plans* for larger project and *regulatory plans* related to individual plots.

All levels of planning meet in the Austrian Conference for Spatial Planning that co-ordinates planning between governments (OECD, 2017). A good practice overview within this frame is shown in Table 4.

Table 4 – Good practices in spatial planning.

Aspect	Description
Presence of mineral information in the land use plans	The Austrian Mineral Resource Plan identifies areas where ore occurrences of economic value do not conflict with other land uses. It does not restrict exploration or extraction to those areas, but permitting in those areas is easier compared to that in no pre-identified areas.

Designation of Natura 2000 areas

Austria joined the EU well after the EU was first founded and hence was a little late with the implementation of the Habitat directive and the formal designation of Natura 2000 sites. Some 16% of the country is covered by Natura 2000 sites, many of which are nature reserve areas as well. The Natura 2000 designation process was completed in 2012 when the sites had been selected by applying ecological parameters to the process of assessment and consultation. Natura 2000 sites belong to the landowner or community, rarely, to the state. There is no fixed management organization at national level and management refers to different ministers according to the typology or protected area. There is no obligation to use management plans, but if a plan is in place it can be implemented at local or regional level. If a plan operates at regional level, they include stakeholder consultation.

The EU legislation has been transposed into provincial legislation since in Austria federal states are responsible for nature conservation. There are 9 provinces responsible for nature protection formally managed by 9 political representatives (Landesräte) who are responsible for the designation of the site. White books (Weißbuecher) have been created through a consultation process with the economic interest groups of an area, aimed at evaluating and describing the impacts of other activities on the conservation of Natura 2000 areas. These are used for stakeholder communication.

2.1.2 Mineral governance

The Mineral Raw Material Act (Mineralrohstoffgesetz – MinroG- BGBl. I Nr. 80/2015) defines three kinds of minerals: operator-owned (“Free to mine”) , (§ 3); Federally owned (§ 4); and Natural (§ 5). “Free to mine” minerals in Austria include all metallic ores and numerous industrial minerals. The permitting procedure described in this report refers to free to mine minerals, excluding aggregates, permits for which are handled at regional level. In Austria there have also been cases of aggregate production in Natura 2000 areas.

Exploration and exploitation permits are applied for at national level. The Ministry of Finance acting as national mining authority (Montanbehörde) issues mining permits for “free to mine” minerals. There are several permits required for starting extractive activities and involve authorities both at national and state administrative level. Water, land use, nature conservation issues are handled at provincial government level (Länder) and in the case of “free to mine” minerals water permits are issued by the national mining authority. The mining permit is issued by the Federal Mining Department but several other authorities are involved in the permitting process to deliberate on permits for nature conservation, water management, waste management, and forestry aspects. Figure 3 shows a schema of the permitting process.

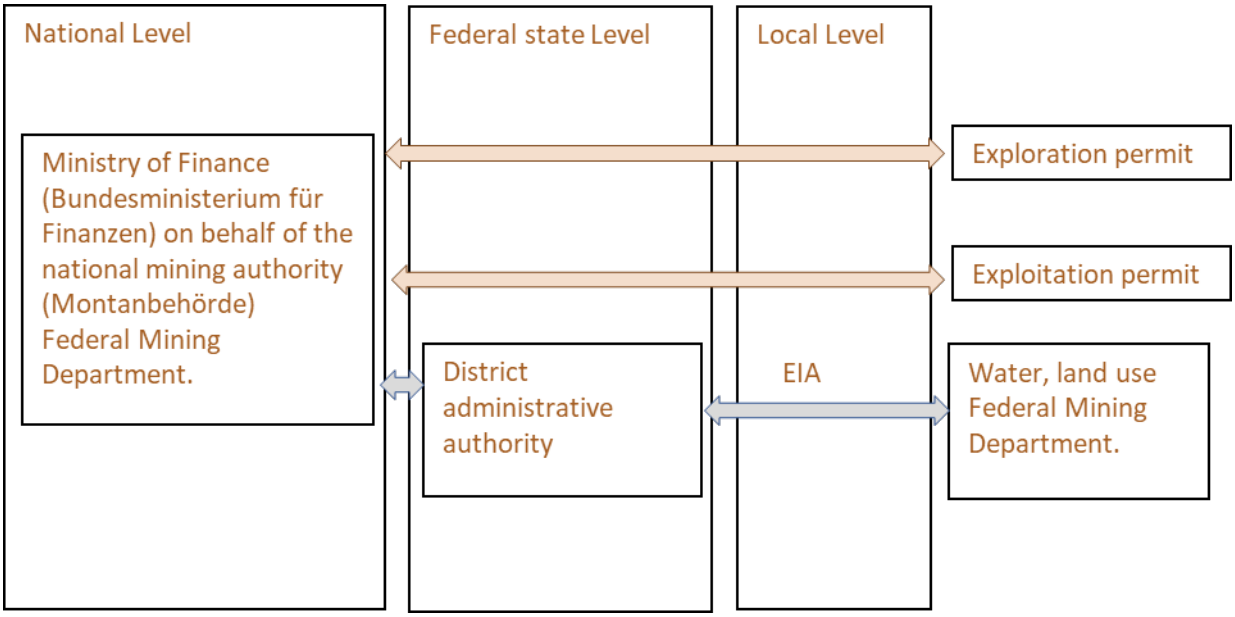

Figure 3 – Permitting process schema.

In this case study, the mine started operation before the protected designation of the park was enacted. Further permits have been approved for the ongoing operation. It is possible that if a similar deposit is found in a different protected area and discovered more recently, under the current laws the actual spatial and mineral governance a permit would had not have been granted. Still an aspect relevant for starting operations is the knowledge of the deposit. A good practice aspect related to the mineral governance in this case study is that the deposit was already well documented.

Table 5 – Good practice aspects of mineral governance and management.

Aspect	Description
Knowledge of the deposit	The deposits are now well known and have been exploited for several years. When underground mining started the deposit was still under exploration. Continuous exploration of the ore body during mining operation relies on drilling and exploration drift. 3D ore model is realized using modern technologies.

2.1.3 Environmental governance

Because of the proximity to a Natural Park the mine adopts environmental monitoring and mitigation measures and invests in technology development to further reduce risks and impacts. Good practice aspects of environmental governance and management are summarized in Table 6.

Table 6 – Good practice aspects of environmental governance and management.

Aspect	Description
Example land use conflict	The mine stands near the Hohe Tauern national park established in 1981 that covers the three federal states Salzburg, Tyrol and Carinthia and contain the highest peak in Austria. The governments of the three federal states are responsible for the administration of the park. The area had seen historical mining and some of those sites are located inside the park.

Aspect	Description
	The mine has eastern and western sites. The eastern part was an open pit and is closed. The western part is underground and is operative since 1977.
Mining methods	The mine has adopted solutions that minimize the impacts of the activities. All the necessary infrastructure and facilities are located underground. Primary and secondary crushing and screening producing 12mm product is realized underground and the product is transported by conveyor belts to the processing plant. The tailing ponds of the processing plant are even farther away, to avoid impacting the national parks.
Technology	The mine introduced new sorters to sort waste material into products that can be sold locally to the construction industry. This also eliminated the need for grinding and floating, thus reduced water and energy consumption, use of chemicals and reduced sewage ponds.
Measures for reduction of impacts in EIA	All the mining facilities are located underground, including offices and part of the treatment equipment, this reduces dust and emissions, reduces also visual impacts, and allow a safer operation, as the mine facilities are protected from possible avalanches. Transport of the ore from the mine to the plant is done in an environmentally friendly manner by means of a conveyor belt through a tunnel. The use of conveyor belts reduces road traffic for the transport of the ore The settling pond has been positively appraised in 2021 by BH Zell am See Umwelt und Forst during an environmental and ecological inspection: “The inspection revealed that the tailings site in question from a nature conservation and zoological viewpoint, is see as or very high-quality. The habitat composition which has arisen here in a secondary manner as a result of activities on the landfill site offers, thanks to the extensive area and is dynamic, with special locations for numerous plant and animal species which are today rarely found in “normal landscapes” (Wolfram, 2021).
Closure - remediation	Remediation activities have been conducted over many years. The Eastern part of the mine, the open pit, in a previous lifecycle was closed, decommissioned, recultivated and reinstated as alpine pasture as prior to mining. But as a result of technological advances it is now economically and technically feasible to extract lower grade ores. This has given rise to new plans to reopen some of the area previously thought to be mined out. A legacy tailings pond is located near the mine and reaches a depth of 25m; it has been covered with compost and is now vegetated. When the mine is restarted, the newly produced tailings will be covered with compost as well and revegetated after mine closure. Mine closure (End of Life) procedures are planned to last 2-4 years after termination of mining activities. While continuing to operate the underground mine in the Western zone, the voids have been filled and consolidated with tailing materials and binder.
Monitoring	Monitoring is performed by both Company and Regulators on a detailed and regular basis, in particular the stability of tailings’ ponds. Inspection frequency is higher following heavy rainfall. The ponds are equipped with a safety water discharge system in case of damage to the barriers.

2.1.4 Stakeholder engagement and communication

The mine engages with the community through different means. Besides the statutory processes, examples of activities performed in the case study are shown in Table 7.

Table 7 – Good practices in Stakeholder engagement and communication.

Aspect	Description
Education	The mine invests and cooperates in education activities for technical universities. EIT Raw Materials financed project produced Virtual mining 3d program (VR mine) and the 3D model is the mine itself.
Responsible sourcing	The mine cooperated with the creation of conflict-affected and high-risk areas (CAHRA) auditing systems for the tungsten industry and promoted sourcing policies informed sourcing from ASM and CAHRAs.
Public engagement	The mine had an open doors policy popular with the community.

2.1.5 Concerns/disputes

The mining activity has been accepted by the community and no major disputes have emerged. Mining is part of local cultural heritage. During permitting, local concerns addressed mainly the possible ecological and environmental impacts and have been resolved in the permitting process. Recently, discontent about the company has mainly come from the workers and concerned inflation and the cost of living crisis (Kronen Zeitung, 2023; Kleine Zeitung, 2023).

2.1.6 Enablers

Key project enablers are shown in Table 8.

Table 8 – Project enablers.

Environmental performance	The park was established when the mine had been long operational. The mine nevertheless added several mitigation actions to reduce its environmental impacts, re-think its operations and continuously invest in new, cleaner, more efficient technology.
Monitoring and Prevention	The company has extensive monitoring activities and safety solutions in place to react in emergencies and prevent environmental disasters
Historical mining being part of local cultural heritage	The area had several historical mining operations that are part of local culture and partly shaped the local landscape. Mineral resources are also mentioned in the local museum of the park.
Engaged with community, education and industry policies	The mining company held open door events attracting large community participation. The company also cooperated to produce educational materials for the universities. It also engaged with setting up conflict-affected and high-risk areas (CAHRA) auditing systems.

2.2 Finland – Rompas-Rajapalot

Finland has two cases that are partially located within Natura 2000 areas: Rompas-Rajapalot (gold-cobalt) and Sakatti (Ni-Cu-Co-PGE) in Lapland, northern Finland (Figure 4). Both are among the most important mineral discoveries of the last decades in Finland. The Rompas-Rajapalot is in the municipalities of Ylitornio and Rovaniemi, and Sakatti in the Sodankylä Municipality. Sodankylä is a mining municipality and hosts already the Pahtavaara and Kevitsa mines; the wider region is a target of intense mineral exploration.

2.2.1 Case overview

Rompas-Rajapalot

The Rompas gold–cobalt deposit in Ylitornio, northern Finland (Figure 4), was discovered in 2008 by the French nuclear company Areva based on evidence from radiometric survey maps.

Table 9 – Rompas-Rajapalot case study summary.

Name	Rompas-Rajapalot
Country	Finland
Region	Ylitornio-Rovaniemi, Lapland
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Au-Co (U) (on the Critical Raw Materials EU List)
Open pit or underground mine	n/a (exploration)
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Exploration
Period of activity	Since 2008
Companies involved	Mawson Gold Oy
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	EU: Natura 2000; National: mire (wetland) protection area

Areva sold the prospect to the Canadian company Mawson Oy in 2010, which expanded its activities to the Rajapalot area. The Rompas–Rajapalot project partially overlaps Natura 2000 areas (Figure 4); the deposit is of a polymetallic nature and for that reason in particular as well as its environmentally sensitive location it is opposed by the Finnish Association for Nature Conservation (FANC).

Because of Natura 2000 the company has employed new low-impact mineral exploration technologies, such as snow, plant, and soil (MMI) sampling, drones, and portable drill rigs to minimize environmental impact of mineral exploration in a sensitive context (Eerola 2021).

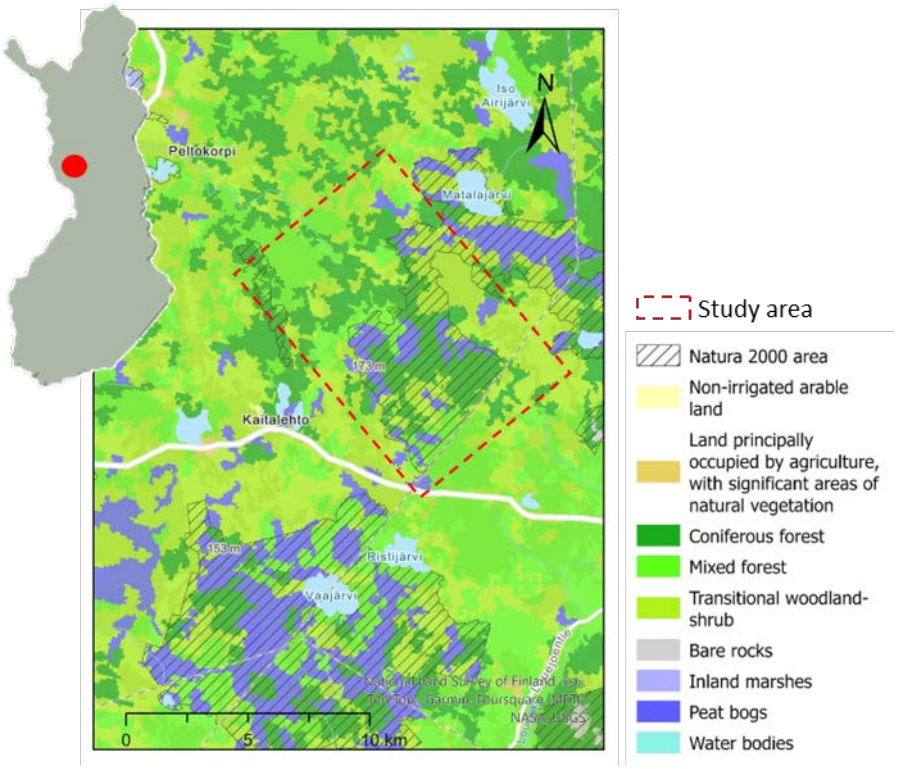

Figure 4 – The Rompas-Rajapalot project area in Ylitornio-Rovaniemi region. Overall geographical localization. Corine land use 2018 map + Natura 2000 map and study area (EEA).

Sakatti

The mine development project of Sakatti nickel–copper–PGE mine (Table 10) is located in the municipality of Sodankylä in northern Finland.

Table 10 – The Sakatti case study summary.

Name	Sakatti
Country	Finland
Region	Lapland
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Ni-Cu-PGE-Co
Open pit or underground mine	Underground
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Planning
Period of activity	2004-
Companies involved	Sakatti Mining Oy, subsidiary of Anglo-American plc.
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	Natura 2000

Sodankylä already hosts the Kevitsa nickel and Pahtavaara gold mines and is a focus of intense mineral exploration. The promising gold deposit of Ikkari was also recently announced in the region.

The Sakatti deposit is located on the margin of the Viiankiaapa mire Natura 2000 area (Figure 5). The deposit was discovered in 2011 by AA Sakatti Mining Oy, which is a subsidiary of the British company Anglo-American plc. Due to the overlap with the Natura 2000 area, the company is exploring the development of an underground mine minimize impacts on the protected area. Despite that, the company will fund compensatory measures for the local ecology. AA Sakatti Mining Oy has also employed closed circuit drilling developed by the Finnish drilling company Kati Oy to reduce the impact of its mineral exploration on areas of environmental sensitivity (Eerola 2021).

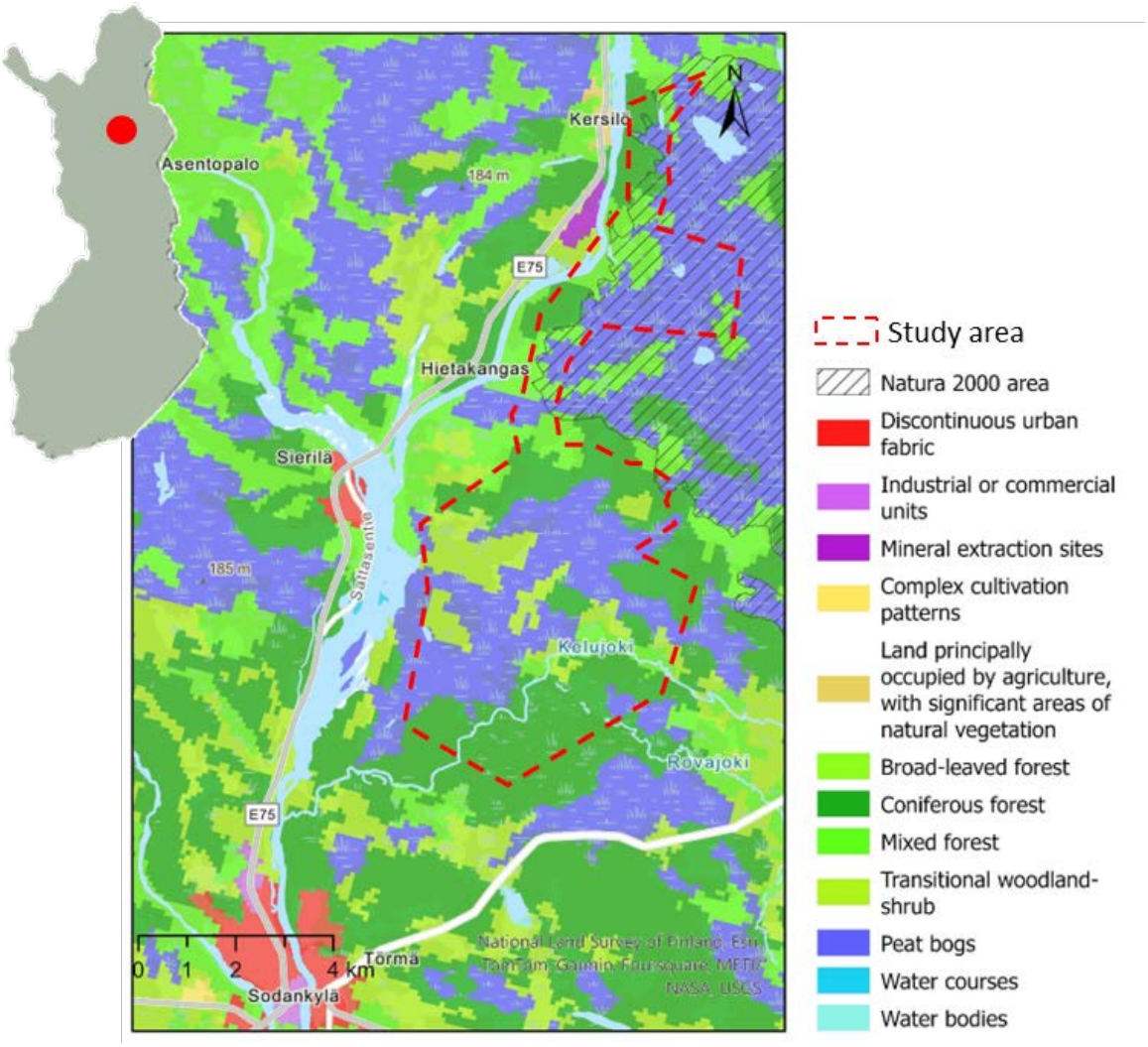

Figure 5 – The Sakatti project area in Sodankylä. Overall geographical disposition. Corine land use 2018 map + Natura 2000 map and study area (EEA).

2.2.2 Spatial planning

Land use planning in Finland is governed by the Land Use and Building Act that consists of 3 levels of spatial planning (national, regional, municipal). Each land use planning level needs to comply with the superior land use plan that guides the subordinate plan, for example local master plan guides the local detailed plan. Land use plans are legally binding. The Local Government Act defines the responsibilities of the municipalities.

Table 11 – Spatial planning organization.

Plan level	Description
National land use objectives	There is not a national land use plan, but the Ministry of the Environment sets the *national land use objectives* to steer policy on land use and infrastructures relevant for the country.
Regional plan	The Regional Council is in charge of regional development, produces the *regional land use plan* that can show advanced mining projects
Local master plan and local detailed plan	The municipality is responsible for the *local master plan* (1:10000) *and the local detailed plan* (1:2000). Extractive activity requires its own land use designation

Together with the government, the Ministry of the Environment sets the *national land use objectives* to steer policy on land use and infrastructures relevant for the country. The Ministry of Environment has also the role to harmonize the regulations that affect land use. There is no national land use plan.

The *Regional land use plan* created by the Regional Council can show advanced mining projects designated as EK areas (minerals exploitation areas). Changes to the plan can be done at predefined time intervals (4-5 years), but they can also happen in between after a company's request. The plan can show other land use designations (forestry, agriculture, peat production, reindeer herding, tourism) that can allow exploration activities.

The municipality produces the *local master plan* (1:10000) *and the local detailed plan* (1:2000). At this level, building permits are managed and extractive activity requires its own land use designation.

Centres for Economic Development, Transport and the Environment monitor regional and local land-use policies to answer the national objectives.

Designation of protected areas

Nowadays, the regional environment administrations (13 Centres for Economic Development, Transport and the Environment or ELY Centres) are responsible for the coordination of conservation and management measures of N2000 sites in mainland Finland, although municipalities and Metsähallitus Parks & Wildlife Finland are involved in planning and operational management work in cooperation with landowners and other stakeholders.

The Ministry of the Environment (MoE) has top responsibility for implementation, monitoring, evaluation and reporting of the Natura2000 network. The Finnish Environment Institute (FEI, Biodiversity Centre) is also involved in site-based information management (Standard Data Forms), monitoring and reporting of the N2000 sites. Parks & Wildlife Finland, the ELY Centres and FEI are all directed and financed mainly by the MoE.

The authorities designated to plan/regulation/protected area are in National level the Ministry of the Environment, regional level Regional State Administrative Agency (AVI) and Centre for Economic Development, Transport, and the Environment (Ely-keskus). At the municipal level it is a municipality. Metsähallitus is an organization under the Ministry of Agriculture and Forestry and the Ministry of the Environment. Metsähallitus under its public administration service of Parks & Wildlife Finland manages and supervises protected areas.

Natura 2000 areas were established by the Ministry of the Environment. New nature conservation areas can be established by decree. The establishment of areas over 100 hectares in size is done by Government decree, and the establishment of areas smaller than 100 ha by a decree of the Ministry of the Environment (ref. Metsähallitus).

Private nature conservation areas include traditional landscapes (landscapes of outstanding natural beauty), areas for the protection of birds, and areas similar to nature parks or manor parks. These are formed on application by the landowner, with the decision of the Centre for Economic Development, Transport, and the Environment (ELY centers) (Salonen at al, 2019)

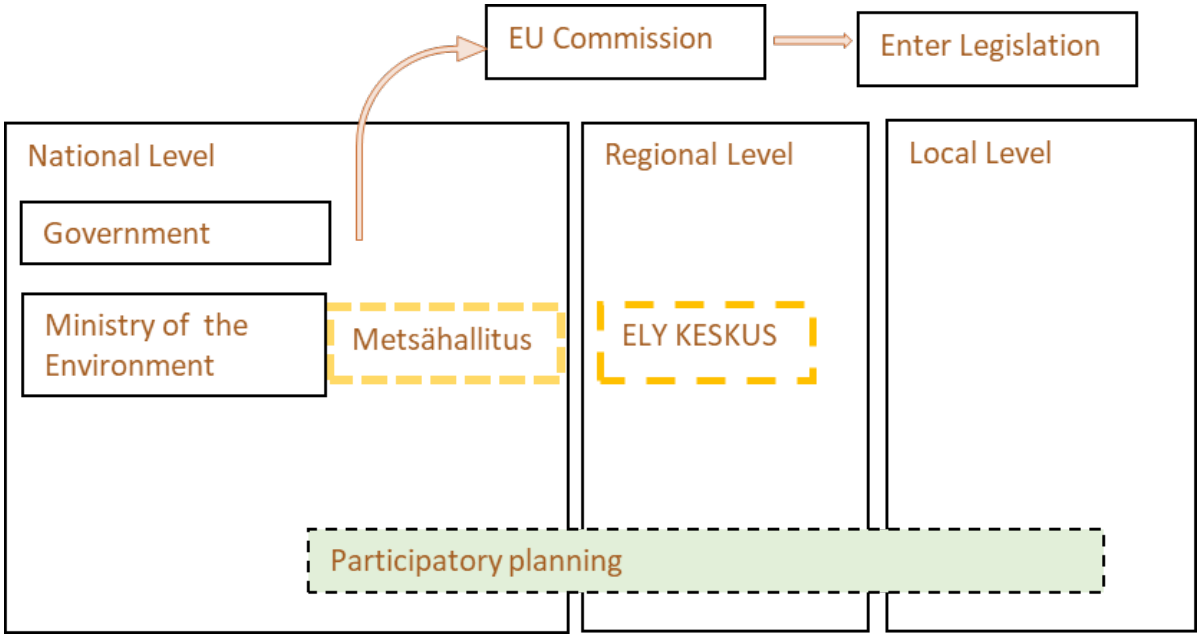

Figure 6 – Scheme of Protected areas' denomination process.

Metsähallitus Finnish forest authority, ELY KESKUS Centre for Economic Development, Transport and the Environment.

The first nature protected areas were created in the 19th century to preserve their wilderness characteristics which were much appreciated in the romantic period. The first sites were on the border with Russia and Punkaharju and Imatra are some examples. They were established by command of the Tzar under the then Russian administration. During the war, large portions of the natural protected areas were lost due to territory secession. New protected areas were proposed by the nature associations to the government in 1949 according to Nature Conservation Act of 1923. The government appointed a commission and created legislation to support the activity. The original site list was critically reviewed by nature conservation officers and in 1978 a new comprehensive list was approved. After that, legislation continued to develop to denominate and regulate protected areas mainly addressing nature protection *in situ* and non-disturbance. Already before 1998 some areas have been expanded and in those cases in which a local opposition rose up, the government established a research group to study the general features of nature and the presence of endangered species, and the proposal was screened by selected stakeholders (Finlex, 1993; Suhonen 2008).

The Natura2000 area list was delivered to EU in 1998. The sites were selected between 1994 and 1996 by a working group appointed for that by the environmental ministry. The ministry was created in 1983. The list produced in 1996 consisted mostly of the areas that already were classified as Nature protection areas owned by the state (around 90%). Those areas were established according to the Nature Conservation Act of 1923 and each area was defined by own conservation regulation (not law). The first announcement of the list mentioned that the final list would include also other areas (under private ownership); and for the final confirmation of the draft list, public hearings were organized of interested party and stakeholders. Denomination of Natura 2000 sites caused dissent between different stakeholders for several reasons. The Ministry of Environment implemented the directive as an administrative duty, denominating as Natura2000 areas the existent protected areas, while Luonnonsuojeluliitto (Finnish Association for Nature conservation, FANC) criticized the activity because it did not consider the ecological value that the directive was aiming for. The Natura2000 sites were monitored over the next 10 years, focusing on the ecological and habitat values.

The Natura 2000 area of the case in Ylitornio has been included in the list in 1998 under designation Special Protection Areas (SPA). From 2005 to 2012, they were under inventory and maintenance. Site data was updated in 2016 and the site was finally designated as a Special Area of Conservation (SAC).

In 2020, new designated sites areas were specified within the boundaries of the existing 20,000 km² (2 million hectares). They were owned by the state or acquired from private owners either as part of the expansion of existing protected areas or as new ones.

There are approximately 7,800 private nature reserves in Finland. They are defined as under the protection government programmes or designated as nature reserves in connection with decisions on plans for government controlled continuous areas. The legislation regulates the parameters to define a protected area, but its site limits depend on the independent expert evaluation that assesses both the ecosystem and the habitat and then sets site boundaries that ensure the protection of the habitat in question. Recently, a discussion has emerged upon buffering zones and fractionation of habitats has emerged. The limits of protected areas have also been under revision to answer for example the migration or enlargement of specific habitats (metsänhoidon suositukset).

Participation in the denomination process of protected areas is made possible in many ways, often by establishing a cooperation group for the duration of the planning process (which may continue working afterwards). With this interactive way of working, Metsähallitus and other authorities can enrich knowledge of the surrounding environment and also to prevent possible conflicts. In the northern regions of Oulu and Lapland, as well as in Northern Karelia (eastern Finland), the Ministry of Agriculture and Forestry has appointed advisory boards with representatives of various interest groups. Their task is to advise Metsähallitus on regionally significant land issues concerning state-owned lands. According to the Nature Conservation Act, such advisory boards can also be appointed for specific national parks. For example, Urho Kekkonen National Park has an advisory board appointed by the Ministry of the Environment.

Protected area management planning should be as open and as interactive as possible. Planning procedures are to comply with the Participatory Planning Guide published by Metsähallitus. Management planning guidelines include a toolkit of participatory methods (See Table 12).

Table 12 – Good practices in land use planning and mineral exploration.

Plan level	Description
Presence of mineral information in the land use plans	The extractive activities need zoning to be realized, so it is defined at local plan level, but the *Regional land use plan* can show advanced mining projects designated as minerals exploitation areas. Instead exploration does not appear in the land use plan but can happen also in other land designation (forestry…). Information on exploration, mineral deposits, mining is publicly available in the mining register map service.
Land use by extractive activity	Exploration can be performed in agreement with the landowner. Or in the event there is no such consent, procedures are in place for government to exercise overriding public interest case powers. Use of private roads and terrain need to be included in the permit. In the extraction phase, the mining area shall be of shape and minimum dimension that allow the activity and may variously include auxiliary and potential ore deposit areas.

2.2.3 Mineral governance

The State owns the subsurface; but with a mining concession, a company can exploit it but needs to pay royalties for landowners and impose mining taxes to benefit the municipality and the state. With the revised Mining Act, released on 1st June 2023, a municipality has a veto right for permit within its territory.

Regarding mineral exploration, “every man’s right” (right to roam in a private land) allows only to roam, perform surface observations, surveys, and small-scale rock sampling. Rights to an area can be safeguarded by a claim reservation, that is a pre-emptive right to apply for a mineral exploration licence (claim). Mechanical exploration (drilling and excavation) needs a claim. In order to exploit a deposit, a mine permit is needed.

There are two types of licence for mineral exploration: claim reservation (varaus) and claim (malminetsintälupa - mineral exploration permit) (Table 13).

Table 13 – Mineral exploration and mining permits in Finland.

Permit	Activity	Rights	Validity	Duties
Claim reservation	Reconnaissance, preliminary surveying	A pre-emptive right to apply for an exploration permit. The freedom to roam gives the right to surveys and small-scale sampling.	One year	Notification of landowners on sampling
Mineral exploration permit (claim)	Mineral exploration	Mechanical mineral exploration activities: excavation and deep drilling.	Four to 15 years	Arranging a hearing, reporting of activities to the mining authority
Mine permit	Mining	Exploitation	Valid for a while	Royalties for landowners, mining taxes, closing and rehabilitation

A company applies for a licence by filling up an online form with an attached map of the area and operational plan. The application is evaluated by the Mining Authority, which organizes the public consultation.

In the exploration application is kept into consideration also environmental protection law (527/2014) on the use of groundwater:

- use ground- or surface water over 100m^3/day, company must inform direct Regional State Administrative Agency (AVI)
- If exploration company use ground water over 250m^3/day, company must apply a permit direct from Regional State Administrative Agency (AVI)

Exploration activity shall not cause:

1) harm to people’s health or a danger to public safety
2) essential damage to other industrial and commercial activity
3) significant changes in natural conditions
4) essential damage to rare or valuable natural occurrences
5) significant damage to the landscape.

If the exploration area includes species or habitat that are protected under legislation and international agreements, the 5 listed issues above must be addressed in all exploration actions conducted on the exploration area.

A permit for the use of private roads is needed from the Landowner if a claim reservation or mineral exploration permit has not been granted. The Landowner needs to be compensated for any occasional damage to the forest, road, or other property.

In the extraction phase, “the mining area shall be of shape and minimum dimension that allow the efficacy of the activity and may include auxiliary areas and potential ore deposit areas”.

The permitting authority for mineral exploration and mining is the Finnish Safety and Chemicals Agency (TUKES). Government can give a redemption permit for a mining area and mining permits related to the production of uranium or thorium. Tukes monitors compliance with the Mining Act, grants the mining safety permits and supervisee mine safety.

A scheme of the permitting process is shown in Figure 7.

The Rompas-Rajapalot prospects are still under mineral exploration permits. Although there is still mineral exploration going on, Sakatti itself is in the mine planning phase.

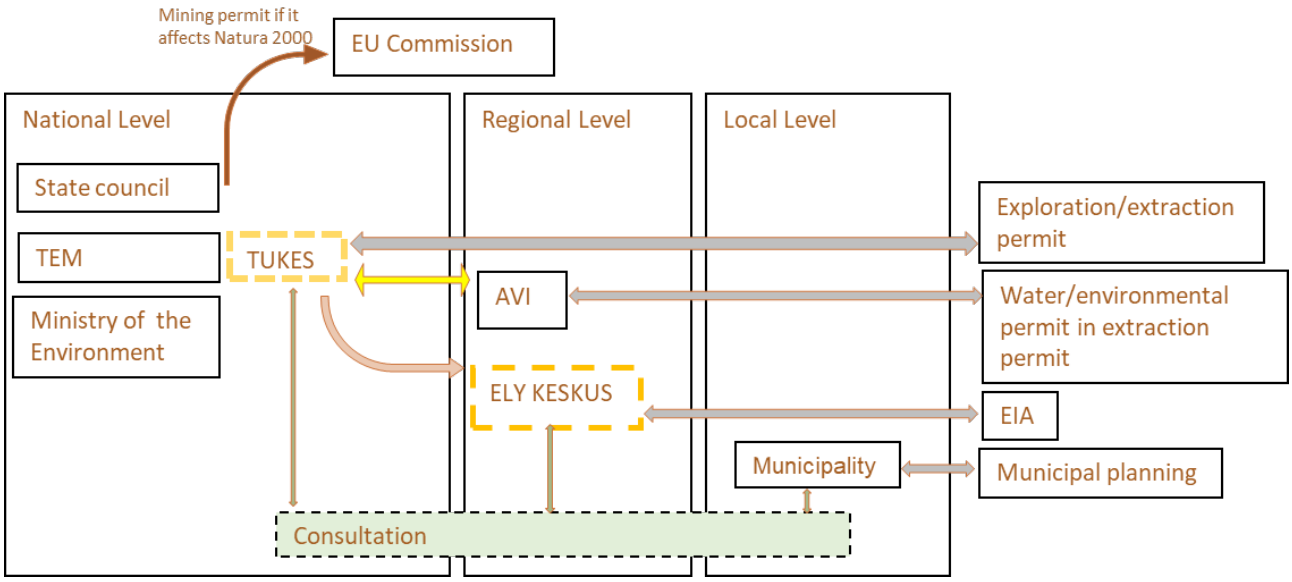

Figure 7 – Scheme of the Finnish permitting process for Natura2000 areas.

In principle, mining is not possible in a nature protection area and authorities cannot grant any exceptions to that. But for Natura 2000 areas, the Mining Authority (TUKES) can grant a mining licence if natural baseline conditions are not significantly impacted. In a case where the impact on the Natura 2000 area would be significant, the government can still grant a mining licence if there is a compelling public interest vase to do so and where no other viable alternatives exist. In such cases, the project holder should assess all possible alternatives to minimise its impact, including mining technologies and methods. It should also ecologically compensate the area. The Ministry of the Environment normally has lead responsibility for presenting the case for the government appraisal of the application; but in the case of species protected by the Natura 2000 Directive would be affected, the government needs also to ask for a statement of the EU Commission on the issue before its decision.

According to the new Mining Act (1 June 2023), mineral exploration and mining are not allowed in:

- national parks, urban areas, areas in use by the defence forces, within 50 m of cemeteries or private graves, or within 100 m of an area controlled by Border Guards
- areas where movement is restricted, or access denied; traffic routes or passages in public use
- within 150 metres of a building intended for residential or work use, an area in horticultural use
- within 50 metres of a public building or utility, or either a power line with a voltage of over 35,000 volts or a transformer station.

The mining authority specifically mentions that “it shall not grant a mining permit if the mining activity substantially weakens the protection grounds of a Natura site located in the vicinity” therefore mining activity requires a change in the status of a Natura 2000 area after a type of decision taken by the government that happens only after consultation with the European Commission.

Also, mining activity can be granted a permit only if does not conflict with other permitted usage of land in the mine site area.

Mire protection areas fall under special regulation and the relevant exploration permit is issued by the Ministry of Environment. Permitting mining requires a change in the status of the conservation area.

Wilderness areas are protected under the autonomous Act. Exploration requires an exploration permit under the Mining Act, and mining requires a government permit with an associated change in the proposed site status.

Relative to the cultural preservation aspects, for the specific case in this study the exploration permit states: "If objects referred to in the Antiquities Act are found in the licence area during the investigations, the licence holder must act as stated in the Antiquities Act and notify the Tornionlaakso Museum of the findings without delay." The order is based on Section 12 of the Mining Act (621/2011) and Section 2 of the Mining Act.

The revised Finnish Mining Act was passed on 1 June 2023, and in future any potential mining licence application will be under its remit. It gives municipalities powers to decide about mining in their specific territories. But for Natura 2000 site permits, the government needs first to consult the European Commission before issuing a mine permit.

Table 14 – Aspects of the case related to permitting aspects and knowledge of deposits.

Aspects	Description
Mineral governance	State-owned with decentralized governance. Municipalities and several authorities rule the mining, environmental and construction permit needed for a mine. The application/granting process of both the exploration licence and the mining concession involves the consultation of other authorities, landowners, and other stakeholders, including reindeer herders in the areas where it is practised. An application affecting the Sámi homeland also requires a statement from the Sámi parliament. An annual report is required by the mining authority. Because of Natura 2000, the government needs to also consult the European Commission.
Knowledge of the deposit	Sakatti is already well known as a world-class deposit, but mineral exploration in surrounding area still continues; Rompas-Rajapalot is under feasibility study and mineral exploration continues.
Time for planning	10 years
Exploration in Protected Areas	Mineral exploration permits partially overlap with Natura 2000. Economic activities, such as mineral exploration, is permitted with certain rules and restrictions. The project and its cumulative impacts on the ecological value of the area interested by the project or standing in the vicinity have to be assessed.

2.2.4 Environmental governance

The water and environmental permits for mining can be given by the Regional State Administrative Agency (AVI) and Centre for Economic Development, Transport and the Environment (Ely-keskus); a permit for mine closure can be granted by the Finnish Safety and Chemicals Agency (TUKES). The Ely-keskus monitors compliance with environmental permits and water, occupational health and safety units of Regional State Administrative Agencies supervises occupational health and safety in mining operations, and Radiation and Nuclear Safety Authority monitor the radiation safety. The instruments and means for monitoring regulatory compliance of mining and exploration are performed by periodic inspection, reporting and administrative coercion (interruption of operations), and fines (Keskitalo 2021). The ministry of economy TEM published a guidebook for exploration activity in protected areas in 2014 where recommendations for low impact technologies are given (TEM, 2014).

The mining authority lists methods with low impact in its own web page. These are not regulated by legislation. During permit application requirements might also cover this aspect. In the Rompas-Rajapalo case the company was not allowed to drill with normal heavy machine drill rigs to prevent track marks or other

vestigial signs of activity or damage to the forest. For that reason, the company used lightweight portable drill rigs.

The environmental impact assessment (EIA) procedure for mining projects in Finland is based on national legislation set out in the EIA Act (468/1994) (Appendix 2) and the EIA Decree (713/2006) (Appendix 3).

EIA according to the legislation requires: "*description of the project; the defining and comparison of project alternatives; a description of the environment in the area concerned; an assessment of the impacts of the project; and the arranging of public participation. Impact assessments should cover the entire life cycle of the project from the opening of the mine to its closure. They must assess impacts on nature, human beings, and the built environment. They should also cover exceptional situations, environmental accidents, and means to mitigate adverse impacts".*

During the permitting process for Sakatti that followed the Mining Act 621/2011, the application contained maps, surface area - land owner information - accessibility certificate – reports on Nature and special features of land use and Natura assessment report - Natura 2000 report – neighbour and area information. A report on the Natura 2000 area's biodiversity values, as required for permitting, was performed. The Natura report included description of the exploration methodology and technology, habitat and possible impacts on the biodiversity/ habitat and hydrogeology. The assessment also included the cumulative impacts on Natura 2000 area with other activities: reindeer herding is seen likewise as impacting the environment by the use of motor sledges and offroad vehicles, and for provision of animal feed, thus attracting other potential invasive species. Use of vehicles without permit for recreational use is also causing damages to the ground. Hunting is seen as disturbing the birds.

Table 15 – Aspects of the case related to environmental governance and practices.

Aspects	Description
Case land use conflict	The Rompas–Rajapalot project partially overlaps Natura 2000 area. Sakatti is located on the margin of the Viiankiaapa mire Natura 2000 area that was established during the 1990s. It was a mire protection and reindeer herding area. Hunting, berry picking and other recreation activities take place in the area.
Low impact Exploration technologies	Low impact exploration methods included MMI (Mobile Metal Ions) sampling, snow and biogeochemistry analysis, drone, portable drill rigs, use of Earth Observation data, application of remote sensing techniques, and of traditional ones outside of the Natura 2000 such as till sampling, boulder tracing, drilling, and trenching. In Sakatti exploration methods included full Tensor Magnetic Gradiometry (FTMG)+airborne electromagnetic survey, Closed circuit drilling and movement of machineries in winter to avoid moss damages.
Compensatory measures	In Sakatti compensatory measures are foreseen for the land surface area affected even though the mining itself will be underground.

2.2.5 Stakeholder engagement and communication

Mineral exploration and mining permits require consultation of all interested parties in a written form and/or public meeting.

The application for and granting process of both the exploration licence and the mining concession involves the request of inputs from other authorities, landowners, and other stakeholders, including reindeer herders in the areas where livestock herding is practiced. An application affecting the Sámi homeland also requires a statement from the Sámi parliament. An annual report is required by the mining authority.

The Mawson Gold Oy is one of the companies operating in Finland that has a long history of communication and stakeholder engagement. However, because of uranium and operation in Natura 2000, it has been opposed by the FANC. According to Eerola (2021), the company was among the few to communicate online about the issues related to social licence to operate (SLO), i.e., its strategies to earn public acceptance. The company also organizes Open Day events for the community where it presents the progress of the project.

Table 16 – Aspects of the case related to stakeholder engagement and communication.

Aspects	Description
Non statutory engagement activities	According to Eerola (2022) and Beland Lindahl et al. (2023) Mawson Gold Oy organizes for Rajapalo open days for the community and has a good company-community relationship and public acceptance at the region. In Sakatti, public meetings have been organised at the municipality, local village, and exploration office quite frequently by the company.

2.2.6 Concerns/disputes

Due to sensitive involving mining uranium and in Protected Areas, both projects are opposed by FANC, the most important and oldest Finnish ENGO founded in 1938. It is an umbrella organization for several local and province-level ENGOs which absorbs and manages a great part of the Finnish environmental movement (Konttinen 2012). FANC had a preeminent role in the previous uranium debate (2006-2008) and on the ongoing mining debate (Eerola 2024). More recently, the Extinction Rebellion has extended its activities from climate issues to opposing mining and mineral exploration in Finland as well, such as towards the Sakatti project.

FANC, Mawson and environmental and mining authorities have been involved in a long legal battle in courts regarding operation within Natura 2000 areas. However, according to Beland Lindahl et al. (2023), local population in Ylitornio and Rovaniemi has mostly supported the project, whereas positions of the government, the authorities, and municipality have been controversial. Ministry of the Environment has a plan to expand nature conservation in the prospect area, while the local municipalities and politicians support the mining project.

Sakatti project was opposed because of their location near Natura 2000 area, recreation areas and reindeer herding areas. FANC, “Save Viiankiaapa” movement, reindeer herders have objected through consultation and appeals. The Extinction Rebellion has interrupted company drilling 20 times already since December 2023 (Lassila 2020, Eerola 2024, Nuutinen-Kallio 2024). It opposes the recent expansion of the mineral exploration licence area and mining at site.

According to successive polls, the majority of the local people in Sodankylä favour the mine project and mining in general in the region, although there is also some local opposition towards the Sakatti project. Local people show more trust in the company than in either the municipality or the mining authorities. The local community has also pressured the company to provide better economic benefits from the project (Tuulentie et al. 2019). Sodankylä municipality plans to establish a mining forum, agreement, and program, which would be the first in the EU (Kotilainen et al. 2022). Nevertheless, Sakatti was also identified by Kangas et al. (2020) as a case of mining versus reindeer herding, recreation, and an overlap regarding the Viiankiaapa Natura 2000 area, showing its potential for conflict.

A potential mining licence application will be issued under the new Finnish Mining Act, giving municipalities power to decide over permitting mining in their own territory. As the Natura 2000 area of Viiankiaapa is based on the Mire Protection Programme, mining will require a change in its legal status.

The company’s application for environmental permit was rejected by authorities because the Viiankiaapa is protected also by the national mire protection programme. There is uncertainty regarding the impact on the groundwater level that drop because of the underground mine. According to authorities, legislation need to be changed to repeal the mire protection status of Viiankiaapa to allow mining on site (see Pelli 2023).

The local community has also pressed the company to provide better economic benefits from the project. The economic benefits have been mainly defined as the use of local entrepreneurs in local services related to mineral exploration and the employment of local inhabitants by the company.

2.2.7 Enablers

Key Rompas-Rajapalot project enablers are shown in Table 17.

Table 17 – Project enablers – Rompas-Rajapalot.

Communication	The companies engaged in communication at very early stage and through different means.
Use of low impact technologies	The companies adopted low impact technologies to perform exploration, meeting the requirements set in the permits.
Ecological compensation	The project has acceptance because another area is bought and protected elsewhere.
Underground mining	The project has acceptance because instead of an open pit, a tunnel would be built under the protected area and mining would happen underground.
Public acceptance	Despite of some resistance (Sakatti), most of the local people accept the projects. Municipalities and local politicians favor the projects as well.
Strategic project	Because of its economic importance and CRM content as a world-class deposit Sakatti is a potential candidate for the list of strategic projects determined by the CRMA. This may overcome the protected area issue.
Benefit sharing (distributional fairness)	Beyond jobs, taxes and favoring local services and products, sponsoring of sport and cultural association and events.

2.3 France - Beauvoir Lithium Mining Project (EMILI)

This case study reviews the EMILI project in Échassières in the Allier department. Échassières is in part in the forêt des Colettes Zone Naturelle d'Interet Ecologique, Faunitisque et Floriste (ZNIEFF) (site Code: 830005417) and SAC (Site Code: FR8301025). The site qualifying/ definitive attributes principally include deciduous forest (95%) and smaller shares of other natural habitats (3%). Species found on the site include Rosalia longicorn and yellow-bellied toad, both protected under the Habitats Directive.

The designated site is 762 ha, of which 33 ha are the old kaolin quarry where lithium was found in the 1970s. In 2019, Imerys, the company that owns the quarry and undertakes the lithium exploration programme announced that it had gathered positive results and intended to move to pre-feasibility and feasibility with a view to open a lithium mine by 2028.

Although the site has a long history of kaolin quarrying, there has been considerable public interest for the potential opening of a lithium mine. The mine is said to be able to produce enough lithium to provide batteries for 700,000 electric vehicles.

The renewal of the Exclusive Search Permit (prospecting licence) took several years but this would not be unusual for this type of administrative procedure. There was limited to no public interest (or at least evidence of such) for the lithium exploration programme or the kaolin quarry activities until announcements were made by the company.

2.3.1 Case overview

A schematic summary of the Exploitation de Mica Lithinifère par Imerys (EMILI) project in Échassières in the Allier department is shown in Table 18.

Table 18 – Case study summary.

Name	Emili: Beauvoir Lithium Mining Project Exploitation de Mica Lithinifère par Imerys (EMILI)
Country	France
Region	Département de l'Allier, Région Auvergne-Rhône-Alpes.
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Lithium (CRM)
Open pit or underground mine	Pre-feasibility looking at underground Existing kaolin quarry
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Exploration Planning & Design
Period of activity	1960 – kaolin quarrying 2019 – confirmation of lithium ore 2019 – deep drilling and pre-feasibility
Companies involved	Imerys
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	ZNIEFF (Zone Naturelle d'Intérêt Écologique, Faunistique et Floristique) – designated 2011 SAC (Special Area of Conservation) – designated 2013

The subject of this case study site is located close to the town of Echassières, in the Allier department of the Auvergne Region. The area has been used for kaolin quarrying since the end of the 19th Century. Kaolin quarrying is still ongoing and is supported by a factory which produces products derived from kaolin, such as sand for public works, glass wool and tin/tantalum and niobium concentrate.

The quarry consists of two granites, one of which is a leucogranite composed of sodium-dominant feldspar malbite) and Rare Earth Elements (REEs). The quarry still has a capacity of 30 years based on the current extraction regime.

The area which is the focus of the lithium exploration is the leucogranite. This granite is colloquially known as 'Beauvoir Granite.' Its composition also includes lithium-bearing mica. Lithium was first identified already in the 1980s. In the 1990s, the ore was classified as being of world-class due to its high lithium and tantalum contents.

In 2015, the company Imerys obtained an exploration licence for search, inter alia, for lithium. In 2019, it confirmed that lithium had been identified through preliminary drilling. Since 2022, the company has been engaged in a campaign of deep drilling (up to 250m in depth) and confirmed in the same year the viability of the lithium reserve. In 2021, the PER was extended for another 5 years. The company has now moved to pre-feasibility stage with a view to start mining by 2028.

There has been quarrying and exploration activity in the area for many years. Tungsten and beryllium were found on nearby sites but were never mined.

The area covered by the current licence is 12.17 km^2. It overlaps or is adjacent to a number of small villages including Échassières (402 inhabitants), Nades (120 inhabitants), Lalizolle (374 inhabitants), Coutansouze (131 inhabitants), Servant (535 inhabitants).

In France, built heritage protection operates on the basis of a de facto 500 m protection buffer applied around protected sites/structures. There is one such site in the vicinity, the Beauvoir Castle, of which 23.5% of its buffer overlaps with that of the exploration area.

According to the Corine Land data cover (Figure 8), the exploration area covers of the Mineral extraction site and different vegetated areas including non-irrigated arable land, pasture, broad-leave Forest, coniferous forest, mixed forest, and transitional woodland/shrub. The site overlaps with a SAC and a ZNIEFF called Forêt des Colettes (Site Code: FR 8301025) and it is important to note that the beech woods are the ones subject of the European designation. It is also adjacent to a discontinuous urban fabric, specifically the village of Échassières.

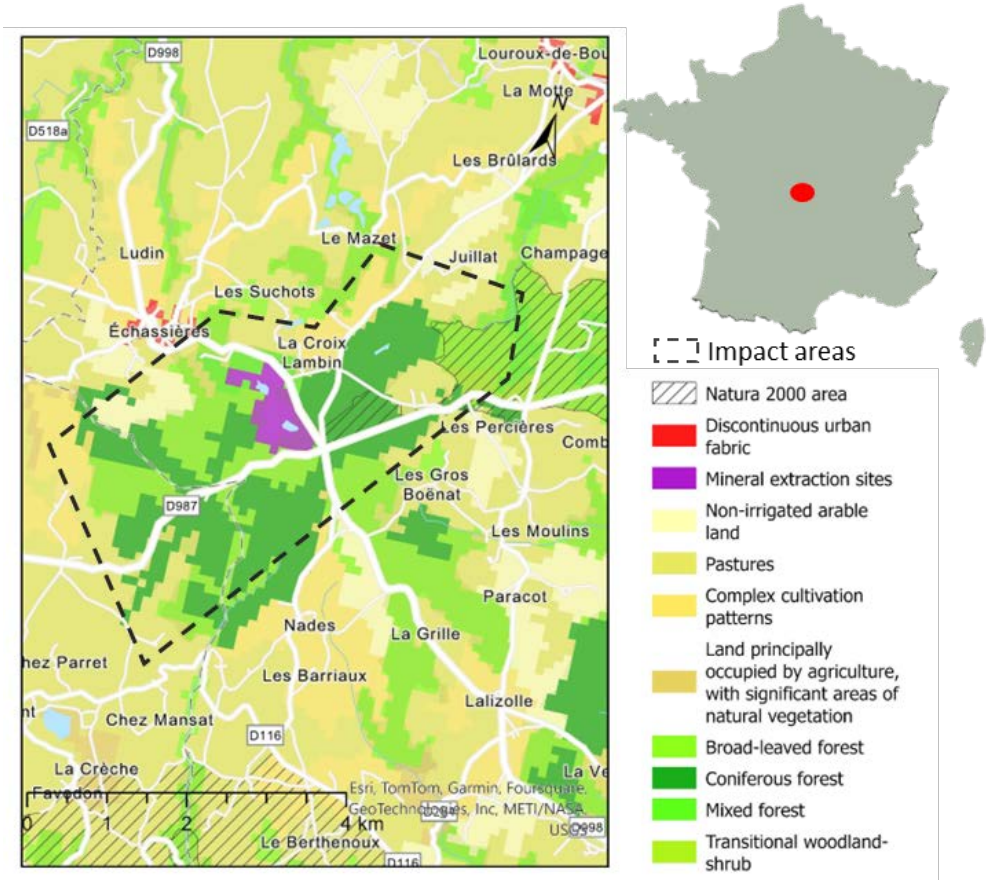

Figure 8 – Overall geographical localization. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and the footprint of the PER in relation to the village of Échassières.

2.3.2 Spatial planning

France has 4 levels of governance but only three levels of spatial planning (national, regional, departmental, municipalities), the national level does not produce plans but instead is tasked with drafting legislation. The departmental and municipal plans reflect the priorities identified in the regional plans (Table 19).

Table 19 – Spatial planning organization in France.

Levels	Aims
Regional schemes for sustainable development (Schéma Regional d'Aménagement, de Développment Durable et Egalité Territoriale (SRADDET)	Spatial planning and territorial equality with large infrastructure showing regional baseline, challenges, and objectives.
Grouping level, territorial coherence schemes (Schéma de Cohérence Territoriale)	Prepared for either urban areas or groupings of smaller local authorities. It serves as a guide for different sectors, for spatial planning, housing, transport, environment, including biodiversity, energy, and climate
At local level, local urban plans (plan local d'urbanisme (PLU)) or inter-municipality local	Main tool for spatial planning. It sets out local zoning regulations. Not all local councils have a PLU or PLUI as levels of development may not warrant it.

urban plans (Plan Local d'Urbanisme Intercommunal (PLUI))	

The four levels of governance in the French land use planning system are national government, regional government (13 regions), departments (101 units) and municipalities (over 35,000 units). The fourth level consists of grouping of local authorities which would be more akin to a metropolitan area of varying sizes. These are *communautés d'agglomération*. They allow for the sharing of resources, whether financial or personnel, and are particularly relevant in rural areas, where small village councils may not have the necessary resources or activity to have professional and technical staff dedicated to specific roles.

The national level, i.e. the government through the various ministries, is primarily responsible for the preparation and enactment of legislation focusing on land use planning, environmental planning, and other specific fields, including but not limited to mining.

There are three levels of spatial planning. There is no dedicated national spatial plan, instead the country operates on a decentralised basis. Each region prepares regional schemes for sustainable development, spatial planning, and territorial equality (Schéma Regional d'Aménagement, de Développment Durable et Egalité Territoriale (SRADDET)). These documents principally act as a guide for public investment for infrastructure, including infrastructure which falls within the remit of the region, such as secondary schools or regional roads. These plans are political and prepared by the Regional Authority and their members, who are representatives of the elected members of the constituting local authorities. These plans include a summary of the regional baseline, challenges, and objectives. This summary is presented both in written form and graphic form. It includes a set of general rules and proposed measures to support other public authorities involved in spatial planning and the environmental report.

At grouping level, territorial coherence schemes (Schéma de Cohérence Territoriale) are prepared for either urban areas or groupings of smaller local authorities. It serves as a guide for different sectors, for spatial planning, housing, transport, environment, including biodiversity, energy, and climate. It translates at grouping level the aspirations of higher-level plans, which allows plans prepared at local level to exclusively refer to this plan for guidance on the policy direction to be followed.

At local level, local urban plans (plan local d'urbanisme (PLU)) or inter-municipality local urban plans (Plan Local d'Urbanisme Intercommunal (PLUI)) are the main tool for spatial planning. They set out local zoning regulations. Not all local councils have a PLU or PLUI as levels of development do not warrant it. In this case, development is regulated by the Planning Code.

Exploration and mining fall outside the remit of the Planning Code and therefore are not considered as part of land use planning. As a result, neither exploration nor mining are addressed in any of the aforementioned plans as these would mean that those plans exceed their legal purpose. Post-mining is the only element that is considered into spatial planning with relevant local authorities preparing mining risks prevention plans (Plan de prevention des risques miniers) where these are located on or near historic mines. In this case, special rules for development and urbanisation will be defined and applied.

Natura 2000 sites are integrated in the planning documents listed above. In essence, plans and policies which may impact on a Natura 2000 sites are subject to appropriate assessment.

Designation procedure for protected sites

France has opted to follow a collaborative approach to the designation of European sites. The Prefect is the authority in charge of the designation of Natura 2000 sites. He/she submits the proposal to designate a site, including the boundary and the scientific criteria to the relevant local authorities and the groupings of local authorities (Etablissements publics de cooperation intercommunale (EPCI)) and to the military authorities in the case of sites including areas used for military purposes.

The council of each member of the EPCI have to give their opinion within a period of two months. Should no opinion be issued within that period, their opinion is deemed to be favourable by default.

In resolution of these opinions, the Prefect must collate a summary of the proposal and forward it to the Minister for the Ecological Transition and Territorial Cohesion. Proposals are then the subject of inter-ministry consultation.

Procedures then vary depending on whether it regards a site designated under the Birds Directive or under the Habitats Directive (Figure 9).

Areas designated under the Birds Directive, known as Special Protection Areas (SPA) (Zones de protection spéciale) are first designated in accordance with French legislation and published in the (French) Official Journal before the European Commission is notified.

Areas designated under the Habitats Directive, known as Special Areas of Conservation (SAC) (Zones spéciales de conservation) avail of an intermediary step where these are considered to be 'proposed Sites of Community Importance' (pSCI) (proposition de site d'importance Communautaire). These require validation of the European Commission which takes around 15 months. On approval, these are published in the Official Journal of the European Union which triggers the designation into French law.

Once the sites are designated, a committee is established for each site comprising local elected representatives of the relevant local authorities, representatives of the different interest groups using the site, of local farmers, of local landowners, of local forestry companies. It also includes scientists, any relevant public authorities, and any other party with an interest in the site.

Together, the committee is tasked with identifying the conservation objectives and the management plan for the site. This committee is known as the Managing Committee (Comité de Pilotage (COPIL). The management plan (Document d'Objectifs (DOCOB)) is approved by the Prefect. The management plan is effectively deemed to be a voluntary contract between members of the Managing Committee.

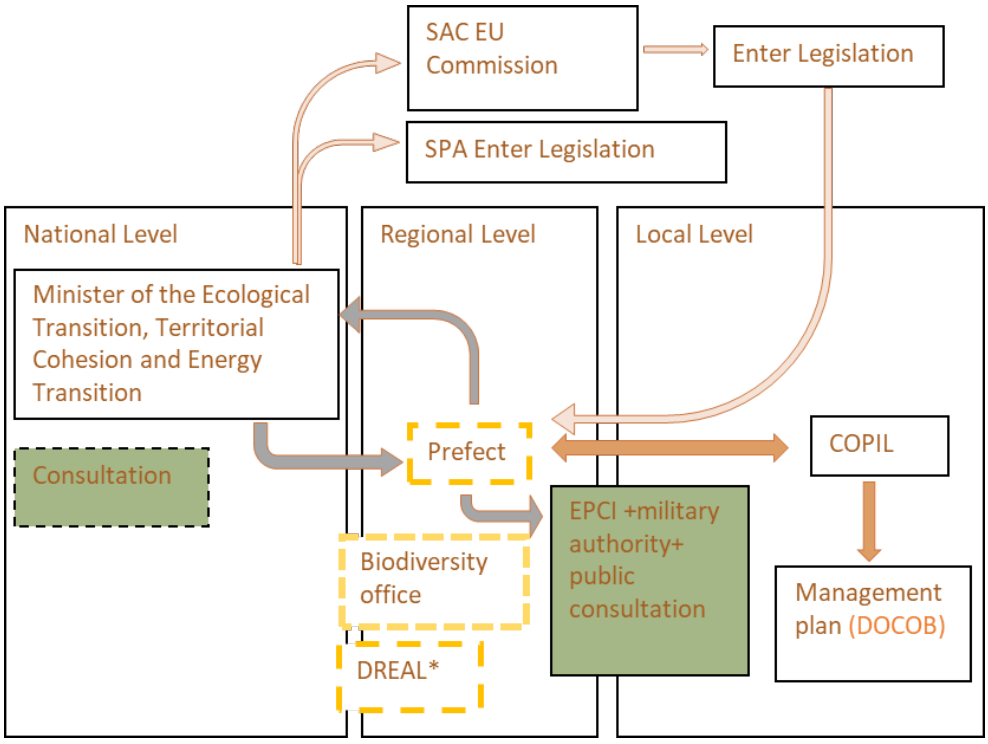

Figure 9 – Scheme of Protected areas' denomination process.

Special Protection Areas (SPA), Special Areas of Conservation (SAC), Etablissements publics de cooperation intercommunale (EPCI), Management Committee (Comité de Pilotage (COPIL), Document d'Objectifs (DOCOB).

There are other natural designations which are not derived from the European Directives. The Natural Zones of Ecological, Fauna and Flora Interest (Zone Naturelle d'Interet Ecologique Faunastique et Floristique (ZNIEFF)) are more akin to an inventory rather than a regulatory protection measure. A number of ZNIEFF sites were eventually designated as SAC or SPA.

An ecological inventory forms the basis of the definition of a site boundary. It uses the common criteria to include the quality of the habitat, its size, the density of the species observed, or the surface used by the species. The importance of a site in a migratory corridor or whether it is adjacent to another protected site, the number of species or habitats observed, the uniqueness of the site are also taken into account.

In relation to the Forêt des Colettes, the area was first designated as a ZNIEFF before it was designated as a SAC. Three criteria were used to designate the site as ZNIEFF. The distribution of fauna and flora, the distribution and arrangement of the habitats and the functions and relationships of the different ecosystems. The ZNIEFF took the whole domanial forest into account, the entirety of the forest is included in the ZNIEFF boundary.

It is not clear from the documentation online why out of the 2,284.78 ha of lands were designated as ZNIEFF, when as only 762 ha were designated as a European site. One part of the SAC includes wetlands and it is assumed that its habitat diversity that it provides that led to the designation. The other (larger) portion of the SAC consists of a continuous tree cover.

It should be noted that although the footprint of the existing kaolin quarry does not overlap with the SAC, it does overlap with the ZNIEFF. The area subject of the lithium prospecting activity overlaps with both the SAC and ZNIEFF.

The approach used for the designation of Natura 2000 sites is collaborative and involved the key actors and stakeholders in a given site. This means that aside from public authorities, users of the site are involved in the designation process and the management process. Public consultation is undertaken as part of the designation procedure. The Département Prefect is tasked with organising and reporting on the public consultation.

In relation to the management of the Natura 2000 site specifically, the prefect appointed the Management Committee for the Natura Site which consisted of representatives on behalf of the State, on behalf of the Local Authorities and the ECPI, all of which have been elected by the public either at local, departmental, or regional elections, on behalf of users and landowners, on behalf of NGOs. These are considered as the relevant representatives with a role in the designation of European sites. Upon the designation of the site, all documentation was made publicly available.

It is unclear how the boundaries of the European site have been established as the designation covers only part of the Forêt des Colettes and is not continuous. It is likely that the boundary was defined following the boundaries of habitats observed.

Methodological Guidance on ZNIEFF suggests three criteria for determining the boundaries:

- Natural heritage interest: this includes the presence of fauna and flora species or rare habitats which are deemed to be 'determining' and allow the physical definition of the boundary.
- Functional interest: this regards the importance of the natural function(s)/role(s) of the subject area.
- Complementary interest: this is indirectly linked to the biological and ecological quality of the area and whether the site is remarkable having considered its geological, landscape or historic interest.

As all SAC and SPA are derived from a ZNIEFF, it is assumed that the Forêt des Colettes was designated on the basis of the above criteria.

Good practices in spatial planning are shown in Table 20.

Table 20 – Aspects of the case related to spatial governance and practices.

Aspects	Description
Presence of mineral information in the land use plans	The minerals as exploration or mining areas are not addressed in the plans unless for post closure sites. Instead, the plans show Natura 2000 areas and areas where certain activities may be restricted. There is in principle no ban on mineral exploration or extraction in Natura 2000 sites unless clearly specified by individual DOCOBs.
Land use by extractive activity	Land use by extractive activity is addressed during EIA according to the environmental code. Land use in extractive activity is possible within boundaries, required landowner consent with procedure in place when there is no consent
Common environmental assessment	The procedure allows for a common assessment to be undertaken to meet both the requirements of the SEA and the EIA Directives and it is done when the plan sets the context for one project, meaning where the plan and project are effectively the same.

2.3.3 Mineral governance

To grant an exploration licence - Permis Exclusif de Recherche (PER) - a request is made by the company to the Ministry of Environment. This demand is transferred to the relevant Prefect who, in turns, tasks the DREAL to check whether the request is valid.

Once the application for a PER is deemed valid, a notification is published in the French Official Journal. This notification is a form of a competitive tender whereby other interested prospection companies are invited to compete for some or all of the area subject of the application. This form of tender is evaluated along set criteria which are not all weighed equally. These are:

- Technical capacity (25 points)
- Quality of preliminary studies (10 points)
- Technical quality and innovation (10 points)
- Understanding of environmental impacts (15 points)
- Financial capacity (25 points)
- Proposed financial returns to the State (25 points).

During this period, the DREAL, who is in charge of instructing the case, undertakes the environmental evaluation to include both for EIA and AA. The assessment will also take account of the need to protect natural habitats and landscapes, fauna and flora and agricultural interests in the area. The DREAL refers the application to the relevant authorities who need to be informed. It then makes recommendations to the prefect. The Prefect will take account of the recommendations of the DREAL and of the comments received during the public consultation period. The mayors of the relevant town and village councils are also requested to provide their opinion. The recommendation of the prefect, which is based on the results of the public enquiry, the recommendations of the DREAL, and that of the mayor(s) is then forwarded for final approval to the Minister. Once a decision is made, it becomes legally binding and officially approved through publication of the French Official Journal as a decree.

Obtaining a PER does not give right to proceed with exploration works. An additional authorisation is required and subject to environmental impact assessment. This is also subject of a public enquiry. This authorisation is delivered by the prefect who will consider the risks associated with the project, including human health and safety at work, public health and safety and the baseline of a receiving environment. The PER also gives

exclusive rights to its holder to proceed with consent for the development of mine, should the resource be feasible to be exploited.

Mining licences are granted according to the following process. Applicants for mining licences already hold a PER which has effectively given them a 'follow on' right to proceed with consent for a mine. Consent takes the form of an authorisation to start mining work which, in its final form, takes the format of a prefectural decree which prescribes techniques and methods to be used depending on the risks or impacts the project may give rise to.

Consent will consider a number of aspects, including:

- Public health and safety
- Risks to public and private buildings
- Impacts to roads
- The receiving environment
- The protection of natural habitats and landscapes of the fauna and flora
- Biological integrity
- Agricultural and fisheries interests
- General interests in the local area.

Applicants should demonstrate how they will make good use of the resources and how the mine will be protected.

Once an application has been submitted, the mayors of the relevant town and village councils will be notified. In turn, they will erect notices to notify the public that a request has been made. The request is subject of mayoral scrutiny, meaning, the mayors have to provide their opinion on the project. The DREAL also has to give its opinion, although its focus in more on EIA and AA.

A PER can be granted for a period of up to 5 years which can be renewed twice. A Mining Concession can be granted for a period of up to 50 years.

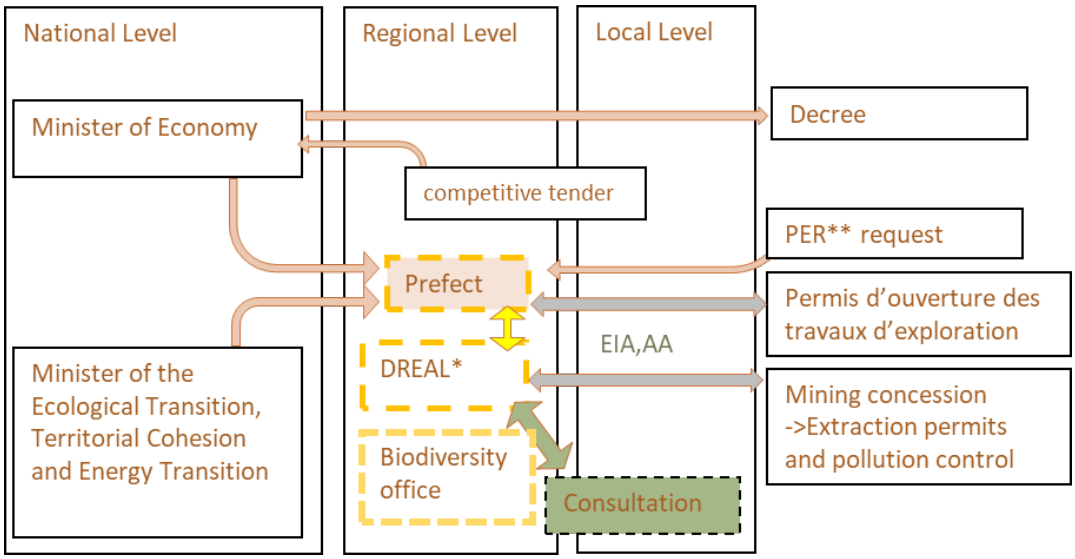

Fig. 10. Schematic permitting procedure.

*DREAL: Regional Division for the Environment, Spatial Planning and Housing (Direction Régionale de l'environnement, de l'aménagement et du logement (DREAL)
**Exclusive Exploration Permit (no right for drilling)
EIA environmental impact assessment, appropriate assessment
Prefect has monitoring duties, coordinates with DREAL

Good practices aspects extracted from the case on mineral governance and practice are summarized in Table 21.

Table 21 – Good Practices - mineral governance and exploration operations.

Aspects	Description
Mineral governance	State owned with decentralized governance
Knowledge of the deposit	The knowledge of the mineral deposit is extensive. The designation took effect in 2013, whereas exploration and quarrying activities started in the 1960s. Lithium was first identified in the 1970s or some 40 years prior to the designation as a European site.
Time for planning	Long term planning took in consideration
Exploration techniques	The following techniques are used as part of the exploration programme: - Geophysical surveys using electrical panels, - Invasive drilling and petrographic description - Core drilling, log and sampling - Mineralogical and petrographic analyses - Mineral processing for the separation of mineral phases, chemical analysis, and analysis of the mix of mineral phases. Computer modelling of the drilling, petrography and grades, calculation of volumes, pits, and reserves.
Exploration in protected areas	Aside from undertaking appropriate assessment, there is no specific processes for granting exploration licences in PAs. Accordingly, any development, works or activity that may impact the conservation objectives of a designated site, needs to be the subject of mitigation. If even after mitigation, the proposed development/works are still deemed to have negatively impacted a Natura 2000 sites, then other steps of AA would need to be pursued or consent should be refused.

2.3.4 Environmental governance

When an application is submitted, the DREAL undertakes the assessment of effects on the Natura 2000 on behalf of the prefect. This assessment will have to review whether there is a likelihood or scientific doubt that the proposed activity could give rise to likely significant effects on a European designated site. This assessment would consider the construction methods (if any) and any methods which may be used as part of the undertaking the activity.

In accordance with the environmental code, the administrative authority in charge of delivering a consent cannot give it to a project if it has been determined that it would impact on the conservation objectives of the site (article L 414-4).

Factors concerning good environmental governance are shown in Table 22.

Table 22 – Good practices - environmental governance and practice.

Aspects	Description
Borders	Nature protected areas boundaries are based on ecological inventory. In the specific case it is not clear why only part of the area has been included in Natura 2000 area, probably for habitat diversity.

Case land use conflict	This case relates to exploration for lithium in the context of a kaolin quarry. A significant part of the site therefore consists of quarry lands. A significant proportion comprises some type of natural forest, the specific types having been detailed above. The exploration area overlaps with cultural heritage buffer zone, several villages, a SAC and a ZNIEFF called Forêt des Colettes (Site Code: FR 8301025). Large area is an active quarry.
Conflicts arising from land use and water	Water and land use issues are dealt with through the preparation of the Schema Directeur d'Amenagement et de Gestion des Eaux (SDAGE), which applies to land use and mining. Any development, mining project included must have regard to the SDAGE. Post mining risk is the only element that is considered in land use planning.
Evaluation of impacts and measures for reduction of impacts in EIA	Given this case study relates to an exploration case moving to pre-feasibility and feasibility, at this stage, it appears that desktop research was used. Information found online suggests that a mix of practical knowledge and desktop research has been used to prepare the assessment submitted as part of the renewal application. It is expected that in accordance with IPC/IE legislation, Best Available Techniques (BAT) will be used. Geophysical surveys and drilling (up to 150m in depth) were the exploration methods used. The use of specific equipment or heavy machinery is not envisaged and not restricted in the DOCOB. Impacts on the Natura site would include vegetation compaction due to the heavy machinery, operational noise during drilling, dust resulting from drilling, mud as a result of the operations. The operator has not identified other effects on the Natura Site as a result of the exploration phase. This view was upheld by the competent authority. A small number of mitigation measures have been put in place, only one could be attributed specifically to the Natura site but it is unclear whether it was a statement of fact (no trees will be cut as it is unnecessary) or whether it actually consisted of a mitigation measure (no trees will be cut because it is a conservation interest). Another impact regards the creation of ditches as a result of drilling activities. Ditches are known to be a habitat favoured by the yellow-bellied toad which is a protected species living in the vicinity. Special mitigation measures are in place in the event that toads were to populate the drilling ditches. Recycling of water is included in the new mining code, project and consent must have regard to the applicable SDAGE.
Conservation	In accordance with the environmental code, the administrative authority in charge of delivering consent cannot give it to a project if it has been determined that it would impact on the conservation objectives of the site (article L 414-4). (DREAL assess projects impacts, gives recommendations to prefect).

Closure- remediation	Licensee must make provision for financial bonds to be used for the closure and remediation of the licenced site in case he/she is not in a position to undertake it him/herself.

2.3.5 Stakeholder engagement and communication

There is mandatory public consultation during the instruction of a PER by the DREAL. This phase was then supplemented by a more significant and developed phase known as a 'public enquiry.' The public enquiry is a mechanism that is only triggered for certain types of projects in accordance with the article L123-2 of the Environmental Code. In French environmental law, all public enquiries must be undertaken prior to consent being granted. The public enquiry is the responsibility of the Commission Nationale du Débat Public (National Commission of Public Debate). It is expected that alternatives, including both project specific alternatives and strategic alternatives and environmental impacts will be debated.

There is both mandatory and voluntary public consultation during permitting. Article L.132-3 of the Mining Code (New) requires public consultation prior to granting mining consent.

As part of the consenting process for the PER, a mandatory phase of public consultation took place between the 10th and 25th April 2015. The documentation was uploaded on the Ministry for Economy's website. The DREAL was tasked with instructing the case, in accordance with the procedure. This means, it also consulted with the relevant prescribed bodies (see Table 23). As stated earlier, a public enquiry will be held, details of which are to be published in Q1 of 2024

In the subject case study, Imerys has engaged with local community.

Table 23 – Good practices - consultation and engagement activities.

Aspects	Description
Planning and denomination of Natura 2000 areas	- Local elected representatives, representatives of different interest groups, local farmers, landowners, local forestry companies and scientists are involved in designation and management process. - Public consultation. - If the site includes areas used for military purposes, then the military authorities are also involved.
Case communication	Company engaged with local community through the organisation of regular public meetings with local communities. Consultation with determined stakeholders and open to public, authorities, local authorities and the ECPI, users and landowners, NGO. Imerys has and continues to engage with the local community, through the organisation of regular public meetings with local communities.

2.3.6 Concerns/disputes

There is evidence online of objections from both local communities and NGOs. Notwithstanding this, there is also evidence of local community support for the project (Vincent, 2022). Locals had already been acquainted to extractive activity by the local kaolin quarry and they saw it as an opportunity of employment. Local Greens also see as an economical possibility for the region considering that it is a reindustrialization. National NGO, as France Nature Environment or Les Ecologistes have participated in the consultation process and have some concerns related to the activity (FNE, 2023; Les Ecologistes, 2022).

Two local organization oppose the mining activity: “stopmines03” and “Préservons la forêt des Colettes”. A number of local events have taken place against the future stages of the project (i.e., the opening of a lithium mine). To date, these have included public meetings, stands at local events such as weekly village market, walks in the Forêt des Colettes, creation of Facebook group, publication of a pamphlet. They fear for deterioration of water quality and risks for the environment. Imerys uses National Commission for Public Debate (CNDP) to organize consultation. (Canas N, 2023, Imerys & RTE, 2023). Imerys also aims to implement international IRMA (Initiative for Responsible Mining Assurance) addressing social and environmental aspects.
It is difficult to gauge the actual level of opposition from the local community itself. Material published by those opposing the mine refers to ‘those who have been charmed by the reassuring speech of the company Imerys.’ This suggests the project is locally divisive. The case attracted both support and opposition.

In common with reactions in other countries, there is deliberate misinformation in circulation regarding environmental impacts of Lithium operations. The opponents seems to associate lithium mining from hard rock to other types of mining. There is also a perspective from one interest group of reducing consumption while another interest group advocates mining for the green energy transition.

2.3.7 Enablers

Some of the key project enablers are shown in Table 24.

Table 24 – Project enablers Exploitation de Mica Lithinifère par Imerys (EMILI)

One reference authority	Mineral governance and spatial planning have separate legislation, though minerals do not appear in land use plans, but mineral and spatial planning governance have a key regional authority of reference in a frame where the governance is decentralized. The Prefect (regional authority acting as the state representative of both under Ministry of Economy and that of ecology…) has a key role in denomination of protected areas and in permitting and monitoring extractive activity. The conflicts and impacts of a project are solved at EIA level.
Involvement of every level	Both land use planning with denomination of protected sites, and decision of extractive activities are steered at regional level but require consultation at National, regional, and local level including public. Protected areas designation and management process involve local level.
Mineral knowledge	Previous extractive site Good knowledge of deposit Large deposit Exploration company through competition-> attested capacity
Low Impacts	Exploration site overlaps with villages, partly with buffering zone of cultural heritage, protected areas, Natura 2000 area – the project demonstrated and was approved to have low impacts on the environment ➔ Mitigation actions implemented ➔ Exploration feasible, also drilling
Case communication and engagement	Extensive consultation with relevant stakeholders and public has been performed. No uniform consent

2.4 Ireland – Blackstairs Lithium Project (Avalonia)

Blackstairs Lithium Company is the holder of prospecting licences to explore for mineral deposits in an area covering over just under 300 sq.km. The company holds eight prospecting licences. Six of the prospecting licence areas overlap to a certain degree (some more than others) with a designated site.

2.4.1 Case overview

The case study (Table 25) focuses on exploration activities undertaken as part of the Avalonia Block, a geological region located in the southeast of Ireland. The exploration activities are licenced through a group of eight licences granted to Blackstairs Lithium Ltd.

The licences were under review as they are due to expire in August 2023 at the time of the research. A renewal application was made towards the end of 2021, yet to date no decision had been made. The application has given rise to high levels of public interest which resulted in a number of public meetings organised by both the exploration company and the local community.

The area has been the subject of exploration activities since the 1970 but the focus changed to lithium in 2009. The methods used for exploration are traditional exploration methods.

Table 25 – Blackstairs Case study summary.

Name	Blackstairs Lithium, sometimes referred to as the 'Avalonia Project'
Country	Ireland
Region	County Wicklow
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Lithium (on the Critical Raw Materials EU List)
Open pit or underground mine	n/a (exploration)
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Exploration
Period of activity	Since 2009
Companies involved	Blackstairs Lithium Limited
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	Special Area of Conservation (SAC) Proposed Natural Heritage Area (pNHA)

The area can be generally described as predominantly agricultural (pasture and grazing livestock) with some forestry (commercial plantation). There are some rural houses and agricultural buildings in certain places and a number of quarries. Having considered satellite imagery, there appears to have been limited to no change pre- and post- exploration.

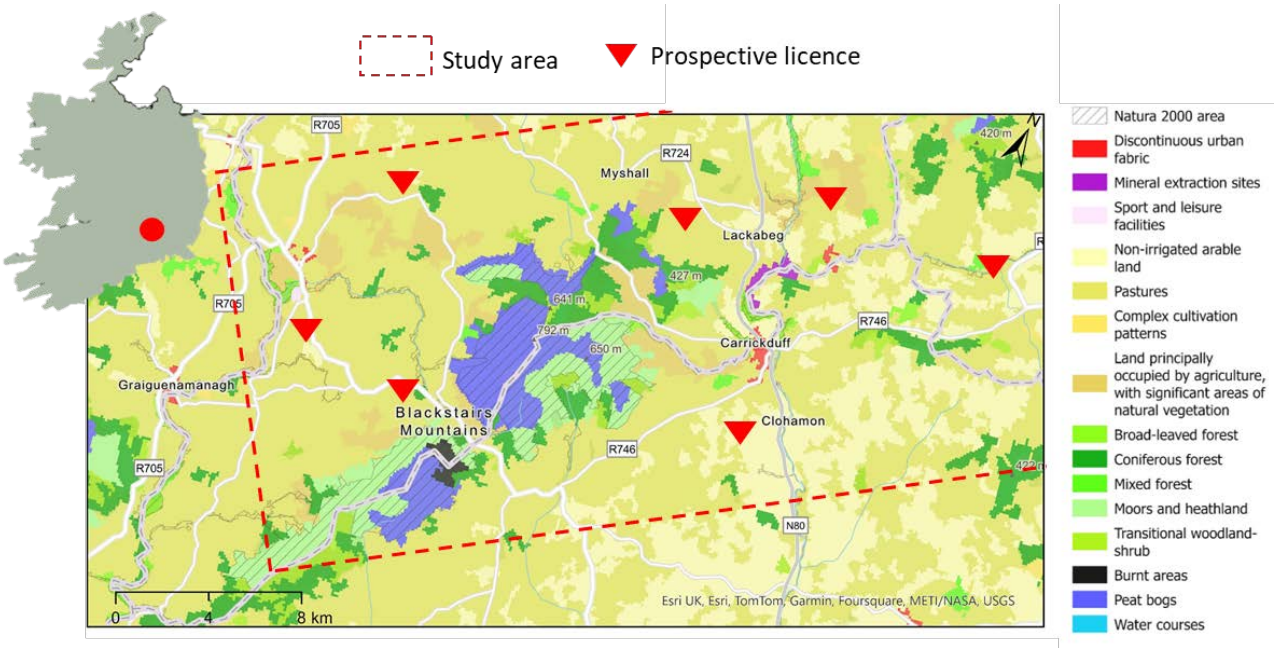

Figure 11 – Overall geographical localization. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and exploration area.

The study area is generally referred to as 'Block Area' meaning it comprises several licenced exploration sites. It is known as the Avalonia Block, which overlaps County Carlow (six areas) and County Wicklow (two areas).

The area consists of a majority of lowland and gently undulating upland areas. In the territory are listed special protection areas, proposed natural heritage areas, natural heritage areas and special conservation areas.

Three of the prospective licence areas are located on the flank of the Blackstairs Mountains.

The river Slaney bisects the area in the middle from north to south and forms the border of two of the licenced areas. This River has many small tributaries.

The relevant designated sites are:

- Slaney River Valley SAC (Site Code: 000781) – designated under the Habitats Directive
- Slaney River Valley proposed Natural Heritage Area (pNHA) (Site Code: 000781) – proposed for designation under the Wildlife Amendment Act.
- Blackstairs Mountains pNHA (Site Code: 000770) – proposed for designation under the Wildlife Amendment Act.
- Blackstairs Mountains SAC (Site Code: 000770) - designated under the Habitats Directive
- River Barrow and River Nore SAC (Site Code: 002162) - designated under the Habitats Directive.
- Tomnafinnoge Wood pNHA (Site Code: 001852) - proposed for designation under the Wildlife Amendment Act.
- Johns Hill pNHA (Site Code: 000808) - proposed for designation under the Wildlife Amendment Act.
- Clohastia pNHA (Site Code: 000830) - proposed for designation under the Wildlife Amendment Act.

There are a number of settlements located in the overall block - Shillelagh (337 inhabitants in 2016), Clonegal (278 inhabitants in 2016), Kildavin (184 inhabitants in 2016), Myshall (286 inhabitants in 2016) and Borris (652 inhabitants in 2016).

2.4.2 Spatial planning

In Ireland, the planning system is top-down and three-tiered as shown in Figure 12.

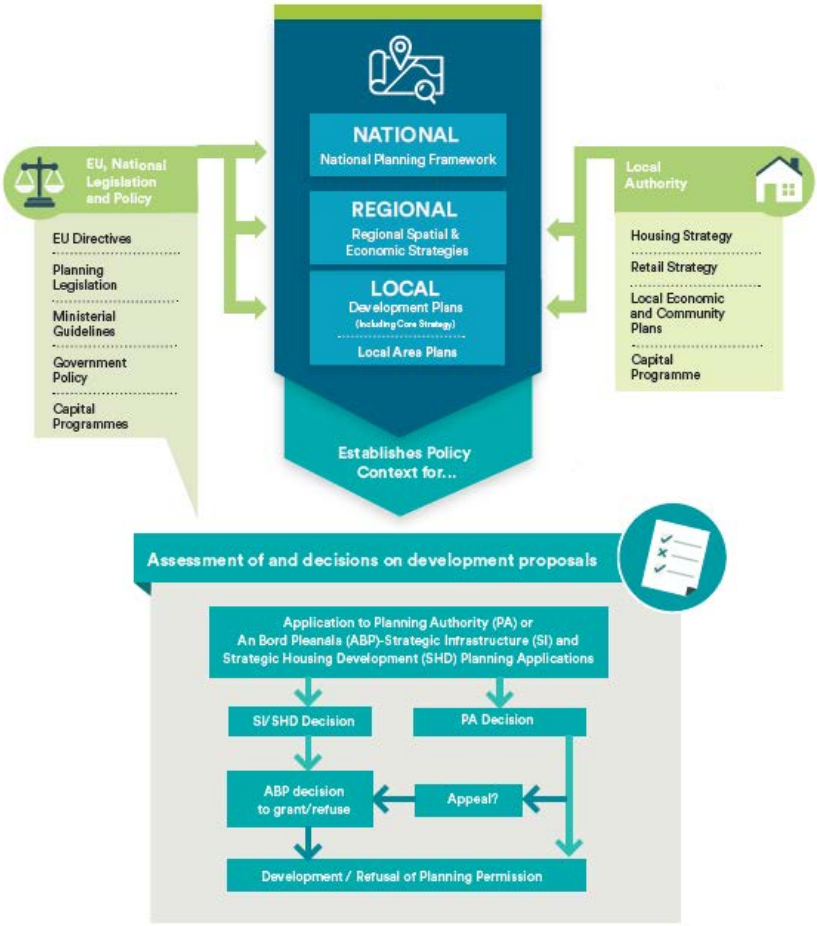

Figure 12 – The Planning Hierarchy in Ireland (source: National Planning Framework 2040).

At the top, sits the National Planning Framework (NPF) 2040, the NPF is supported at regional level by Regional Spatial and Economic Strategies (RSES) which are prepared by the Regional Assemblies. There local authorities have to prepare a City or County Development Plan (CDP). Table 26 shows the planning system by level of responsibility.

Table 26 – Spatial planning organization.

Level	Duties
National Planning Framework (NPF) 2040	Provides the vision for the spatial development of Ireland up to 2040. The high-level policy was adopted by the Government of Ireland, but its preparation was led by the Minister for Housing, Planning and Local Government (now Minister for Housing, Local Government and Heritage).
Regional Spatial and Economic Strategies (RSES)	Prepared by the Regional Assemblies, support NPF at regional level There are three regional assemblies in Ireland, each of them has prepared its own RSES. These plans translate and adapt national policies at regional level.

City or County Development Plan (CDP) and Local Area Plans	Prepared by local authorities. There are 31 local authorities in Ireland. These plans are the local translation of national and regional policies. It is under the development plan process, that areas subject of specific landscape protection regimes would be designated. Below the development plan level sits local area plans that are made for areas that: a. Are designated as a town in the most recent census of population b. Have a population in excess of 5,000.

It is also possible to prepare local area plans for settlements between 1,500 and 5,000 inhabitants, but these are not compulsory. It is under the development plan process, that areas subject to specific landscape protection regimes would be designated.

Resolution of any potential conflicts is mostly undertaken through the spatial planning process. At plan-making stages, conflicts or potential conflicts are sought to be resolved through the use of policies and policy objectives and zoning. The development management process is where most of the potential conflicts would be resolved. This means that most conflicts are resolved once an application is made to the local authority to obtain planning permission. There are first- and third-party rights of appeal to the national planning appeals body, An Bord Pleanála.

Ireland has transposed the directive via Statutory Instrument 436/2004 – Planning and Development (Strategic environmental Assessment) Regulations 2004. Its requirements were integrated into primary legislation i.e the Planning and Development Act 2000, as amended.

In accordance with the Directive, land use plans in Ireland are subjected to strategic environmental assessment. This assessment is undertaken concurrently to the plan-making process and submitted to the same level of public scrutiny. The environmental report prepared as part of the SEA for the Development Plan will strategically assess relevant policies and objectives in relation to mineral extraction. These are assessed against strategic environmental objectives (SEOs). Where a likely effect is identified, mitigation measures may be incorporated into the Plan. Where significant environmental effects are identified through the SEA process, specific elements/objectives may be removed from the Plan. In such an event, there would be no planning policy framework to support subsequent development consent for a specific mineral project.

All policies issued by the Government, including the Policy Statement on Mineral Exploration and Mining are, at a minimum, screening for SEA. The aforementioned statement was subject to a full SEA.

Designation procedure for protected sites

The Minister draws a lists of candidate sites of Community Importance having regard to the surveillance he/she has undertaken. It may also include a request to include a site. This list is then made publicly available to allow any person or body or the public in general, to submit within a specified period of not less than four weeks to make a written representation regarding any specified issue or issues relating to the identification of sites for consideration as site of Community Importance. The Minister shall then submit the list of candidate sites of Community Importance and any modified list of candidate sites of Community Importance to the European Commission. The Figure 13 shows the process for denomination of PAs.

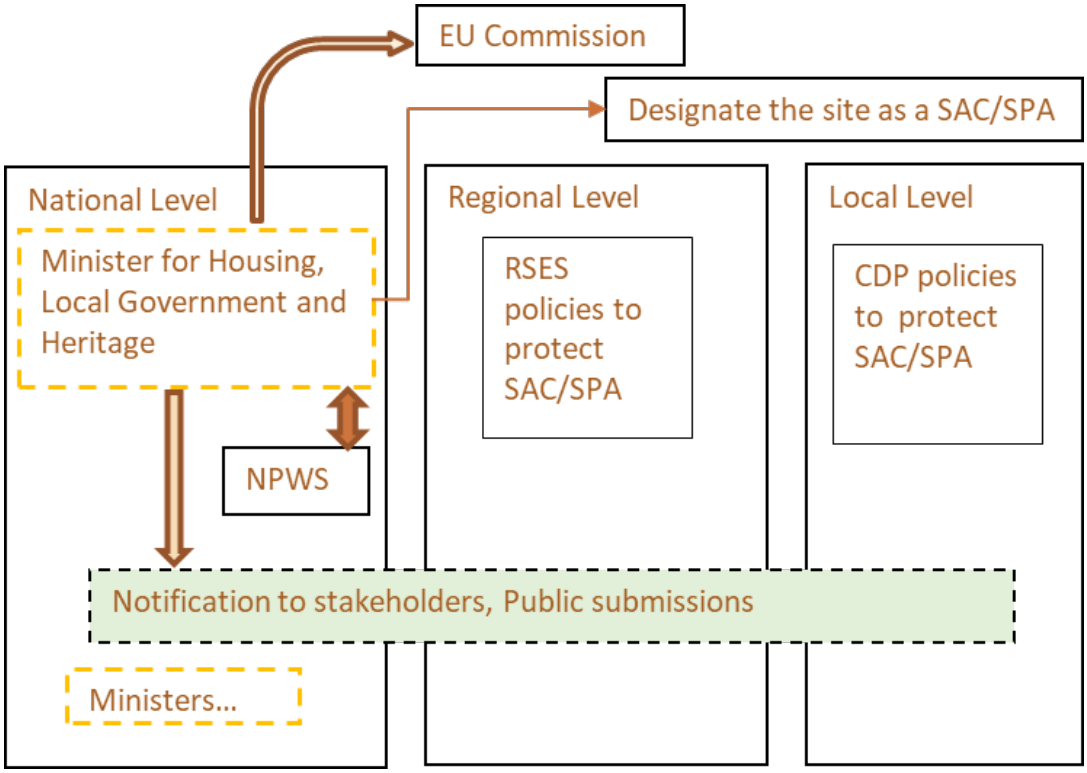

Figure 13 – Process for denomination of protected areas. Special Areas of Conservation (SAC) and Special Protection Areas (SPA).

NPWS - National Parks and Wildlife Service; RSES - Regional Spatial and Economic Strategies
CDP - City or County Development Plan

In relation to the designation of sites, if considering European Sites, the Minister for Housing, Local Government and Heritage is responsible of the designation, amendment, and re-designation of sites. In this task, help is provided by the National Parks and Wildlife Service (NPWS).

Natural Heritage Areas (NHA) are also the responsibility of the Minister for Housing, Local Government and Heritage with the help of the NPWS. Natural Heritage Areas boundaries coincide with identifiable (and mappable) features on the ground or with water features. On land, these may be fences, hedges, ditches, or roads. In the case of boundaries in large lakes or the sea, the boundary may be a straight line between visible markets (headlands, islands, etc.). High and low water mark can be used.

Designation of the European Sites reviewed in this paper dates from the 2000s. There is limited record on how the boundaries were defined. It is possible these were defined using scientific criteria as envisaged in the Directive.

Another Minister has responsibility in relation to fish species specified in annexes of the Habitats Directive. As the statutory consultation is intertwined with the designation process shown in Figure 13, the bullets below provide a summary of the mandatory steps:

- The Minister must notify the public through the publication of newspaper notices and may also publish online and broadcast the intention on the radio.
- Parties with an interest in the lands or parts of the lands to be designated are notified of the intention to designate the site.
- These parties can object on specified grounds to the Minister.

The Minister must consider these submissions and provide a response. In detail:

Under the Habitats Directive (Articles 3 and 4), Member States designate Special Areas of Conservation (SAC) to ensure the favourable conservation status of each habitat types and species. Member States also designate Special Protection Areas (SPAs) according to scientific criteria. The national authority then decides which are the most appropriate criteria and identify the most suitable territories.

The Minister establishes the priorities for the designation of sites having regard to

a) The importance of the sites for the maintenance or restoration at a favourable conservation status

b) The conservation status of natural habitat types and or priority species

c) The coherence of the Natura 2000 network

d) The threats of degradation or destruction to which those sites are exposed.

The Minister draws a lists of candidate sites of Community Importance having regard to the surveillance he/she has undertaken. It may also include a request to include a site. This list is then made publicly available to allow any person or body or the public in general, to submit within a specified period of not less than four weeks to make a written representation regarding any specified issue or issues relating to the identification of sites for consideration as site of Community Importance.

The Minister shall then submit the list of candidate sites of Community Importance and any modified list of candidate sites of Community Importance to the European Commission.

The following information is provided for each site:

- An ordnance survey map of appropriate scale, upon which the boundaries of the site are marked, so as to identify land comprising the site and the boundaries thereof.
- Its name, location and extent.
- The data resulting from application of the criteria specified in Annex III, Stage I, to the Habitats Directive.
- The scientific and legal criteria and rationale for the identification of the site as a candidate site of Community Importance.

The Minister shall also notify other public authorities, which are known as prescribed bodies. Every owner and occupier in any land included in a candidate site of Community Importance must be notified. The decision to propose certain sites for designation must be published in at least one newspaper with circulation covering the area in which the lands referred to in the notice is located. The Minister may broadcast it on a radio channel generally available in that area and publish it on the internet. There may be public displays organised in public buildings.

It is possible to object to the proposed designation of the site. To object to the proposed designation of a site, a party must have an interest in or over land the land comprising the site or part thereof or any other person having or being entitled to an interest in or over land outside the site whose interest may be potentially affected by the designation of the land comprising the site or part thereof may make an objection within three months from the date the notice was served. To object, the party must use the grounds of the criteria set out in Annex III, Stage I, of the Habitats Directive and relevant scientific information to the inclusion of a site or part therefore in the list of candidates of sites of Community Importance. This means that an interested party may request a review or modification of the particulars of the site on grounds of the aforementioned criteria.

The Minister may consider the objections or any request for a review or modification and shall inform the person making the objection or request of his or her decision. Again, this is dependent on the aforementioned criteria. On foot of this, the Minister may a) having considered the objections, b) to the criteria and c) the submissions made, modify the list of candidate sites of Community Importance before transmitting it to the European Commission in accordance with Article 4(1) of the Habitats Directive.

Once the European Commission has adopted a site, the Minister shall then designate the site as a SAC.

Statutory Instrument (S.I) No. 477 of 2011 – European Communities (Bird and Natural Habitats Regulations 2011 which sets out the process for the designation of sites, specifically refers to prospecting licences and exploration licences, stating that holders of such licences can request further information from the designation of a site.

The Minister shall undertake ‘or cause to be undertaken’ surveillance and monitoring of the conservation status of natural habitats and species. If another Minister has responsibility in relation to fish species

specified in any of the annexes of the Habitats Directive, he/she would be responsible for the surveillance and monitoring of the conservation status of the said fish species and their natural habitats.

NHAs are designated under the Wildlife Act 1976-2000. Section 16 of the Wildlife Amendment Act requires the Minister of Housing, Local Government and Heritageto publish and notice and to serve a notice on the owner of any land and any holder of a valid prospecting licence or exploration licence. Submissions may be made and the Minister may, or may not, make the designation order.

The Statutory Instrument (S.I) No. 477 of 2011 – European Communities (Bird and Natural Habitats Regulations 2011) sets out the process for the designation of sites and specifically refers to prospecting licences and exploration licences, stating that holders of such licences can request further information from the designation of a site.

2.4.3 Mineral governance

Prospecting licence

A prospecting licence is required to undertake mineral exploration. It gives the exclusive rights to explore for certain specified minerals. A number of requirements apply:

1. Complete and submit a prospecting licence application form
2. Pay the appropriate fee (€190/area)
3. Provide a map of the area if it has never been licensed before.

When applying for a licence, the prospective holder should identify the minerals of interest, i.e. those that are being searched for. The applicants should provide details of the work programme, and the expenditure associated.

Once the application is received, it will be reviewed by the Geoscience Regulation Office (GSRO) of the DECC. Prior to issuing a licence, the proposed licence must be advertised in a local newspaper to allow anyone with concerns to make a submission within 30 days. The submissions made are then reviewed by the Minister before the final decision is made. A prospective licence is issued for a period of six years. All prospective licence applications are subject to screening for Appropriate Assessment (AA) and Environmental Impact Assessment (EIA) Screenings by the Minister and may require additional approvals from different authorities depending their impacts on areas of cultural or natural importance or vicinity to gas pipes. To be granted a permit requires:

- approval to undertake exploration activities where those are located near Special Areas of Conservation and Special Pas;
- authorisation from the Minister for Culture, Heritage, and Gaeltacht where a national nature reserve may be affected;
- approval from the Minister for Culture, Heritage and the Gaeltacht for the Sites and Monuments Records;
- approval of Bord Gáis Energy for trenching or drilling within 30m from gas pipes.

Only licence holders can be considered for the development of mining facilities within the exploration area. The development of mines in Ireland is subject to three separate procedures:

a) A mining company can seek planning permission from the planning authority in accordance with the Planning and Development Act 2000 as amended. There are first- and third-party rights of appeal to An Bord Pleanála. This permit relates to the development of the surface and sub-surface mining infrastructure.
b) Once planning permission has been secured, the applicant can seek an IPC licence or an Industrial Emissions Licence from the EPA.
c) Once both the planning permission and the environmental permit have been granted, the applicant must obtain a State Mining Lease/Licence from the Department of Environment, Climate and Communications. To obtain one, the prospective applicant must hold a valid prospecting licence. State mining licences/leases contain a clause prohibiting the working of minerals without a planning permission in accordance with the Planning and Development Act, 2000 as amended, from the

planning authority and/or An Bord Pleanála for the development of the surface and sub-surface mining infrastructure.

Ref. Guidance on Good Environmental Practice in Mineral Exploration (DECC, 2019)

The Permit procedure is shown in Figure 14.

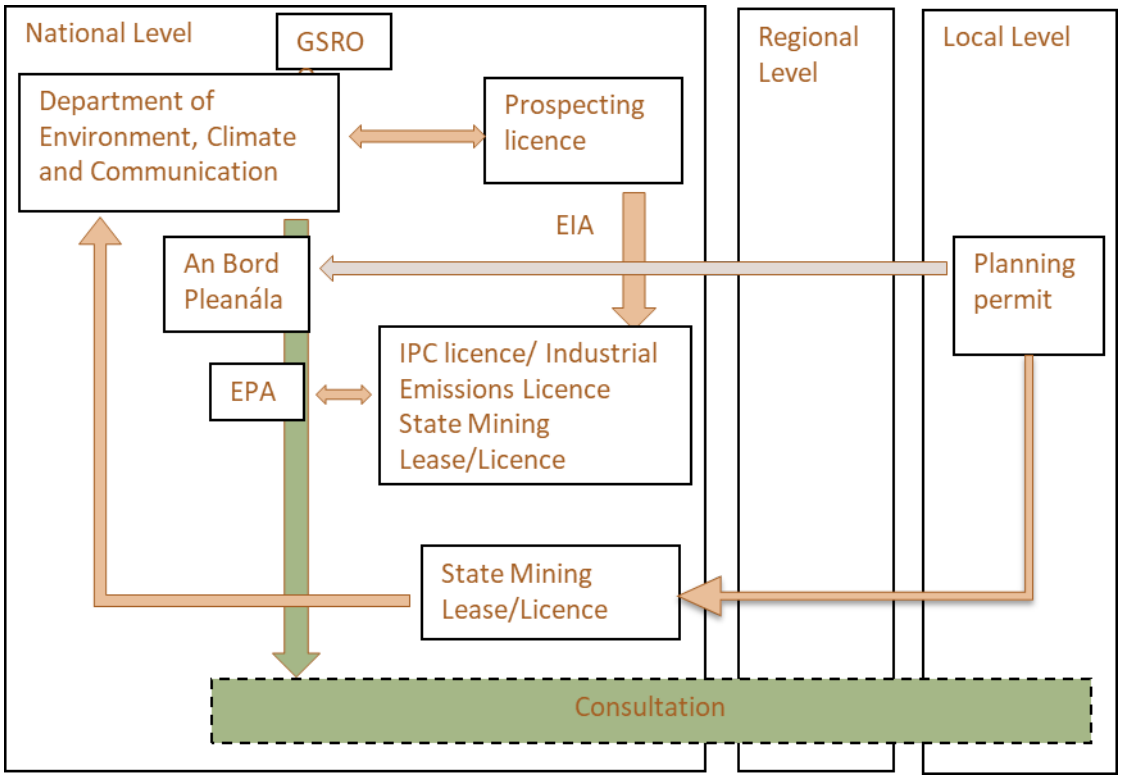

Figure 14 – Permitting process.

GSRO Geoscience Regulation Office

There would usually be monitoring and reporting as identified in the Environmental Impact Assessment Report (EIAR) and/or appropriate assessment (AA). Standard conditions would be attached to the grant of permission, which puts the onus of the applicants to undertake the monitoring and report back to the planning authority or other parties as appropriate.

For IPPC or IEL, reporting is again undertaken by the applicants and reported back to the EPA. Annual Environmental Reports (AER) are a mandatory requirement. The EPA may also undertake spot checks and unannounced visits as part of their role as environmental authority.

Monitoring is also undertaken by Mining Inspectors twice per year to ensure that State Mining Facilities (i.e., facilities subject of a State Mining Lease/Licence) are compliant with the terms attached. Mining Inspectors work on behalf of the consenting Minister.

Aspects related to permitting aspects and knowledge of deposits in the specific case are shown in Table 27.

Table 27 – Good practice aspects of the case related to permitting and knowledge of deposits.

Aspect	Description
Knowledge of the deposit	Knowledge varied depending on the protected site considered. There is clear evidence of geological knowledge and understanding in relation to the

	Blackstairs Mountains SAC, where the qualifying interests are Northern Atlantic wet heaths with Erica tetralix and European dry heaths. In relation to the Slaney River Valley SAC, it is less clear from the designation report that there would have been a good understanding and knowledge of geology in relation to the site. This is likely due to the qualifying interests of the protected site which relates to fluvial ecology and marine ecology. Notwithstanding the aforementioned statements, there were, at the time, exploration activities in those designated areas, meaning there was an existing degree of knowledge prior to designation. At the outset, it should be noted that, to date, no extraction has been undertaken and this case study focuses on an exploration programme. The area has been subject to exploration since the 1970s by other companies (IBM/Westland between 1970 and 1990; Angus and Ross between 1999 and 2003 and Blackstairs since 2009).
Techniques	These companies have used different techniques such as: prospecting, boulder mapping, deep overburden geochemistry, geophysics, trenching and core drilling. Reports attached to the current licences suggest that the most successful methods used to date to identify prospects were prospecting by pegmatite boulder mapping. The data and analysis collected by those formed the basis of the current licences. Between 2009 and 2013, exploration consisted of digital data capture of historical datasets, processing, and statistical analysis of these datasets, mapping the extent of boulder trains and pegmatite locations, orientation soil sampling, orientation geophysics, an initial phase of due diligence diamond drilling, regional prospecting and lithogeochemical sampling. As part of the application for renewal, Blackstairs Lithium has indicated that their work programme would include geological mapping, hammer prospecting, collection of small samples of rock for geochemical analysis. Between 2013 and 2015, the company undertook soil sampling, prospecting, and boulder mapping, before undertaking follow up soil sampling in preparation for a drilling programme.

There is no data publicly available after 2015, as this data is still subject to confidentiality. The exploration licence expires in August 2023, but the applicants have already applied for its renewal. It is expected that, at least, part of the data collected after 2015 would be made publicly available, so long that it does not prejudice the exploration company's commercial interests.

2.4.4 Environmental governance

Part 4 of the S.I. No. 477 of 2011 on the European Communities (Bird and Natural Habitats) Regulations 2011 determines how activities may occur in, on, under or near a Natura site. In essence, legislation does not explicitly preclude activities and development in such context. However, public authorities must take appropriate steps to avoid, in European sites, the deterioration of natural habitats and the habitats of species as well as disturbance of the species which have been designated when they are undertaking their consenting function.

Although the mechanism known as Imperative Overriding Reasons of Public Interest (IROPI) exists as per the Habitats Directive, to date its use in Ireland has been extremely limited and only occurred on two occasions

in relation to projects promoted by a semi-state-owned company or a public authority. This means that should a mining operation be unable to find alternatives under Stage 3 of the AA process, it would be very possible that it would be refused by the Competent Authority and not be put forward for Stage 4 – IROPI.

The Development Plan includes specific policies to protect Natura 2000 site in the development process.

Ecologically Sensitive Areas & Nature Reserves

Natural Heritage Areas are derived from the Wildlife (Amendment) Act 2000. Unlike the regime applied to European sites, the Wildlife (Amendment) Act 2000 ensures that 'no person shall carry out, or cause or permit to carry out, on that land any works specified in the order or any works which are liable to destroy or to significantly alter, damage or interfere with the features by reason of which the designation order was made.'

This means that, in practice, the Act would preclude activities or developments from being carried out. If it is found during the consenting process (be it exploration or exploitation), then authorisation to proceed will have to be obtained from the Minister.

Cultural Heritage Sites

The assessment of impacts on cultural heritage sites would be undertaken through the Environmental Impact Assessment process. If there are cultural heritage sites, applicants would be required to engage with the local authority and the National Monument Services to identify the best course of action in relation to the development.

Archaeological heritage is protected under the National Monuments Acts 1930-2004. Responsibility for this lies with the Department of Tourism, Culture, Arts, Gaeltacht, Sport, and Media. Other legislation regulates the protection of cultural heritage such as the European Union (Environmental Impact Assessment of Proposed Demolition of National Monuments) Regulation 2012 and the Heritage Act 1995. It is not possible to demolish or remove wholly, excavate, dig, or plough or otherwise disfigure, deface, alter or in any manner injure or interfere without the consent of the appropriate decision-maker. The Department of the Environment, Heritage and Local Government's (now Department of Housing, Local Government and Heritage) guidance on Good Farming Practice and Archaeology (2003) states that the 'The monument and a buffer zone of 20m around it should not be interfered with through activities such as quarrying, drain excavation or associated farm works which would cause disturbance of the ground'. This is also the guidance recommended for exploration, see Table 28.

Table 28 – Good practices - environmental governance and practice.

Aspects	Description
Case land use conflict	Six of the prospecting licences areas overlap to a certain degree (some more than others) with a designated site under Habitat Directive and Wildlife Amendment Act. The area presents agricultural and quarrying activity.
Assessment executed in stages	Compliance with the Birds and Habitats Directives is ensured through the undertaking of Appropriate Assessment (AA). There are four stages for Appropriate Assessment. The 4 stages include the *Natura Impact Statement* in stage 2, after which if are considered alternative solutions if the project has impacts that cannot be mitigates, after which, in absence of suitable alternative solutions, is reached level 4, where project proceed if for reasons of a social or economic nature and that are critically required after EU commission consultation. Blackstairs Lithium Ltd has commissioned a third party to do an assessment of drilling operations at Moylisha. It uses a basic source-pathway-receptor risk model.

Aspects	Description
Low impacts	When a prospecting licence is submitted, the Minister must carry out screening for Appropriate Assessment and might request mitigation measures. Guidance on Good Environmental Practice in Mineral Exploration (DECC, 2019), states that in certain cases, where exploration activities are to take place in sensitive areas, modified vehicles may be necessary to minimize damage. To date, the extant prospecting licence held by Blackstairs Lithium Limited was only subjected to the screening process meaning the Minister determined, as the competent authority, that there was no need to avail of mitigation measures (i.e use specific equipment or machinery) to avoid impacts on the conservation objectives of a Natura 2000 site. Guidance on Good Environmental Practice in Mineral Exploration (DECC, 2019), states that in certain cases, where exploration activities are to take place in sensitive areas, modified vehicles may be necessary to minimise damage.
Low impact techniques for exploration	The majority of exploration activities completed to date has included hammer prospecting, geological mapping, soil and rock sampling, and ground geophysical survey. These are transitory, low impact and non-intrusive. There have also been drilling operations. Mitigation Measures include: • Water management systems implemented for drilling • Disposal of drill cuttings • Fuel and oil spillage prevention and management.

2.4.5 Stakeholder engagement and communication

Public consultation is mandatory for all phases of a mining project**.**

Exploration: Once the Minister has determined that he/she intend on granting or renewing a licence, a mandatory 30-day public consultation period starts. There is a public consultation period prior to determination of the exploration licence application. The Minister makes the information available online. The public can object to the licence within that period. The public is notified by way of publication of a newspaper notice in a relevant local newspaper.

Project consent for mining: Once a valid planning application is made to a planning authority, the public may make an observation on the application within a period of five weeks. The public is notified in two ways: via the publication of a notice in one or more newspapers and via the erection on the application site of a site notice. Third party rights in planning are very regulated. The decision of the Planning Authority is circulated amongst parties who made an observation. On foot of a grant of permission, a third party can appeal the decision to An Bord Pleanála, the national appeals board. With regard to the permitting process, the prospective applicant must place a notice in a newspaper and several notices around the site advising that a planning application has been lodged with the planning authority.

With regard to the planning permission process, the prospective applicant must place a notice in a newspaper and several notices around the site advising that a planning application has been lodged with the planning authority. The notices must also state whether an Environmental Impact Assessment

Report and a Natura Impact Statement have been submitted and if an IPC Licence or Industrial Emission licence (IEL) will be required. Any person or body has then a period of five weeks to make a submission on the application. In accordance with the Planning and Development Act 2000, as amended, any person or body may make a submission on a planning application once it has been submitted to a planning authority. To that effect, the developer must erect site notices and place an ad in a newspaper circulating in the vicinity. The developer may also opt to undertake separate public consultation and use other means of notification, but these are not mandatory. Once a planning application is lodged, any other person or body (Third Parties) may comment for or against the development on the application during a five-week period from the date of submission. In all recent mining cases, submissions were received from private citizens, prescribed bodies, and private companies.

Following the decision of the Planning Authority, any third party may make an appeal to An Bord Pleanála against the decision or any conditions attached to the grant of planning permission. The developer may decide to appeal the conditions of the grant or if the determination is against the development. An Bord Pleanála may decide to hold an oral hearing providing all parties with an opportunity to present their case and evidence.

Industrial Emissions or Integrated Pollution Control Licences: These are also subject to statutory consultation. Applicants must notify the public of their intention to apply for such licences in the same manner as for the planning phase (newspaper and site notices as well as notify the planning authority). Public submissions are also allowed to comment on IPPC licence/IEL applications. Any person or body may then comment. Following a period of 8-week, the EPA publishes a notice which indicates how it intend to determine the application and notify those who made a submission. A period of 30 days is then opened to allow any person or body, including the applicant of the licensee, to make an objection. An oral hearing may form part of the IPPC/IEL process, if requested by the objector.

State Mining Lease/Licence: the same requirements as for exploration apply.

- As the public is invited to comment on a proposed development, the planning process would be used to try and resolve most issues. If issues are outstanding there are other avenues that could be pursued but these can be long and / or costly.
- In the first instance, there are rights to submit objections on planning applications, exploration licence applications and mining licences/leases.
- There are third party rights of appeal against a decision of planning authority on a planning application. This appeal is determined by An Bord Pleanala. This appeal may consider all relevant planning considerations.
- Judicial review of the decision to grant planning permission and/or the environmental permit. This would only regard points of procedure.
- Complaints can made to the Ombudsman, but these cannot regard the decision on the planning application. It can regard environmental issues such as pollution.

If there are suspicions or evidence that unauthorised activities are being carried, then anyone can notify the Planning Authority with a view to launch an enforcement action.

The statutory process was followed but there is no evidence online of how previous applications were received by the public. However, the pending licence renewal application has been subject to considerable public scrutiny which is unusual for a prospecting licence in Ireland.

There is clear evidence online of public opposition to the application with a Facebook group established and local residents organising regular protests. Further evidence shows that the applicants themselves have sought to meet with the residents and organised at least one public meeting. These activities are evidently outside the remit of statutory consultation. The application for the licence renewal was the subject of several articles in national newspapers.

Although this case relates to exploration only, there already are objections to

a) the renewal of the licences which is ongoing and

b) to any potential mine which may be developed in the future (not the subject of any sort of planning or permitting process).

Protests were particularly rife during the period of public consultation associated with the licence renewal process which took place during the first quarter of 2022 and were still occurring as of February 2023. 187 submissions were made on the application (see Table 29).

Table 29 – Good practices – public consultation and stakeholder engagement.

Aspects	Description
Voluntary consultation engaging with public and local politicians	Licence holders have to agree with the landowners the surface that will be required to support the exploration activity. Guidance provided by DECC requires that prospecting companies give sufficient notice and engage with the relevant landowners to ensure their access and use to their land is minimally impacted. Mandatory and voluntary consultation is undertaken prior and during the permitting process. Recent mining development applications in Ireland show that mining developers engage with the public and local politicians. This is undertaken on a non-statutory basis prior to submission of planning application but varies from project to project. It will usually involve the preparation of a stakeholder engagement strategy, identification of relevant national and local state/regulatory bodies, local community groups, NGOs, and key community leaders.

2.4.6 Concerns/disputes

There might be multiple aspects affecting the discussion relative to the project. People might not be keen on mine and it (presumed) impacts on hydrology. Protect Moylisha group has been against the project fearing impacts on the ecosystem and water quality. Protests have been made since 2022, when the company applied for renewal of drilling permits, and nowadays still hit the news. The group told that the local community has not been engaged in the plans. Councillor instead told that have been following the issue and have been in contact with relevant authorities and stakeholder groups. The group has been promoting and works for preserving the beauty of the area. They raised funds to stop mining operating but at the same time shared mining company's service for water test during drilling operation in 2023. Recently there is high resonation caused by the near general elections. There has been misinformation but also real concerns for landscape impacts. (Myles,2024; Fallon, 2022; Protect Moylisha group Facebook pages, O'Sullivan, 2024)

2.4.7 Enablers

The following aspects have been individuated in the case study that have favourably affected the project (Table 30).

Table 30 – Key enablers Blackstairs Lithium – Avalonia Project.

Knowledge of the deposit	The area has been historical mined and exploration activity also with traditional methods has been performed. There has been extensive knowledge of the deposit
The activity had no relevant impacts	The exploration activity was assessed and was considered having no relevant impacts to the protected areas, low impacts techniques are also used. This process was completed through AA and EIA screening exercises.
Performed communication also at voluntary bases	The company engaged community and local politicians also on voluntary bases.
Statutory consultation / Communication responsibilities	Both authorities and companies are in charge of communication and consultation actions, empowering the companies also from the statutory side

2.5 Italy – Monte Tondo

The gypsum quarry in Monte Tondo is located in the Vena del Gesso belt in the Emilia Romagna region and has been operating since 1958. It is considered one of the main gypsum extraction sites in Europe and is the only active mine in the region. Monte Tondo is adjacent to an area recognized as Natura 2000 and UNESCO site only long after the quarry began operations. The natural park is not included in the quarry site, as operations in natural parks are not allowed. The quarry has permission to extract 1.7 million m^3 during the time covered by the provincial mining plan.

2.5.1 Case overview – Monte Tondo Gypsum Quarry

The Monte Tondo case is presented in brief as follows, see Table 31.

Table 31 – Monte Tondo case study summary.

Name	Monte Tondo quarry
Country	Italy
Region	Emilia-Romagna Region
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Primary raw material: gypsum
Open pit or underground mine	Open pit (previously underground mine)
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Operation/closure
Period of activity	1958
Companies involved	Saint-Gobain
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	Regional Natural Park and, Natura 2000 areas, MAB UNESCO heritage candidate, Habitat directive site

According to the regional law on quarry activities (17/91) the exploitation area is delineated in the mining plan, so there is no other land use in the quarry area.

The permitted extractive area and the contiguous protected area are shown in Figure 15 which also shows Monte Tondo's location in Italy.

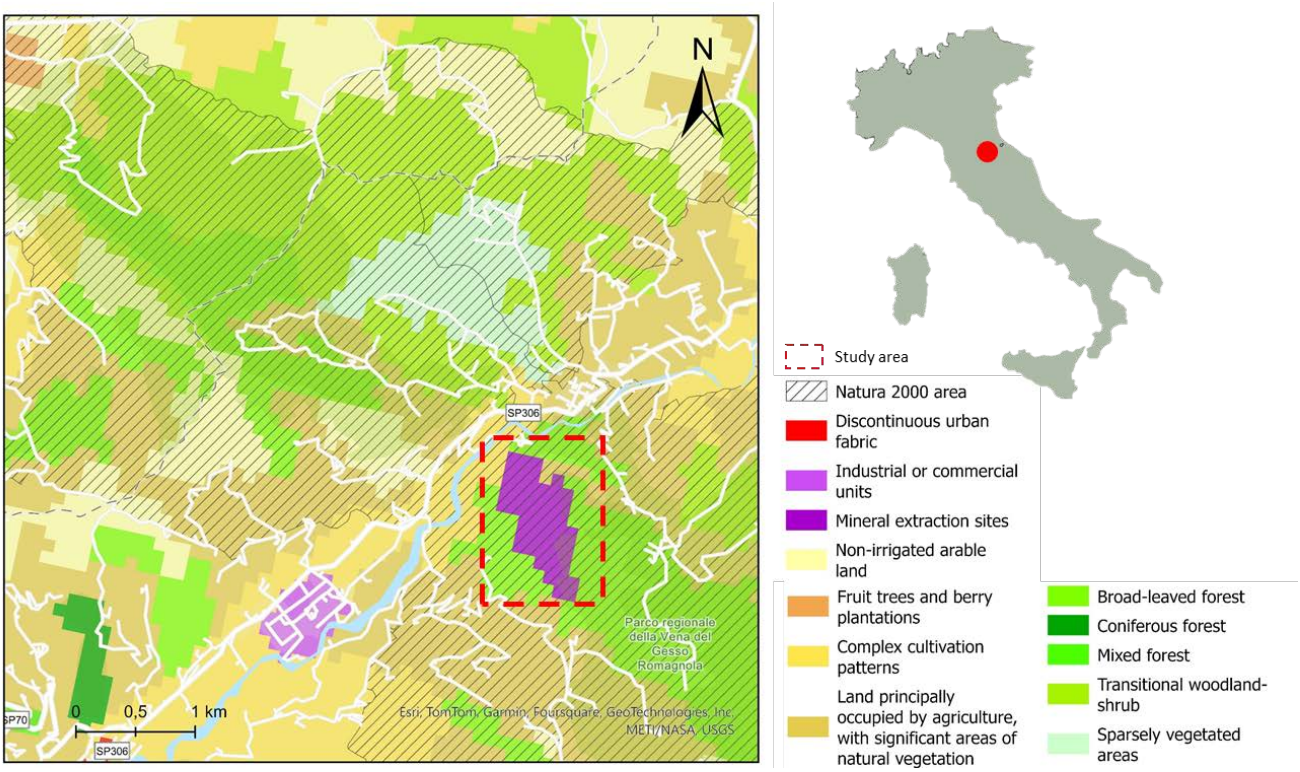

Figure 15 – Overall geographical localization. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and extractive activity area.

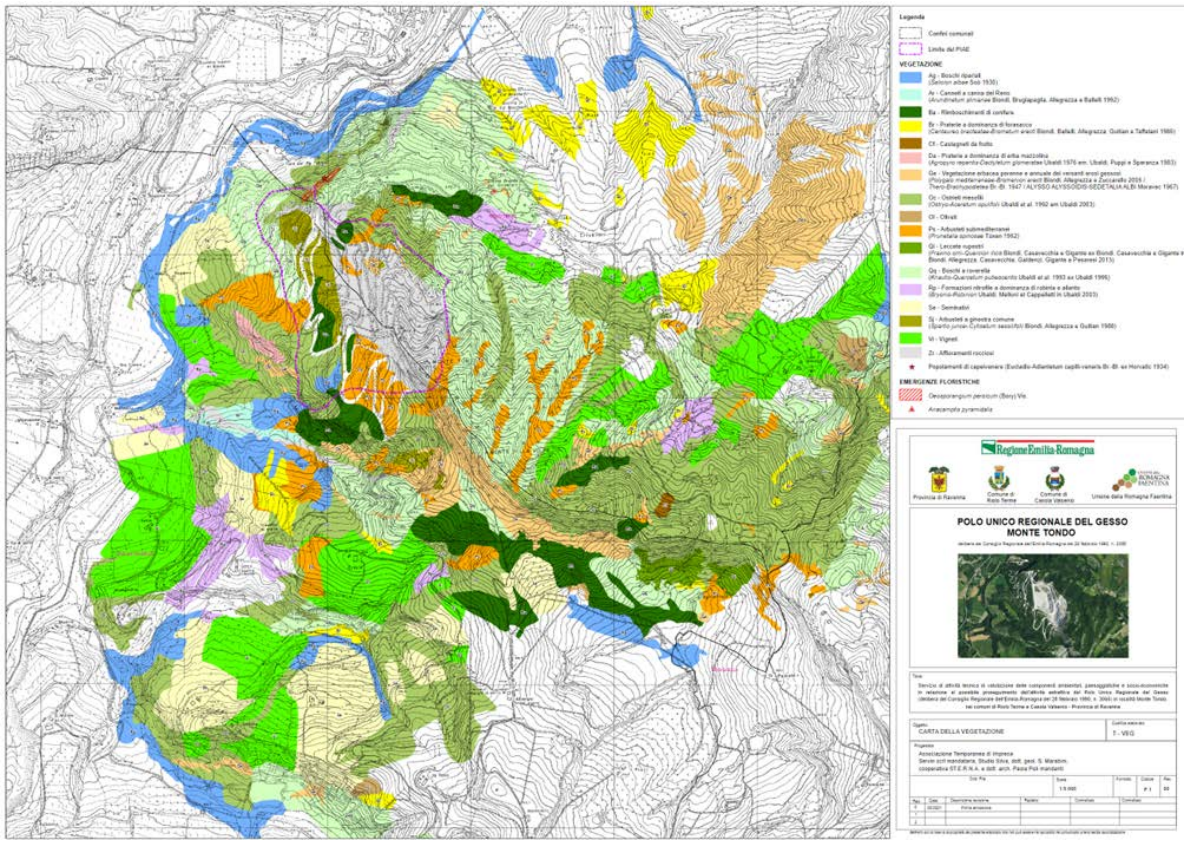

Figure 16 – Vegetation map (Regione Emilia Romagna).

The park covers some 6000 hectares. This comprises 2000 ha of park, sub-divided in integral area 52ha, general protection area 749ha, environmental protection area 1,240ha, while the remaining 4,000 ha balance are classified as contiguous area. The protected area is significant for its habitat and nature conservation

activities, presenting some important caves that in some cases are archaeological sites. The valley hosts over twenty habitats (Figure 16). The caves themselves were used by ancient cultures as safe habitations and for celebrating religious rites.

Gypsum has been extracted underground in the past; now it takes place in open pit. Images of the mine, past and present, are shown in Figure 17.

Figure 17 – Images of the mine from the past and present. The Monte Tondo quarry (L) at the beginning of operations. Photograph taken 24 September 1958 (Archive A. Olivier). The Monte Tondo quarry in July 2021 (R) (Photo courtesy of M. Nolé).

2.5.2 Spatial planning

Italy has 4 levels of government (national, regional, provincial, and local) and 3 levels of spatial planning (regional, provincial, municipal). Rules and laws differ from region to region, but the planning system is similar throughout the country. Each land use planning level needs to develop its own planning procedures in conformity with the overarching national plan.

There are several plans, such as the Water protection plan, the Basin planning plan etc., to ensure equitable access to and use of resources (see Table 32).

Table 32 – Spatial planning organization.

Level	Duties
National	Develops guidelines for development of the territory, it is the reference for infrastructures of national importance, there is no framework law
Regional	Regional acts, planning acts, regulations regulate statutory land use plans. The Regions prepare: - Regional Territorial Plans (not all the regions prepare it) - Regional Landscape Plans in cooperation with the National Ministry of Cultural Heritage and Activities and Tourism
Provinces/ Metropolitan cities	Prepares the Provincial Territorial Coordination Plan, and in a case of metropolitan cities, it will be prepared a metropolitan strategic plan. These plans harmonize the planning between municipalities within their territory. In several provinces/Metropolitan areas, there is a Province Mining Plan that is part of the Land Use Provincial Plan
Municipal	Municipalities with more than 5000 inhabitants prepare Local development plans with local zoning. In some regions it is a Structure Plan or Territorial Development Plan. These plans are likely to trigger the creation of other

	detailed plans. At municipal level there is also a related Municipality Mining Plan.

Denomination of protected areas

In 1995, the classification of the entire area as a Site of Community Interest (Ministerial Decree. 3 April 2000, n. 65), pursuant to Directive 92/43 / EEC, made it appropriate and urgent to establish a protected area.

Depending on the level of the designed protected area different public authorities are involved. In this specific case, the Regional Park is independent public body instituted by Region, Province, and municipalities.

The Regional Park proposal was implemented in 1997, through a preliminary Territorial Plan for the Regional Park of the “Vena del Gesso Romagnola”, promoted by all the territorially interested bodies, including the Region. Thus, started a long phase of meetings between the territorially interested bodies, to share the objective and the methods to finally reach the establishment of the Park. The first meeting was held on March 27, 2000. The perimeter and the safeguard rules were those initially elaborated by the project of the Province of Ravenna. All the public interested bodies, the private citizens and their associations were involved in the definition of the boundaries of the protected area. The Park has a surface area of 6,063 hectares, of which 2,041 are real park areas and 4,022 of Contiguous Area (Ente Parchi e biodiversitá).

From 2000 to 2002 many public consultations were held by the Municipalities of the Park for the presentation and sharing of the project. To complement these consultations there was a detailed programmatic document, drawn up together with the agricultural associations. In addition, to meet the requests of the agricultural associations, a "unilateral pact of obligation" was approved that committed the Authorities and the Park to satisfy the requests of these associations and to involve the companies in the management of the Park. This also committed the stakeholder Bodies themselves to complying with the requirements and principles set out in a series of precise and stringent clauses, proposed by the associations themselves (Table 33).

At the end of the legislative permitting procerss, almost simultaneously with the approval of the new regional law on protected areas, the Regional Law 10/2005 "Institution of the Regional Park of the Vena del Gesso Romagnola" was finally approved (Ente Parchi e biodiversitá).

Table 33 – Good practice aspects in spatial planning.

Aspects	Description
Presence of mineral information in the land use plans	In Emilia-Romagna region Province Mining plan is part of the Land use plan. Area is zoned for extractive activity.
Establishment of the Regional Park	Establishment of an independent body that manages the park

2.5.3 Mineral governance

The Permitting procedure described here refers first category material (not energetic). By Royal Decree 1443/1927 mineral resources are subdivided in two categories based on their use and relative importance. First category materials are owned by State, second category materials by the private sector. In respect of Monte Tondo, gypsum is classified as a second category material. For the related permitting process see Figure 18.

Regional and municipal planning categorise different resource areas on the basis of studies and investigations conducted. During the authorization phase (under municipal jurisdiction) for extraction, the entrepreneur requesting authorization will carry out further investigations and in-depth studies to improve knowledge of

the present resource and define the extraction methods. In practice, from a formal point of view, the authorization request is sent to the Region (Impact Assessment Area - Area Valutazione impatti) because the act LR 4/2018 about the EIA foresee the PAUR procedure (single regional authorization provision), which includes the environmental assessment and also all the opinions and authorizations from the various bodies that are necessary to obtain the actual authorization that is issued by the municipality.

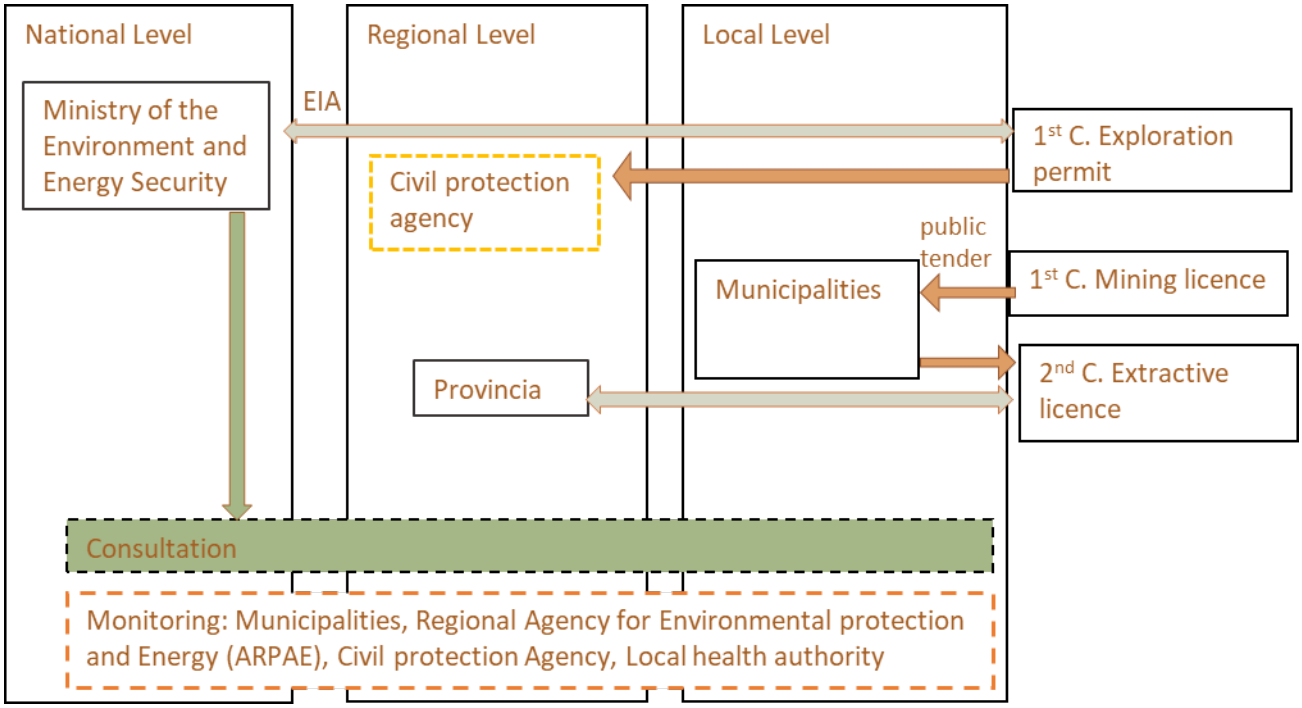

Figure 18 – Permitting process for 1st category and 2nd category minerals.

Relative to the first category materials (mines), before the permit request is made, an EIA procedure is carried out by the Ministry of the Environment and Energy Security. At the same time, within this same procedure the opinions and observations of all the competent regional authorities and bodies are collected and collated. Once the EIA procedure has been successfully concluded, the research permit must be applied for to the Provincial Territorial Office of the Agency for Territorial Security and Civil Protection, which also has responsibility for mining police activities. At the end of the research and exploration phase, the company can apply for a mining concession to the Municipality (or more than one Municipality) interested in the territory. Before issuing the concession, it is necessary that the concession itself is made public to verify that there are no other competing companies interested in exploiting the resource.

The licence defines rights, limits and area of use, monitoring activity and remediation project. By Royal decree 1443/1927 the right to use the surface is strictly connected to the exploration or mining right.

For first category minerals' exploration there are no public consultation requirements but there is public evidence of the process. If the exploration phase is successful, for having a mining licence is foreseen a public tender. During the EIA is usual to put in place a stakeholder consultation but it is not mandatory. The regional authority publishes the application on the web site and collect the comments.

Second category minerals are handled at municipal level and is allowed only in the areas predefined in the plan of mining activities. The permitting authorities are the municipalities, but the EIA for the expansion of the project of the case under study was handled at regional level by the Regional Agency for Environmental protection and Energy (ARPAE). Municipalities, ARPAE, Civil Protection Agency, Local health authority are all performing monitoring duties. Survey monitoring is done annually by Municipalities and Mineral policing controls are carried out by the Civil Protection Agency.

Planning and environmental authorizations provide for several phases of public consultation (see Table 34).

Table 34 – Good practices - mineral governance and management.

Aspects	Description
Knowledge of the deposit	The protected area was instituted after the beginning of the quarry activities. For this reason, the mineral deposit was well known. The presence of the gypsum outcrops is the main reason of existence both of the quarry and the protected area.
Regional authority as One stop shop	The Region as authority collects and shares on its own web page all the documents relevant for permitting for the extractive activity.

2.5.4 Environmental governance

The environment has been assessed through research and the impacts of past and present mining activity on the current hydro-geological status have been studied (see Table 35). Even if the mining activity has impacted the original flows, no risk of pollution derived from the mining activity is anticipated. (Margutti, 2009).

Table 35 – Good practices - environmental governance and practice.

Aspects	Description
Case land use conflict	Monte Tondo is an extractive site in protected area: Regional Natural Park and, Natura 2000 areas, MAB UNESCO heritage, Habitat directive site. The regional law 6/2005 "Regulations for the institution and management of the regional system of protected natural areas and sites of the Natura 2000 network" defines rules and bindings for any anthropic activities near a protected area. Exploration or mining activities inside the protected areas are generally forbidden and extractive operations are not allowed in protected areas. The presence of the gypsum outcrops is the main reason of existence both of the quarry and the protected area. The quarry is in the contiguous area of the natural park. The extractive operations, in particular explosions and the dust, may affect habitats and biodiversity near the quarry.
Extraction in relation to protected areas	The process for exploration licence application is the same process, but the required environmental analysis is much more thorough. The EIA necessary for the authorization contains a background analysis of whole environmental characteristics (geology, hydrogeology, fauna & flora, landscape etc.) Habitats are used for the definition of protected area. Some buffer zones are connecting the protected area with the unprotected one. Exploitation cannot occur. In this case the protected area has been delineated outside the extractive site.
Compensatory measures	Several compensatory measures are foreseen, in general are voluntary as part of contract between the permitting authority and the enterprise. i.e. public works maintenance, bicycle route, environmental projects etc. Activities as monitoring and study of local population of bats inside the ancient quarry galleries and accessibility to King Tiberio archaeological site by the enterprise are some example of compensatory measures adopted.
Measures for reduction of impacts in EIA	Classical mining methods were applied because of the costs. Measures for dust reduction by water showers are in place. To reduce visual impacts, a visibility protection barrier was built with waste materials.
Closure - remediation	Both for licence and authorization a remediation project is mandatory. The remediation costs are warranted by a surety (bank or insurance). The

Aspects	Description
	remediation project includes a maintenance program, lasting usually at least 5 years. In the example under examination in this case study revegetation of the slopes has been completed and the rehabilitation project is under review. The plan for post-mining site use is to establish an integrated tourism, academic, archaeological, and speleological (caveing) complex.

2.5.5 Stakeholder engagement and communication

Even if there are no specific requirements for a public consultation process, holding the process in any well planned form ensures transparency and shows stakeholder consultation has been possible and is encouraged (see Table 36).

Table 36 – Good aspects of stakeholder engagement and communication.

Aspects	Description
Planning and denomination of Natura 2000 areas	Planning and environmental authorizations foresee phases of public consultations.
Consultation	No public consultation requirements/rights. There's public evidence of the process. During the EIA is usual to put in place a stakeholder consultation. Is not mandatory.

2.5.6 Concerns/disputes

In 2023 the company opposed the decision of inclusion of "Carsismo nelle evaporiti e grotte dell'Appennino settentrionale" that includes the Monte Tondo quarry area into the UNESCO heritage list because of the limits imposed on the exploitations. The company had not noticed the plans before their proposals. UNESCO recommended Italy not to extend the exploitation permits of the quarry because it would damage two karst systems that are adjacent and that the exploitation activity should be interrupted to preserve the site. This was supported by local speleological association, but opposed by the municipality, that instead already saw the possibility of coexistence of the quarry with adjacent Natural protected area, Parco Vena del Gesso. The vision of the Italian authorities was that the quarry should had not have been included in the UNESCO perimeter. The Province and the Region, as authorities, permitted the extractive activity including it in the regional plan where the quantity of material that may be extracted by law was also defined. This allowed the company to continue operation. Concerns referred to geomorphological and geohydrological aspects and to the methodology of extraction. Some environmental associations opposed the continuation of the extractive activity. Reservations were solved in the permitting process.

2.5.7 Enablers

Key project enablers are shown in Table 37.

Table 37 – Key project enablers for Monte Tondo case.

Plans	Plans for different aspects in order to have fair use of resources
Consultation and creation of an entity that takes responsibility on behalf of the nature protected area	Involvement of regional and local entities in the decision and management of the park.
Permit application	Similar procedure for protected sites and normal permitting for exploration activity.

2.6 Norway – Nussir ASA

The case study treated in this section concerns reopening a closed underground mine in Finnmark, northern Norway (Figure 19) still equipped with existing infrastructures. The land of interest adjacent to the mine is part of the land area in Finnmark owned by FeFo (Finnmarkseiendommen) on behalf of all the inhabitants, both of Norwegian and Sámi descendancy. The site under study is not in an actually protected area but it is of concern and significance for reindeer herding and includes the fjord into which the river Repparfjordelva flows, which itself is classified as a salmon river of national importance.

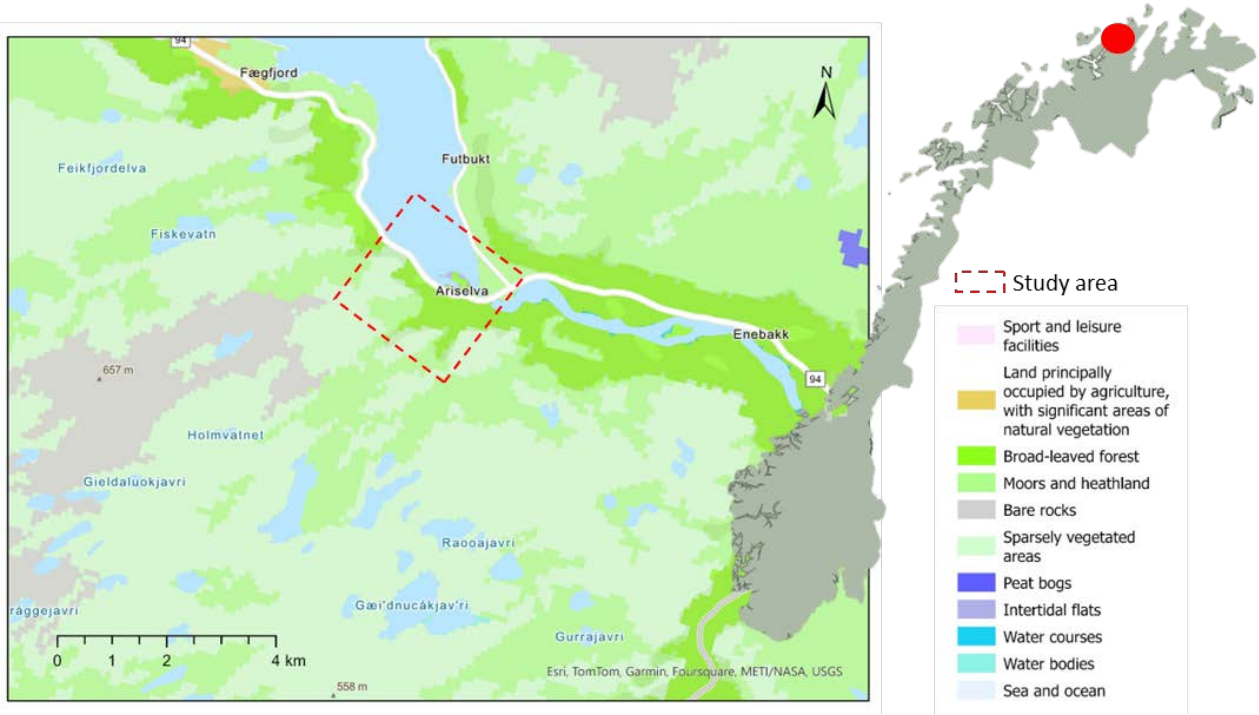

Figure 19 – Overall geographical localization (L). Corine Land data cover classification 2018 + Natura 2000 map (EEA) and study activity area (R).

2.6.1 Case overview

Nussir ASA is fully permitted for operations, including Zoning Plan (2014), mining rights (2006, 2013 and 2015), operating licence (2019) and tailings permit (2016) (Table 38).

Table 38. Case study summary – Nussir ASA

Name	Nussir
Country	Norway
Region	Troms and Finnmark counties
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Primary raw material is copper; secondary gold and silver
Open pit or underground mine	Underground

Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Reopening, development/operation
Period of activity	1972-1979 and 202x-
Companies involved	Nussir ASA
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	Not a protected area or close to one. But mine project is located to socially and environmentally sensitive indigenous Sami area with reindeer herding. The mine plans to dispose some tailings into the Repparfjord, a water body that is recharged with fresh water from a designated national salmon river.

The Nussir mine was operated previously as both open pit and underground. The mine still uses existing infrastructure from the previous operational mining cycle, with the addition of some new facilities. The new project will be executed solely underground including the ore processing. Part of the mining residues and tailings are planned to be used as back fill and part will be disposed of in the Repparfjord to the depth of 50-90 meters where it will be immobilised. The seabed as disposal site was researched and demonstrated to be the safest solution for tailings disposal under specific monitoring conditions.

The existing mine facilities, located on a narrow ledge by the fjord (Figure 20), are served by their own harbour that is used to ship the processed ore and is also positioned close to the main road. They are located in Kvalsund area, now part of Hammerfest municipality.

Figure 20 – The Nussir mine and infrastructure seen from across the fjord.

The fjord is listed in the register of Major protected Norwegian salmon fjords, a conservation class and status that was formally recognised in a White Paper of 1999 resulting from a process that started in 1989 with the establishment of safety zones for the salmon. These zones were characterised by restrictions to aquaculture practices to protect wild salmonids from diseases associated with intensive aquaculture (R. M. Serra-Llinares et al, 2014). In Kvalsund area are about 1000 residents, tens live from fishing and fishing is practiced also as a hobby. The community also hosts seasonal leisure cottages.

Activities performed in the areas are integrally connected to local Sámi practices, such as reindeer herding which is indigenous to the area. In the autumn, the mine site also acts as grazing land and rutting area, as

well being a staging point in the Fálá migration route (SWECO 2011). The mine site is also located adjacent to the reindeer calving area and the summer reindeer pastures of Fiettar (Figure 21).

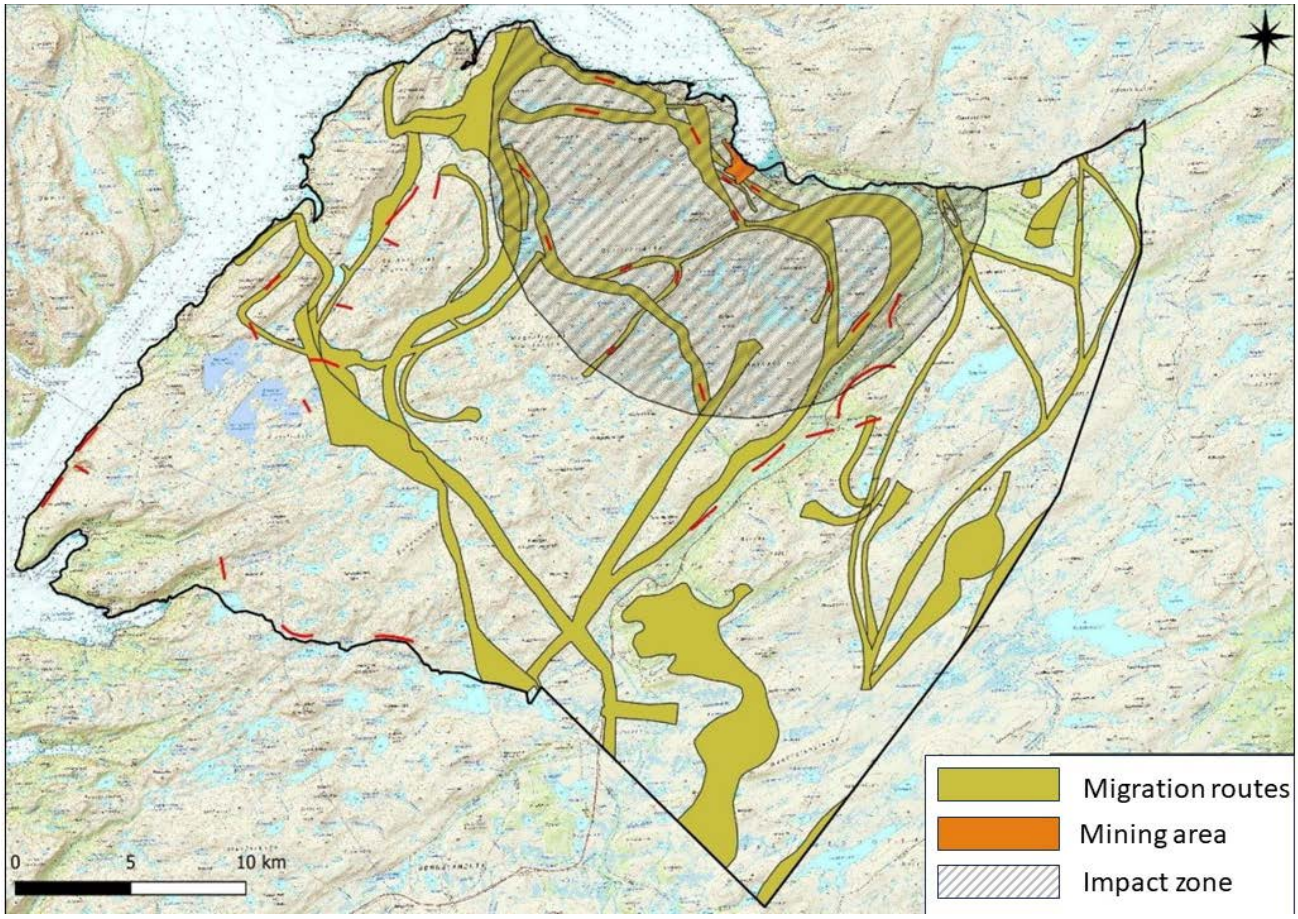

Figure 21 – Map of reindeer migration routes near the Nussir mine
(Extracted from the report by Anders Johansen Eira et al., 2020).

Figure 21 shows one of the several cumulative environmental impacts examined in the area during permitting. Public consultation was also performed at every stage of the process on a voluntary basis. There was some stakeholder opposition expressed, focused on the planned seabed disposal of the mine tailings which objectors saw as waste. But the local outcome was that the project was approved, the board of FeFo, which consists mostly of inhabitants with Sámi background, voting in favour of the Operating Licence. By contrast, the Sámi parliament voted to oppose the mining project.

In the vicinity of the mine is also present an element of cultural heritage. The protection permits states: "*Finnmark County Council (30 August 2017) points to only one cultural heritage location which is assumed to be affected by the measure, and where the duty of care according to Section 8 of the Cultural Heritage Act is taken into consideration in the planning regulations.*"

2.6.2 Spatial planning

Land use planning process is defined by the Planning and Building Act (2008)[2]. Decision-making is made at national, regional, and local levels, respectively by the King, the regional planning authority and municipal councils (Table 39). "National expectations" are defined at National Level. On their basis the three levels of decision-making bodies have the own independent planning strategies.

The Geological survey of Norway defines mineral deposits of public interest, and the Directorate of Mining may accordingly object to some plans and zoning when these may jeopardize future utilization of resources classified as national/ international or regionally important.

The Planning and Building Act (2008) allows the creation of zones of special consideration in areas adjacent to protected sites.

Table 39 – Spatial planning organization.

Level of responsibility	Duties
National	"National expectations" and national planning strategies are set for instances where the Geological Survey of Norway designates mineral deposits as being of "public interest"
Regional	Regional authorities are in charge and work to defined regional planning strategies. Svalbard and Finnmark have special provisions.
Local	Municipal councils are in charge and define local planning strategies

Designation procedure for protected sites

Long term goals are defined in White Papers published by the Norwegian parliament. At government level the Department for Nature management is responsible for implementation of nature protection areas.

The Norwegian Environment Agency Directorate for Nature Management is in charge of performing studies, while the Ministry of Environment has responsibility for producing an action plan to address the issues arising from studies. The protected areas have been recognised formally for their habitat value since 1999, creating large enough areas of continuity. Since that initial action there has been further targeted expansion of the protected areas.

The Directorate has also produced guidelines for management of protected sites, which are managed at both central and local government levels (see Figure 22). The Governor of a county is responsible for managing the protected sites, but the municipalities can take over the management responsibility through a cross-municipal conservation board with a secretary employed by the state who manages the conservation area day to day. When fully implemented, the community-based conservation reform will provide local control over 75% of protected areas in Norway. The Norwegian Nature Inspectorate supports some management activities (Browna et al, 2015; Ministry of Climate and Environment NO).

Norway does not belong to the Natura 2000 network, but according to international conventions follows the Habitat directive and does belongs to the Emerald network. The Emerald network does not cover Norwegian habitat classification because it was not updated to include boreal habitats which by contrast was the case for the Natura 2000 network when Finland and Sweden entered the European community. In Norway, natural habitats have been mapped since 1999 under the municipal Biodiversity Mapping Programme and of these the protected nature areas were the first to be considered. Even before that, vegetation types were mapped

[2] See https://www.regjeringen.no/en/dokumenter/planning-building-act/id570450/

across the country. For classification purposes, the New Norwegian Natural Habitat Classification (NNN) is compatible with EUNIS habitat classification (Directorate for Nature Management, 2007[3]).

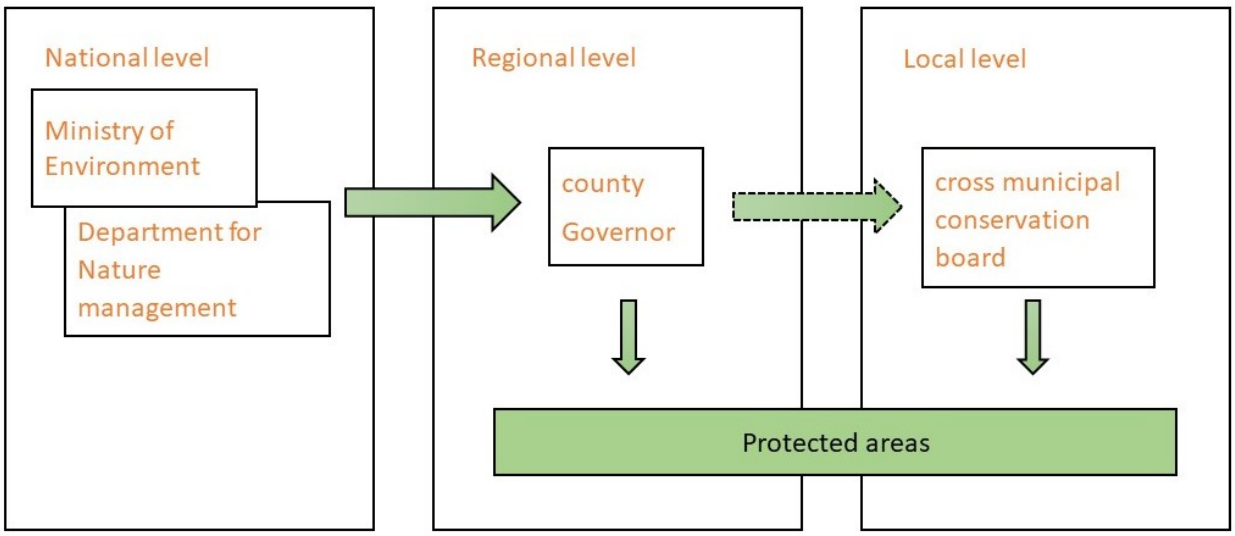

Figure 22 – Process for designation of protected areas – Norway.

2.6.3 Mineral governance

Permitting procedure

The Directorate of Mining is responsible for issuing exploration permits for the State-owned minerals (≥ 5g/cm^3) or if the exploration company and the landowner cannot reach agreement directly on exploration terms for Landowner owned minerals, (< 5g/cm^3) (see Figure 23). Special permit is required for Finnmark.

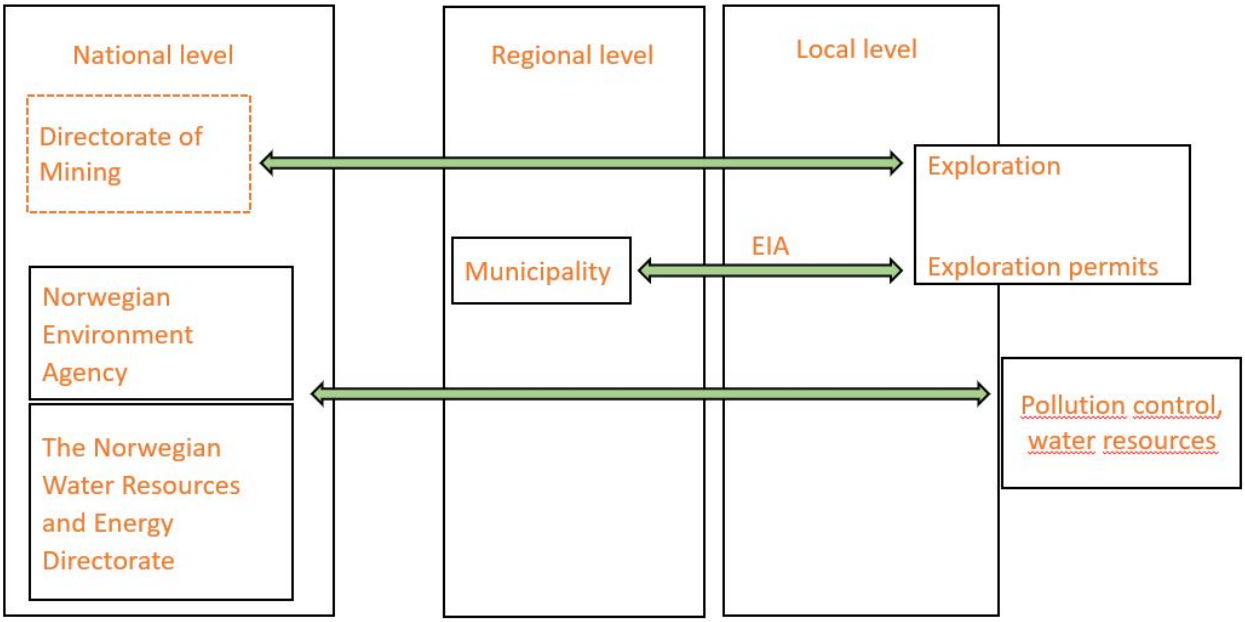

Figure 23 – Permitting procedures – Norway.

[3] See https://eldis.org/organisation/A6602.

Pilot extraction from up to 2000 m^3 surface requires a permit from the Directorate of Mining, a process which starts with inviting comments from the landowner, the land user, the county governor, the county board, and the municipality. Additional permits from both municipality and landowner are needed if motor vehicles are to be used.

The overall value of the deposit and the commensurate environmental and social impacts from mining it are taken into consideration during the assessment of the application. Decisions are taken on the basis of the economic value of the deposits, the impacts of recovering this value and the balance of risks and mitigation actions proposed. The permit application requires submission with it of management plans for wastes and tailings, together with waste reduction options including recycling and reuse of unwanted materials, together information on manging and monitoring for biodiversity protection and compliance with the Water Framework Directive.

Some good practices related to mineral governance in Norway obtained in this case study are listed in Table 40.

Table 40 – Mineral governance and related good practices.

Level	Duties
Knowledge of the deposit	The mine is a well-known deposit with a long-established history. The Repparfjord deposit was discovered around 1900 and original exploration activities were conducted 1903. A second exploration phase was started in 1960 by the Norwegian Geological Survey prior to resuming mining activities in the 1970s. The Nussir deposit was discovered in 1979. A scoping study was next conducted between 2006 and 2009 that included extensive drilling (109 drill holes) and a detailed helicopter-borne geophysical survey. The permit application stated: "approximately 70 million tonnes of ore have been mapped in the Repparfjord copper deposit. The investment is expected to generate close to NOK 700 million in annual turnover and create 150 direct person-years of employment at site." (P. Eilu, 2012)
Low impact technology facilitates permitting	Even in cases where there are impacts on protected areas, according to the Natural Diversity Act an exemption can be granted if the measure "does not conflict with the conservation purpose" and "cannot significantly affect the conservation values". If these conditions cannot be met the application has to be assessed "if significant societal interests... make it necessary". Permits for **exploration** in such protected areas have been granted as, for example, to the Geological Survey of Norway (NGU). Guidelines have been prepared to handle applications for geophysical low-fly measurements eg with drones.
Guidelines on best practices facilitate permitting	Guidelines and best practice on seabed disposal have also facilitated the permitting process

2.6.4 Environmental governance

The Nature Diversity Act states that before granting a permit, activities that might adversely affect the conservation value of protected areas must first be taken fully into account. Exploration and exploitation techniques and methods to operate should be environmentally sound, as referenced in the Nature Diversity Act (Lov om forvaltning av naturens mangfold naturmangfoldloven).

The Minerals Act emphasises the duty to exercise caution and to develop safety measures to prevent or minimize pollution and environmental impacts as a permitting pre-requisite. Likewise, temporal or spatial

restrictions or other conditions for operation can be imposed by the authority as part of the granting of a permit.

Table 41 – Good practice in mineral governance and management.

Aspects	Description
Case land use conflict	The mining project uses existing infrastructure from a previous operational phase, with the addition of some new facilities. A fraction of the mine tailings will be stored underwater in the Repparfjord, a Protected Site in the list of important Norwegian salmon fjords established in 1999. The community next to the mine numbers both professional and amateur fishermen and also some second homeowners. Reindeer herding routes cross the mining area.
Comprehensive Studies	In 2009, assembly of an EIA included surface samples monitoring metal concentrations and benthic communities. Some investigations and modelling done during permit application were called into question. Akvaplan-niva and NIVA carried out a baseline investigation and impact assessment for Repparfjorden, Finnmark. The Institute of Marine Research posed critical questions about the methodology and results of the work. So, the Norwegian Environment Agency asked Det Norske Veritas (DNV) and SINTEF to conduct an independent assessment of the research. New environmental investigations were aimed to monitor long-term impacts from mining. To obtain a baseline, 15 sediment cores were drilled and characterised to evaluate their physical properties and metal concentrations. Research and laboratory tests were also performed to assess the potential impacts on human health and biodiversity, mainly concerning seabed disposal. Dispersion and exposure pathways were applied to evaluate risks t human health and the environment. The risk of possible effects of chemicals from the tailing to the marine organisms was seen as low, and the environmental authority set requirements for a monitoring program including reporting on potential leaching or mobilisation of chemicals and monitoring for chemical impacts on or uptake by the organisms relevant to the food chain.
Compensatory measures	Agreement with reindeer herders was in a first moment reached including provision for mitigating measures to minimize any disadvantages for reindeer husbandry.
Measures for reduction of impacts in EIA	Sea Tailings Placement (STP) was seen as causing lower impacts than from tailings placed on land. This decision is consistent with the Guidance document Best practices Guidelines and Best Available Techniques for Submarine Tailings Disposal in Norwegian fjords: Recommendations from the NYKOS project. This is important as the mining industry is not covered by the Industrial Emissions Directive but rather references the European Commission document Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities[4].

[4] See https://ec.europa.eu/environment/pdf/waste/mining/MWEI%20BREF.pdf

	A monitoring program has been set up to control chemical, particle concentration, metal concentration in the discharges and in the marine environment and ecosystem. It represents a solution to limit the spread of metals from the disposal site during operations. In order to reduce to a minimum any disturbance to reindeer herding, 10 rules were prescribed relative to access to certain mine sites, including limiting vehicle movements at certain time, decreasing operational noise overall, fencing off openings, prohibition of construction in certain areas. An End of Life plan was required which includes management and remediation of wastes from the mining process.
Technologies	The operational mining technology complies with statutory requirements on reduction of waste and is approved by the Directorate of Mining and the Environment Agency. Method and technologies applied (Ref: Nussir, Mining plan): **Extraction:** electrification and automation. In the extraction process the equipment runs on electricity to reduce CO_2 emissions. **Treatment:** Optical sorting of Cu-ore; New low-energy flotation technique - tailings are thickened in the concentrator plant with flocculation agent Magnafloc 10; the particles are denser and sink more easily to the bottom of the fjord while any fresh water extracted during operations is reused in the system. **Waste management:** Controlled Pumping system. Flocculation and dewatering with the chosen chemical increases the density of the sludge and improve deposition on the sea bottom. The pumping mechanism is also planned to avoid dispersion of the sludge and homogeneous distribution of the sludge on the sea bottom.
Closure - remediation	The site has to be revegetated; measures to avoid pollution should be taken and should be safely installed and operated, precisely according to the instructions. An End of Life/ closure plan is to be approved before the permit is granted. The EIA mandated the establishment of new benthic communities and habitats for benthic fish after cessation of mining operations.

2.6.5 Stakeholder engagement and communication

The mine was approved at local level by the municipal council after an assessment programme that was subject to public consultation. The EIA was managed at national level in the course of which a public consultation process took place where stakeholders identified by their environmental or cultural heritage protection requirements, or their specific land-use rights, were invited to comment. As the mine is located in Finnmark, the permit mentions that: "*Consultations were also held with reindeer herding district 22 on 30 November 2018. Consultations were held between NFD and the Sámi Parliament at administrative level on 29 January 2019, and new consultations were held at political level on 11 February 2019. No agreement was reached during the consultations".* Consultation was conducted throughout according to statutory requirements. Communications between the mine and stakeholders started at an early stage, with extensive negotiations conducted in both formal and informal meetings.

The opinions of the stakeholders involved in statutory consultation were taken fully into consideration by the permitting authorities during the process. There are contradictory reports about the consideration of the matter discussed. There were opponents and there were supporters. On one side, it was felt that the consultation was fruitful, on the other that the process was mainly for promotional purposes. The main

opponent was the Sámi Parliament. The company itself followed internationally recognised Environmental, Social, and Corporate Governance (ESG), and Corporate Social Responsibility (CSR) reporting systems and standards (Petterson et al 2018, Dannevig and Dale, 2017).

2.6.6 Concerns/disputes

Nussir ASA has permits that allow operation (Zoning Plan, mining rights, operating licence and tailings permit). The first permits have been given by the municipality through the assessment program (AP). The adoption of the zoning plan had objections and was later on approved at Governmental level by ministries. The EIA was a very elaborate and extensive submission with highly technical language in some parts, easily understood by scientists but was felt less understandable by the public.

AP and EIA procedures both include public consultation. Fears were mainly connected to the deposition of tailings at the base of the Fjord. The evaluation of Environmental impacts on waters was criticised by scientists causing the Norwegian Environment Agency to require further research. EIA included solutions to mitigate the impacts on the marine habitat but there has been dispute about the relevance of the EIA. Stiftelsen Protect Sápmi in 2020 developed new methods to assess the cumulative impacts. EFTA Surveillance Authority (ESA) has also been requested to intervene several times.

The municipality, that counts about 1000 residents, mainly elderly people, sees that the mine would be an economical driver for the local economy. Those opposing the mining activity believe that have not been considered traditional indigenous habits and rights or the relevance for recreation purposes and the ecological values. (Heinämäki L. et al, 2023; Dannevig & Dale 2018; Gómez-Baggethun & Benjaminsen A,2018; Day L. & Worthington A, 2022; Angell E et al., 2020; Royal Decree 29 November 2019; Eira A. J. et al 2020; Samediggi, highnorthnews.com).

2.6.7 Enablers

Key enablers of the Nussir AS project are shown in Table 42.

Table 42 – Key project enablers Nussir ASA.

National -public interest	Deposits of public interests defined at national level.
Historical mining	Utilisation of previous mining facility and minimal use of the upper soil. Activity mainly underground.
Knowledge of the deposit	The deposit was well known, and of economic importance.
Guidelines	Available best practices and best technology guideline.
Low impact techniques	Permitting has been facilitated by the use of low impact mining techniques and technologies.
Communication	The mining company has been open and willing to communicate and create agreement with local communities.

2.7 Portugal – a) Neves Corvo Mine & b) Serra de Aires e Candeeiros

Two complementary cases are presented from Portugal: Neves Corvo Mine and Serra de Aires e Candeeiros. One relates to polymetallic mine and the other to limestone production, both interacting with protected areas.

2.7.1 Case study a. Neves Corvo

The mine is located in the Alentejo district of southern Portugal. The operation is situated approximately 15 km southeast of the town of Castro Verde and approximately 200 km southeast of Lisbon. Neves-Corvo has good connections to the national road network and a dedicated rail link into the Portuguese rail network and to the port of Setúbal. There are no major centres of population close to the mine, although there are many small villages with populations numbered in the hundreds. Most employees travel to the mine by provided buses or private cars.

Table 43 – Neves Corvo Case study summary.

Name	Neves Corvo mine
Country	Portugal
Region	Alentejo province, southern Portugal
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Copper, Zinc, Lead, Silver, Tin
Open pit or underground mine	Underground
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Operation
Period of activity	Continuously since 1988
Companies involved	Mineralisation at Neves-Corvo was discovered in 1977 following an exploration joint venture between Sociedade Mineira de Santiago (legally succeeded by EMMA – subsequently renamed EDM), 51%, SMMP 24.5% and Coframines 24.5%. Rio Tinto became involved in the project in 1985 effectively forming a 49:51% joint venture with the Portuguese government (EDM). On June 18, 2004, EuroZinc acquired a 100% interest in SOMINCOR (EDM/Rio Tinto). Eurozinc merged with Lundin in 2006 retaining the Lundin Mining name and being the actual 100% owner.
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	REN (National Ecologic Reserve) and Natura 2000. REN is managed by CCDR and APA and the Natura 2000 by the ICNF, all State departments with different competences

Underground mining at the Neves-Corvo Mine has been continuous since 1988 (Figure 24). The principal means of mine access are by a shaft and a ramp from surface. The shaft is used to hoist ore from the 700 m level while a conveyor descends from the 700 m level to transport ore from the deeper levels of the mine. The mine is highly mechanized and several different stoping methods are employed with the most significant being bench-and-fill and drift-and-fill.

The processing facility at Neves-Corvo comprises two plants. The copper plant processes copper ores and has a capacity of approximately 2.8 million tonnes per annum (Mtpa). The zinc plant, which can process zinc or copper ores, has recently undergone a significant expansion to a design nameplate capacity of 2.5 Mtpa.

Copper and zinc concentrates are transported by rail to a dedicated port facility at Setúbal from where they are shipped to variety of smelter customers that are primarily European based. Lead concentrate is containerized and trucked to ports for overseas shipment.

The mineral deposits at Neves-Corvo are classified as volcano-sedimentary massive sulphide. They typically occur as lenses of polymetallic (copper, zinc, tin, lead) massive sulphides that formed at or near the seafloor in submarine volcanic environments. Seven massive sulphide lenses have been defined comprising Neves, Corvo, Graça, Zambujal, Lombador, Semblana and Monte Branco. The base metal grades are segregated by the strong metal zoning into copper, tin, and zinc zones, as well as barren massive pyrite. The massive sulphide deposits are typically underlain by stockwork sulphide zones, which form an important part of the copper orebodies.

Exploration techniques include soil geochemistry, geological mapping, various geophysical techniques including airborne magnetics, residual ground gravity survey, airborne gravity survey, ground electromagnetic survey and 3D seismic survey and exploration drilling. Recent exploration work has concentrated on the development of a 3D regional geological model and exploration drilling focusing on the area between Corvo, Zambujal, and Semblana deposits.

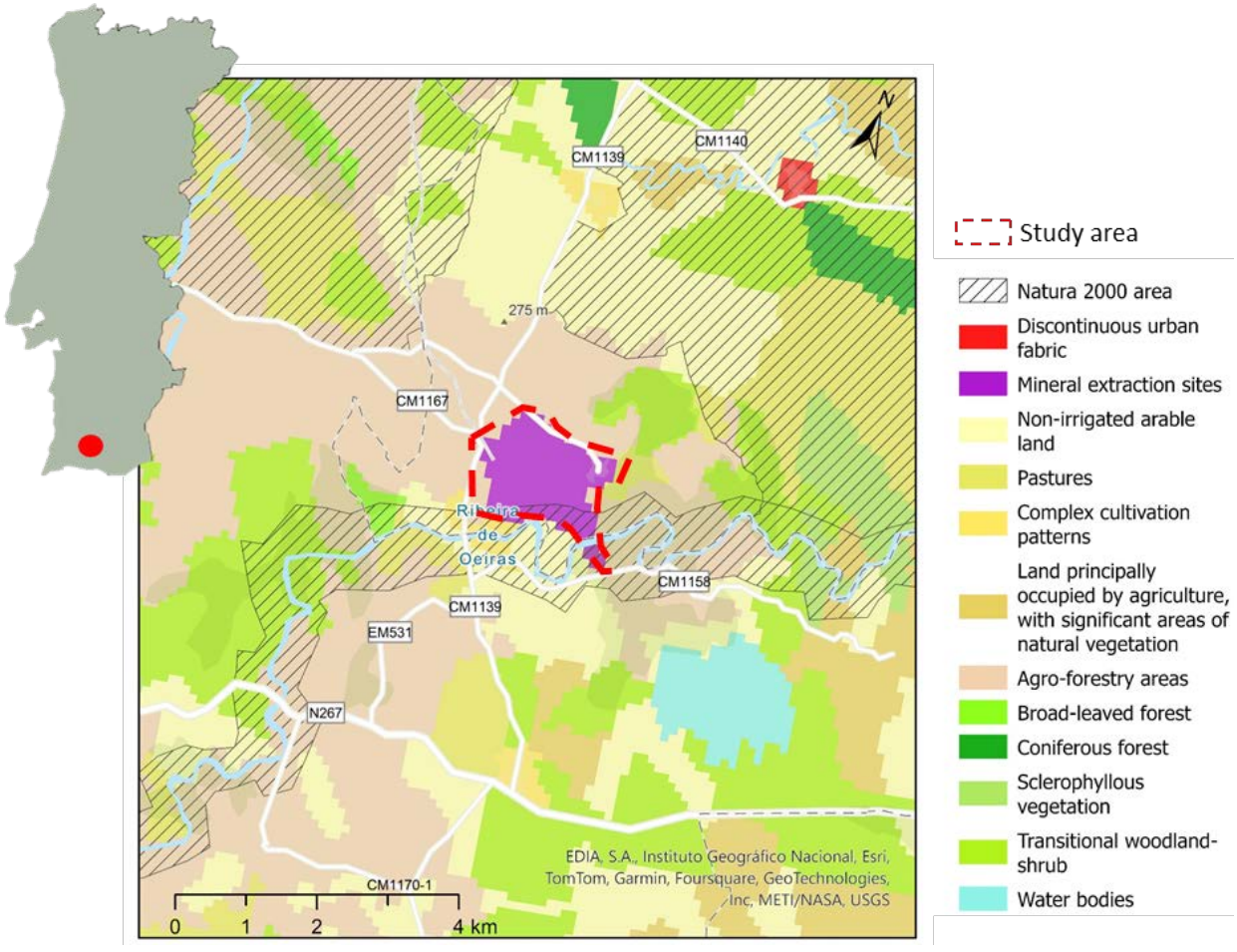

Figure 24 – Overall geographical localization. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and extractive activity area.

The Neves Corvo mine itself (see Figures 24, 25) includes ground partially affected by the Birds Directive (SPA-Special Protection Areas, Castro Verde - PTZPE0046) and Habitats Directive (SCI-Sites of Community Importance, Guadiana- PTCON0036) and other specific soil use restrictions (REN-Reserva Ecológica Nacional and RAN-Reserva Agrícola Nacional).

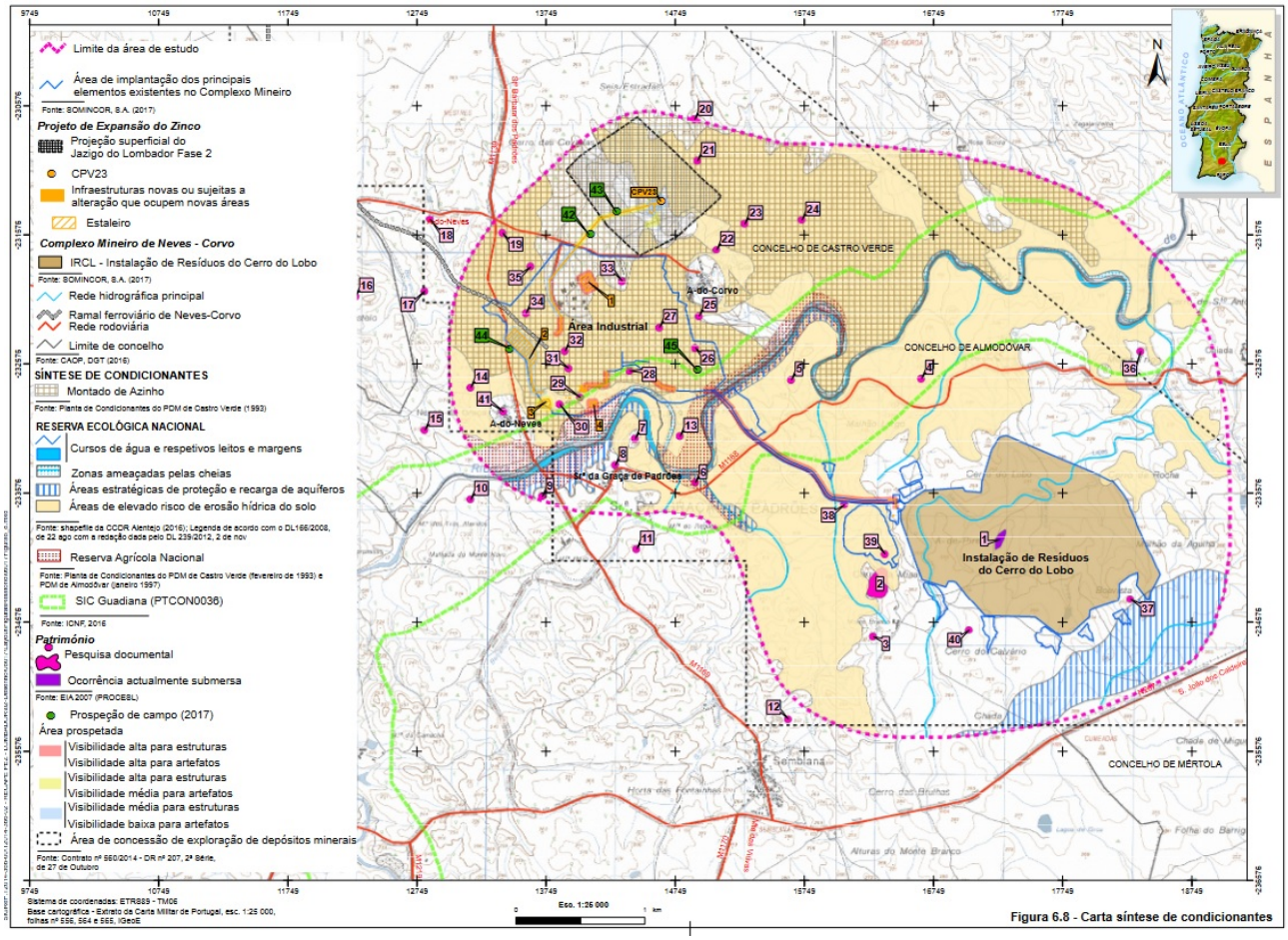

Figure 25 – Map of the Neves Corvo mine complex in detail.

2.7.2 Case Study b. Serras de Aires e Candeeiros

The Serras de Aires e Candeeiros Natural Park stands largely over a large limestone massif, named Maciço Calcário Estremenho in central Portugal. The area has more than 800 species and is rich in cave habitats. Famous caves are Mira de Aire, Santo António, Alvados, Moeda, Algar do Pena. This limestone massif is one of the largest in Portugal and some of most famous Portuguese dimension stones are from this region. There are plenty of quarry areas, some closed and some active that operate adject or within the natural park (see Figure 26 and Table 44).

Table 44 – Case study summary Serras de Aires e Candeeiros.

Name	Serras de Aires e Candeeiros
Country	Portugal
Region	Centro
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Natural Stone – Limestone
Open pit or underground mine	Open pit
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Active
Period of activity	Since 1970's

Companies involved	More than 35 companies involved in extractive activities inside the Park: Airemármores, Bentel, Bentos, Calcidrata, Calsal, Candipedra, Extrarustico, Frazão e Rosário, Gaspares, grupo Frazão, Joaquim Paulo Alves, Limestone, Lusical, Mármores Carrascal, Mármores e Alvenarias Antunes & Alves, Mármores Garcogel, Mármores Ferrar, Mármores Rosal, Mármores Vigário, Marmorimal, Miexport, Mocamar, Mós Stones, MRF Stone, Nalfstone, Pedra de Toque, Pedramoca, Pyramide Choice, Polirústicos, Rafaéis, Rafael e Cordeiro, Relvicreme, Ruipedra, Solancis, Solismar, Sousa & Catarino, Telmo Duarte
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	Natura 2000, SCI. Considered Natural and Semi-natural Habitat with calcareous habitats. Includes over two thirds of the limestone massif.

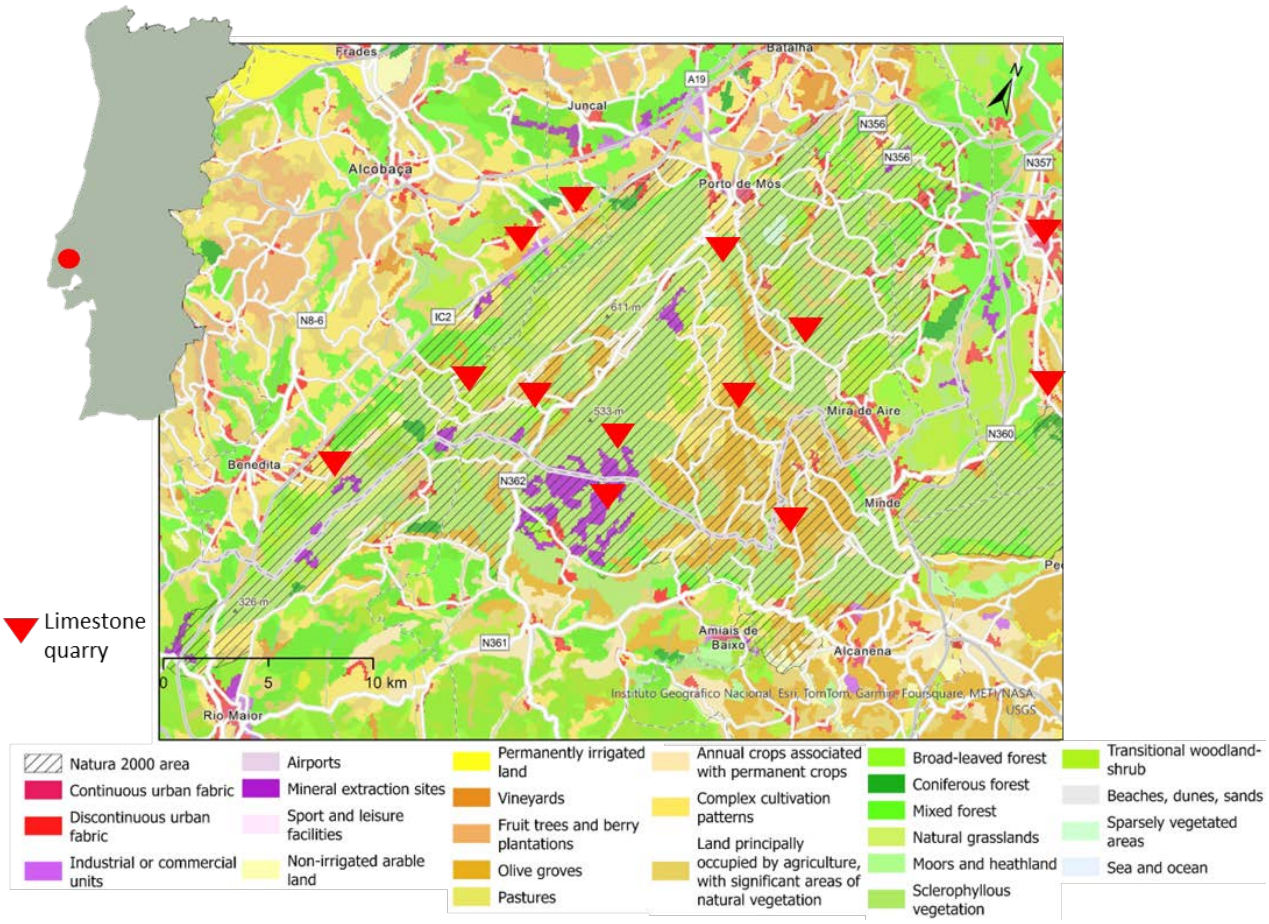

Figure 26 – Overall geographical localization of Serras de Aires e Candeeiros. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and extractive activity area. Red marks show clusters of limestone quarries (EGDI database).

2.7.3 Spatial planning

Portugal has 4 levels of spatial planning (national, regional, inter-municipal and municipal levels) within a framework of a coordinated interaction as visible from Figure 27.

Figure 27 – Scheme of spatial planning in Portugal.

There are programmes that establish the strategic framework for territorial development and its programmatic guidelines or define the spatial application of national policies to be considered at each level of planning. Then there are plans that establish options and actual actions concerning territorial planning and organisation, defining the spatial use (see Table 45).

Table 45 – Spatial planning organization.

Level	Duties
National Level	Establishes the strategic framework at national level (PNPOT)
Regional Level	Establishes the strategic framework at regional level (PROT)
Inter-municipal level	Establishes the strategic framework at inter-municipal level (PIMOT)
Municipal Level	Establishes the land use regime and regulations (PDM and PIER)

The Municipal Master Plan (PDM) is a fundamental and mandatory legal instrument in the management of the municipal territory. The PDM defines the strategic framework for the municipality's territorial development, the land use and occupation regimes, being the reference instrument for the elaboration of other optional municipal plans, such as the Detailed Plan – Intervention Plan for Rural Spaces (PIER).

Neves Corvo

At municipal level, the Territorial Management Instruments in force in the Neves Corvo Mining Complex is the PDM of Almodôvar and Castro Verde.

Serras de Aires e Candeeiros

In the Serras de Aires e Candeeiros Natural Park the Territorial Management Instrument in force is an Intervention Plan in Rural Space (PIER[5]). This Plan is developed by municipalities. It defines the rules for land occupation taking into account the existence of environmental values to be preserved.

[5] PIER is the Portuguese language acronym

The PIER consists of the following categories and subcategories of rustic soil:

a) Spaces for Exploration of Energy and Geological Resources:

i) Preferential spaces for the extractive industry — A1

ii) Preferential spaces for the extractive industry subject to compensatory measures — A2: I. Type I (A2 — Type I)

iii) Type II (A2 — Type II).

b) Natural and Landscape Spaces:

i) Preferential spaces for nature conservation — A3

The elaboration of the PIER took into account the Birds and Habitats directive (Decree-Law nº 49/2005, February 24th), having first mapped the natural values of this scope, with threat status, values representative of the local identity and values that justify the creation of protected areas.

A project PIER is a guiding and normative municipal level territorial management instrument whose strategic objective is to establish rules of land occupancy, including the definition and implementation of appropriate measures and actions for planning and management of the terrain. These align the requirements of the extractive industry with the values of the existing natural, heritage and landscape values, to guarantee the sustainable use of the territory with the following high-level objectives:

a) define the rules for occupying and managing the territory of existing and potential extractive areas, valuing the mineral resource, and preserving, minimizing and/or compensating the ecological and geological values that may be affected

b) establish conditions for the development of the extractive industry

c) minimise the environmental impacts on cultural heritage and landscape resulting from the development of extractive activity

d) promote sustainable development and conservation of nature and biodiversity, based on the enhancement of natural, heritage and landscape resources.

The proposed spatial organization of the areas presented in the PIER was based on the following set of specific objectives:

a) define preferential areas for the exploitation of mineral deposits

b) define preferential areas for nature conservation

c) establish guidelines for the implementation of the Integrated Project in accordance with the provisions of the legal regime for the exploration and exploitation of mineral masses, currently, Decree-Law No. 270/2001, of October 6th, in the wording given to it by Decree-Law No. 340/2007, of October 12th and the development of the Model Waste Management

d) develop an implementation program that guarantees the fulfilment of territorial qualification actions, and landscape rehabilitation

e) define the model of partnership between the entities involved, local agents and operators, with the mission of managing and financing initiatives aimed at offsetting the environmental cost caused by the implementation of the PIERCV and monitoring the execution of the Project Integrated.

Designation procedure for protected sites

In Portugal the classification of protected areas (Figure 28) of national significance may be proposed by the national authority or by any public or private entities, such as local authorities and associations for the defence of the environment, and the respective proposal must be accompanied by the following elements:

a) characterization of the area in terms of aspects geological, geographic, biophysical, landscape and socio-economic

b) justification of the need to classify the protected area, which must include a qualitative and quantitative scientific assessment of the existing natural heritage and the reasons that impose its conservation and protection.

c) typology of protected area considered most appropriate for the intended conservation objectives.

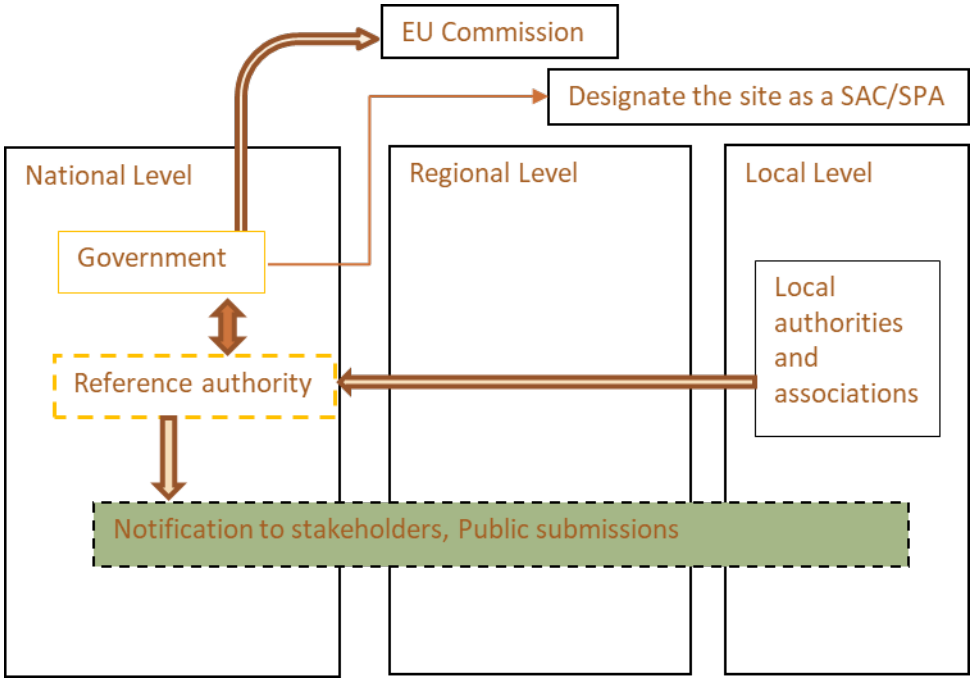

Figure 28 – Process for the denomination of protected area.

The classification proposals made by any public or private entities under the terms of the previous number are presented to the national authority, which proceeds with its technical assessment and, in case of agreement, proposes the respective classification to the member of the Government responsible for the area of nature conservation as a nationally protected area.

The protection regime (see Table 46) of each protected area is defined according to the importance of the values and natural resources present and the respective ecological sensitivity, which can be delimited in the summary plan of the special program:

a) total protection areas - which correspond to spaces where the natural and landscape values assume an exceptional character from the point of view of conservation of nature and biodiversity and which are characterized by high ecological sensitivity, intended to guarantee the maintenance or recovery of the state of conservation of the natural values in presence and integrity of associated ecological processes, with minimal human disturbance.

b) partial protection areas - which correspond to spaces that contain natural and landscape values that are assumed, as a whole, as relevant for the guarantee of biodiversity and maintenance of the favourable state of conservation of natural habitats and species of fauna and flora, where human activities and land use must be particularly adapted to conservation objectives, promoting the natural values in presence.

c) complementary protection areas - which correspond to spaces that establish the framework, transition or cushioning of impacts that negatively affect areas subject to total protection and partial protection levels and that include natural and landscape elements with a high appreciation potential through the development of management actions that promote the sustainable use of resources and local socio-economic development and the compatibility of human intervention with natural and landscape values, encouraging the settlement of populations and improving the quality of life.

Areas of specific intervention may also be delimited, for which, regardless of the applicable levels of protection, the development of a plan, program or specific intervention projects is foreseen.

The delimitation of the protection regimes foreseen in the previous numbers must be done taking into account the existing constructions and legally consolidated rights, without prejudice to the obligation of compensatory whenever this is not possible.

Table 46 – Good practices - spatial governance and practice.

Level	Duties
Land use by extractive activity	Land use in the area of the Neves Corvo Mining Complex is managed in accordance with the PDM of Almodôvar and Castro Verde. Exploitation in the Serra de Aires e Candeeiros Natural Park is managed in accordance with an Intervention Plan for Rural Spaces (PIER), a land use instrument that is the responsibility of municipalities, defining the rules for land occupation, taking into account the existence of environmental values to be preserved. The extraction activity itself is regulated by the provisions of Integrated Exploitation Projects, which provide for concerted exploitation between all companies in each of the exploitation clusters in the Natural Park.
Classification of protection	In the Serra de Aires e Candeeiros Natural Park, the protection regime of each area is defined according to the importance of the values and natural resources present and the respective ecological sensitivity: total protection, partial protection, complementary protection. The extractive industry is only permitted in areas classified as Complementary protection areas.
Compensatory actions	In Serra de Aires e Candeeiros Natural Park, in order for a new licence to be granted in this area, it is necessary to recover a degraded area of the same size of the quarry to be opened. In addition, in some cases, given the area that is affected, companies may have to compensate the Park in other places/sites (e.g., restoration of habitats, monitoring of species, etc.) according to the provisions of the PIER. No monetary compensation is provided. In addition to these measures, companies must always comply with regulations applicable to the extractive activity and environmental legislation.

2.7.4 Mineral governance

The permitting procedure showed in Figure 29 is relevant for both the cases described in this section. Depending on the class of quarries (defined in Decreto-Lei n.º 340/2007, de 12 de Outubro) the licensing entity may be the Directorate-General for Energy and Geology (DGEG) or the Municipal Councils. In this case study, licences were awarded by the DGEG.

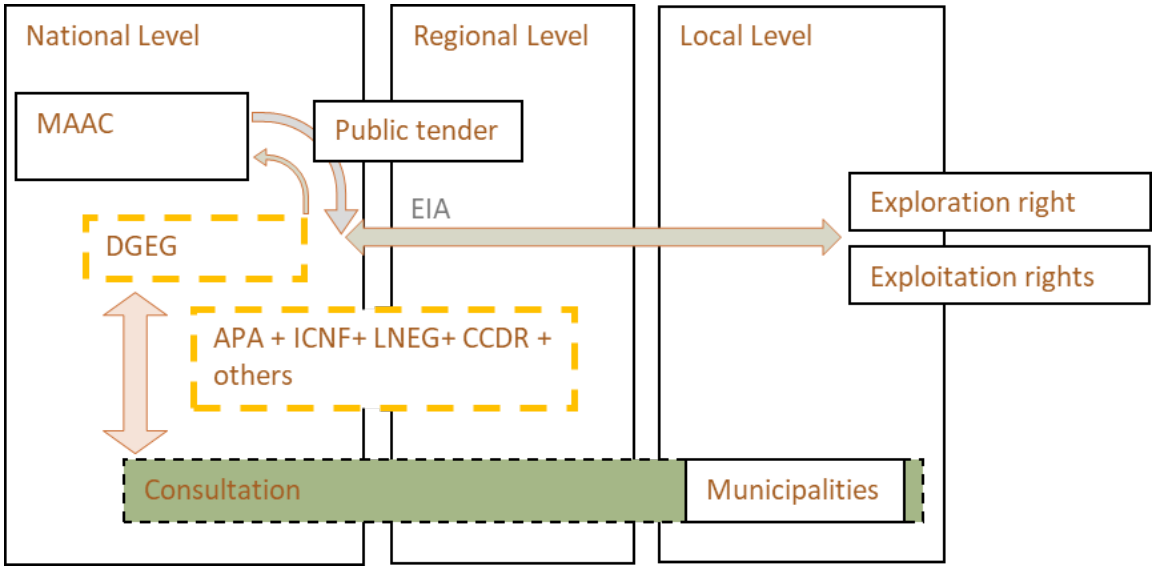

Figure 29 – Permitting process for exploration and exploitation rights.
MAAC: Ministry of the Environment and Climate Action directly supervises the General Directorate for Energy and Geology (DGEG) and makes the final decision for permitting,
APA: Portuguese Environmental Agency,
ICNF: Nature and Forest Conservation Institute,
CCDR: Regional Coordination and Development Commission and the municipalities are relevant players in the mining sector in Portugal.

For projects inside the Serras de Aires e Candeeiros Natural Park, DGEG must consult the environmental impact assessment (EIA) authority about the need to obtain a favourable environmental impact statement, even when a project is not covered by the EIA regime (Table 47).

Table 47 – Good practices - mineral governance and management.

Aspects	Description
Minerals	The application for exploration rights can be triggered by the initiative of the applicant, upon submittal of the corresponding application, or by the State initiative, through the member of the Government responsible for the area of geology, who opens a tender procedure, under specific terms and conditions.
Knowledge of the area	The area has been quarried for long time and with the elaboration of PIERs, the geological knowledge has been expanded.

2.7.5 Environmental governance

The cases are interacting with natural protected areas. Aspects relative to environmental governance and performance are included in the following table (Table 48).

Table 48 – Good practice aspects on environmental governance and practice.

Aspects	Description
Case land use conflict	Both cases are interacting with protected areas. In Natura 2000 Law decree 30/2021, 7th May (introductory note and Article 17th of the decree) suggests that mining activities should be avoided nevertheless it does not exclude that possibility.

Aspects	Description
	Neves Corvo Mine has started before the denomination of Natura 2000 site and is an underground operation, while in Serras de Aires e Candeeiros Natural Park many of the existing quarries were illegal before the approval of the PIERs.
Evaluation of impacts	In the Neves Corvo mine case the EIA dated from 1982, which was the first study of this type made in Portugal produced before the first legislation on environmental impact studies was published. The studies included source-pathway-receptor model used to identify potential risks from extractive activities. Presently SOMINCOR uses an environmental management system focused on the main environmental impacts and risks including human health, and biodiversity, among many other aspects. The system in place includes: - Monitoring program - Systematic control of emission sources - Process's change on the elimination of the source impacts - Control of the EIA requisites and the Environmental licence - Control based on internal and external audits - Control of procedures and emergency plans - Control of the implementation of the closure plan
Measures to mitigate impacts	Recent examples for Neves Corvo mine: - Follow up of exploration drilling operations - Building of a storage facility for the copper concentrates in order to minimise dust emissions - Building of a new conveyer belt at the shipping dock at Setubal port to minimise dust emissions - Soundproofing of the mine ventilation shafts - Forced evaporation of the tailings - Archaeological preservation - Protocols with local farmers to keep agricultural fields operational - Cinegenic management - Protocols with the environmental agencies to protect and promote biodiversity In Serras de Aires e Candeeiros the areas for circulation of machinery and equipment are restricted to those absolutely necessary for the normal conduct of work, and their proliferation is avoided.
Mitigation and compensation	In Serras de Aires e Candeeiros more than 100 mitigation measures are defined in the environmental impact statements to safeguard nature and human health. The measures are of different types, with the aim of minimizing impacts on air quality, groundwater quality, flora, fauna, waste, etc. Some examples of such measures include: 1. Fencing and signalling the perimeter of each intervention area, in order to limit as much as possible, the entry of strangers to the quarries and, in this way, avoid accidents. 2. Protect, during exploitation, the entire perimeter of the excavation border with earth walls or blocks (minimum height of 1m) that must evolve as work progresses in the area. 3. Define, quarry by quarry, the places for deposition of stocks of blocks, waste rocks and stripped superficial soils, within the scope of the respective Quarry lands. 4. Ensure the periodic maintenance and overhaul of all vehicles, machinery and equipment present on the holdings, carried out in licensed shops and outside the

Aspects	Description
	quarry areas, keeping up-to-date records of such maintenance and/or overhaul by equipment in accordance with the specifications of the respective manufacturer. 5. Ensure the correct management and handling of waste and effluents produced and associated with quarries, namely oils and fuels, solid waste, and wastewater, by collecting them and transporting them to an appropriate deposit/final destination. 6. Participate jointly in the maintenance of roads most frequented by trucks. 7. From the exit quarries to regional roads, repair and maintenance sideways and control of pavement degradation. 8. Arrange actions aimed at improving the most requested sections, namely corrective paving of more degraded areas, cleaning and maintenance of shoulders, and occasional widening that facilitate the crossing of trucks in narrower places. 9. Contribute to the maintenance and control of signals at the entrance and exit of the villages in the vicinity of national roads, warning of any corrections to be made. 10. Make drivers aware of the speed limit to be respected when driving inside towns. 11. Ensuring compliance with safety standards and signage for entry and exit of vehicles on public roads. 12. Implement measures for the management of biotopes of priority habitats such as Rupicolous Meadows and Substeppes of grasses, in the undisturbed surroundings, with a view to their maintenance. The activities to be carried out in this context include the selective cutting of weeds (namely gorse - Ulex europaeus L. subsp. latebracteus) using light machinery and the eventual creation of a herd of small ruminants. 13. Carry out campaigns to collect propagation material for RELAPE species (Rare, Endemic, Localized, Threatened or Endangered), especially the collection of seeds, which must be properly preserved. The conservation and storage of seeds will be the responsibility of a Seed Bank. 14. Creating/recovering biotopes of interest for conservation, namely native forest areas through replanting/reforesting holm oaks, cork oaks and oaks, including species with conservation value in the tree structure and sub-forest, whose distribution in the PNAC is quite restricted, such as the species: lotus (Celtis australis), rowan (Sorbus domestica), yellowtail (Acer monspessulanum), mountain dog (Pistacia therebinthus). 15. Promote the creation of escarpments with conditions for the establishment of populations of fauna and flora characteristic of the limestone rocky slopes typical of this region. With the objective of conserving the Protected Flora such as orchids and species of punctual distribution: Saxifraga cintrana, Silene longicilia, carry out transplants of plots with the presence of these species, for an area to be defined, creating a nursery.
Monitoring and compensation	Environmental management and monitoring by the NEVES CORVO MINE goes well beyond the legal requisites with a tight follow-up extending to the whole concession area. As indicated by Somincor the measures include:

Aspects	Description
	- Continue proactive management of pipeline integrity from risk identification to mitigation - Continue to monitor and review noise levels from evaporators. Investigate further noise abatement measures and closely monitor any grievances related to noise levels - Timely update and submission to the authorities of required operational management plans - Environment policy induction to all employees. Protocols with environmental agencies: Examples include building of biodiversity observatories; replacing each holm oak tree (*quercus ilex*) cut by two new plants.
Low impact techniques	Neves Corvo mine used several low impact techniques for different life cycle stages of the extractive activity: a) For exploration: avoid trenching and other impacting excavations. Exploration techniques include soil geochemistry, geological mapping, various geophysical techniques including airborne magnetics, residual ground gravity survey, airborne gravity survey, ground electromagnetic survey and 3D seismic survey and exploration drilling. Recent exploration work has concentrated on the development of a 3D regional geological model and exploration drilling focusing on the area between Corvo, Zambujal, and Semblana deposits. Field work (geophysics mainly) was coordinated with the environmental agencies mainly to avoid disturbance principally during mating periods of wildlife. b) For extraction (extraction method, haulage, waste management-dump): visibility is low because this is an underground operation, however it is worth mention that effort has been put into having underground infrastructures (offices, crushers, service vehicle shop). c) For treatment (plant, physical and chemical separations): The water treatment circuit was upgraded with a RO (Reverse Osmosis) unit, enabling replacement of freshwater with treated water in the mine's paste plant. Alternatives to the present main water supply (Santa Clara) reservoir continue to be studied both for potable water and operational water. d) For rejects (ponds and tailings): In 2010, the tailings management facility was converted to a thickened tailings deposition facility with a thickened tailings plant (3 Deep Cone Thickeners) to increase the storage capacity and reduce the area of impoundment. e) Storage and expedition: Building of a storage facility for the copper concentrates in order to minimise dust emissions and building of a new conveyer belt at the shipping dock at Setubal port to minimise dust emissions.
Closure-remediation	Neves Corvo mine has foreseen the rehabilitation of the areas occupied by existing mining infrastructures through the restoration of original land conditions (including streams and other landforms); recovery of the tailings pond with the deposition of a soil blanket and revegetation. For Serras de Aires e Candeeiros: for each of the main exploration clusters, Landscape Recovery Plans were drawn up, which envisage the least possible impact of this activity after its closure.

Aspects	Description
	Actions are planned to fill in excavation ponds, smooth the slopes and reforest with indigenous species. In addition to what is foreseen in the Environmental and Landscape Recovery Plan, additional decommissioning phase measures include: - Protect, after the end of the extractive activity, the excavation border with an earthen wall (with a minimum height of 1m) the areas where the maintenance of the final configuration of the excavation is foreseen (that is, without modelling with the overburden to be produced). - Proceed, as soon as the first dismantling bench reaches the excavation limit, to its redesign for a slope with a height of less than 1 m and a landing with a width of about 2 m. - Dismantle all structures associated with industrial activity and remove existing equipment in each of the quarries, taking the necessary steps to ensure that, whenever possible, it is reused or recycled or, failing that, sent to its destination suitable ending. - Ensure the removal and cleaning of all deposits of waste or hazardous substances (used oil deposit tanks, fuel deposits, etc.), ensuring that they are properly sent to their final destination. POST-DECOMMISSION PHASE Evaluate the evolution of the recovered area through the continuation of monitoring and conservation activities in each of the quarries, with special attention to the behaviour of slopes and vegetation growth. Carry out inspections at each of the quarries in order to: - Ensure that all areas affected by activities associated with the exploration of each of the quarries are properly recovered in accordance with the Decommissioning and Recovery Plan. - Check the state of conservation of the fence and signaling, in order to guarantee adequate protection against accidents.

2.7.6 Stakeholder engagement and communication

In Serras de Aires e Candeeiros during establishment of the protected area and at relevant subsequent stages of the project there was a public discussion procedure, where interested entities and the community had the opportunity to express their opinion (see Table 49).

The benefits for the communities were defined in the PIER Characterisation and Diagnostics phase.

The likely socioeconomic impact was also analysed when preparing the Environmental Impact Assessment for each of the valorisation projects.

Table 49 – Good practices - Stakeholder engagement and communication.

Aspects	Description
Case communication, stakeholder engagement	Neves Corvo mine: There was a public consultation process where all stakeholders had the opportunity to appeal or comment and decision making is made based on the responses obtained. Within informal stakeholder engagement. Three social specific management plans were approved in 2020 and included i. a Stakeholder Management Plan, ii. a Grievance Management Plan and iii. a Communications Plan (Somincor).
Benefit to community	Neves Corvo mine transformed an economically depressed area around the mine, in one wealthier areas. As an example, in the case of the municipality of Castro Verde the purchasing power of 52% of the country's average in 1993 has more than doubled in 2019 to 105% of the country's average. One aspect of the social performance management is community investment, which was reported at about 270k€ in 2021 (excluding strategic social investment for entrepreneurship in schools).

2.7.7 Concerns/disputes

The main cause of friction or dispute is the insufficient regulation of land use management practices and licensing. In consequence often the most closely responsible official agencies (mines department, environmental agencies, etc.) lack direction or postpone prompt actions due to these uncertainties.

2.7.8 Enablers

The key enablers of successful projects in Portugal are shown in Table 50.

Table 50 – Successful mineral projects, Portugal – key enablers.

Adoption of PIER	An PIER (Intervention Plan in Rustic Space) that included knowledge of mineral resources and defines the rules for land occupation taking into account the existence of resources and the existence of environmental values to be preserved. Classification of values that allow extracting operation.
Commitment to environmental issues	In NEVES CORVO MINE the mining activity started in the 90's, when the protected area had not yet been denominated. However even then, a comprehensive environmental assessment has been performed. The employees are educated to the environmental values and several activities are working towards the improved environmental performance of the activity.
Mitigation and compensation	Extensive and continuous adoption of measures to improve environmental performance in several activities of the mining life cycle in both cases aiming at mitigating the impacts on the environment. Rich plan in compensation actions to preserve the ecological value of the area in future actions.
Adoption of a Plan for communication and engagement	Besides communication included in the statutory processes the company has formulated a Strategic Social Implementation Plan that benefit the community and addresses Stakeholder Management, Grievance Management and Communications.

2.8 Spain - Mina de Barruecopardo

This case study concerns to an active Tungsten ore mining area in the Salamanca region interacting with a protected area.

2.8.1 Case overview

Barruecopardo (see Table 51 and mine location map Figure 30) has a mining history dating back almost 100 years, mining operations in the area have been recorded since 1902. During the majority of its past operating life, this mine was the largest tungsten mine in Spain, producing it from an open-pit mining. Mining ceased abruptly at the mine in the early 1980s, but after nearly 40 years of shutdown, the Spanish government owned mineral development company, Saloro, brought the Barruecopardo Mine back online in 2019.

Table 51 – Mina de Barruecopardo - Case study summary.

Name	Mina de Barruecopardo
Country	Spain
Region	Barruecopardo, Salamanca (Castilla y León)
Type of mineral resources (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Scheelite (Tungsten ore, $WCaO_4$)
Open pit or underground mine	Open pit
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Operation
Period of activity	First period: 1902-1982 Second period (SALORO): 2019 onwards
Companies involved	Saloro SLU (Saloro – Mina de Wolframio)
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	Special Protection Area for Birds (in Spanish, ZEPA)

According to the ZEPA (Zonas de Especial Protección para las Aves) Declaration: "The area is included in the scope of the Bonelli's Eagle Conservation Plan in Castilla y León (Decreto 83/2006, de 23 de noviembre, por el que se aprueba el Plan de Conservación del Águila Perdicera en Castilla y León). Within this plan there are also five critical areas for protected species. It also overlaps territorially with the Recovery Plan for the Black Stork in Castilla y León (Decreto 83/1995, de 11 de mayo por el que se aprueba el Plan de Recuperación de la Cigüeña negra y se dictan medidas complementarias para su protección en la Comunidad de Castilla y León), including ten critical areas for the species."

Natura 2000 sites together cover an area of more than 22 million hectares, the largest single site in Europe.

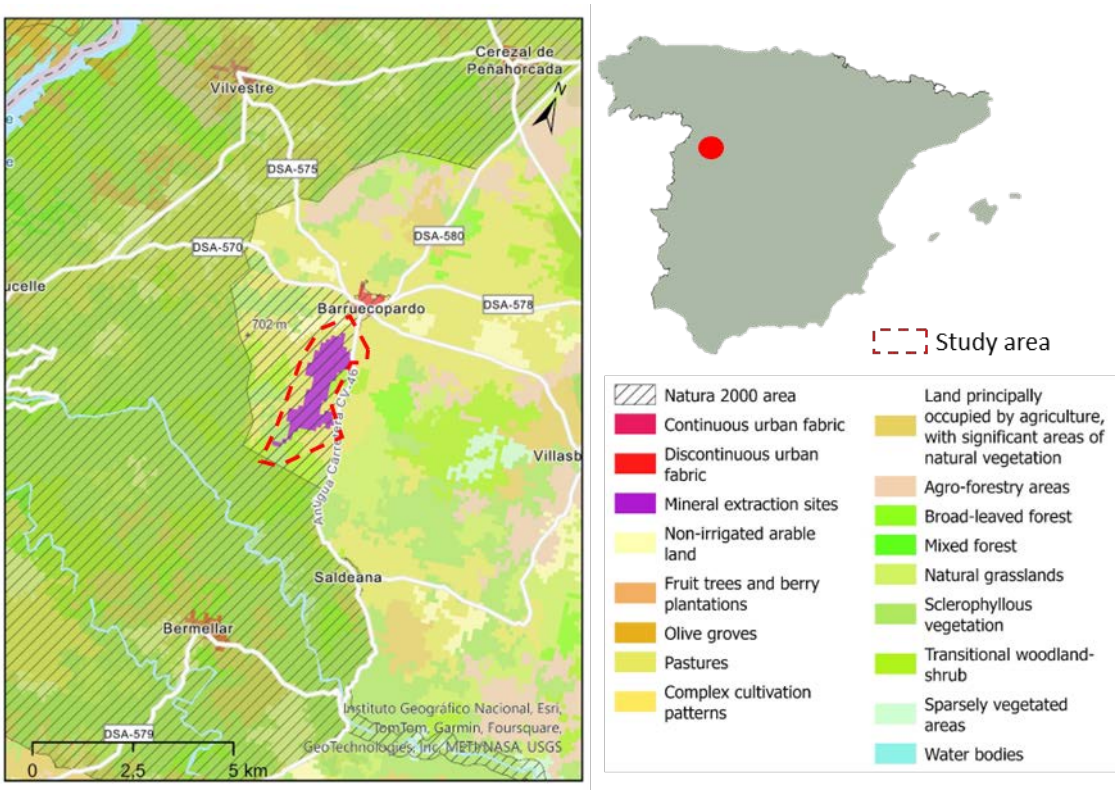

Figure 30 – Overall geographical localization, Barruecopardo. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and study activity area.

2.8.2 Spatial planning

The Ministry of Territorial Policy (Ministerio de Política Territorial) is the department of the General State Administration responsible for proposing and executing the Government's policy on relations and cooperation with the autonomous communities and the entities that make up their local administration. This covers the powers related to the territorial organization of the State as well as relations with Government Delegations and Sub-delegations and support for their management (details in Table 52).

Table 52 – Spatial planning organization.

Level	Duties
National government	National government provides framework legislation that guides regional legislation. Decisions taken by national government can affect the use of land at regional level. There is no general national spatial plan, but there is a national sectoral Hydrological Plan, the Solid Waste Plan, the Environmental Plan, the Plan of Infrastructure. Sectoral plans are done in consultation with the autonomous community governments.
Autonomous communities- Regional level that is still government level	There is Regional Legislation on land use planning. The autonomous communities can prepare a regional spatial plan and can handle permits for large building project. Not all the regions have regional plans. Regional parliament approves the regional plans. Regional government approves sub-regional plans.
Intermediate	There are sub regional plans as territorial land use plans that can cover the whole region or parts of it.
Municipal level	Municipal master plans and development plans.

Designation procedure for protected sites

Spain had mainly national parks before the Habitat directive came into force. Unsurprisingly, the introduction of the Natura 2000 network created some problems in the delegation of powers between central and regional governments (Rojas-Briales, 2000).

ZEPA "Arribes del Duero" was designated a Special Protection Area for birds at Regional level in 1991, Ley 8/1991, de Espacios Naturales de Castilla y León, included in the Royal Decree (Real Decreto) 1997/1995 and included in the Forest Law 43 from 11/2003. It covers 1,080.03 km^2 and is managed by the CONSEJERÍA DE FOMENTO Y MEDIO AMBIENTE.

ZEPA (regional government, Government of Castilla) and Red Natura 2000 (Europe) are the bodies in charge of designating Natura 2000 protected area in the region. The regional government also has management responsibilities. The statutory consultation is through Servicio Territorial de Medio Ambiente de Salamanca, of Junta de Castilla y León.

At national level there are also Conservation Guidelines (7/2011) and procedures for state - community government communication of these protected sites. The parks have natural resource management plans (**Fig. 31**).

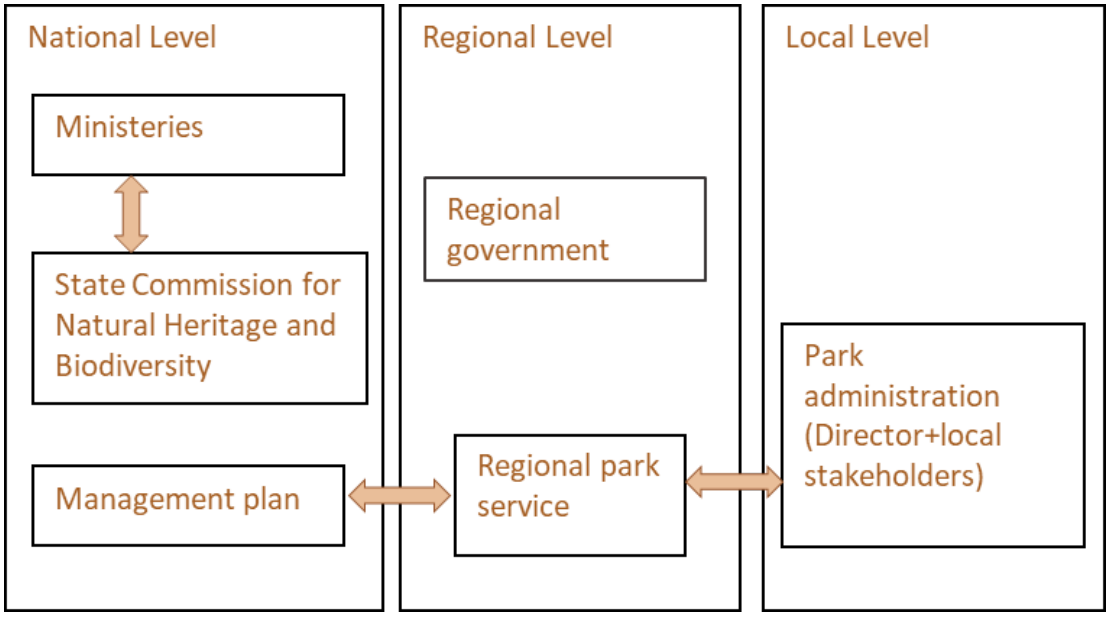

Figure 31 – Process diagram for designation of protected areas in Spain.

2.8.3 Mineral governance

Spanish mining legislation states that all mining resources are publicly owned. SALORO is the company that valorises these mineral resources under an administrative concession regime.

Mining permits, as defined by the Spanish Mining Law 22/1973, 21 July, are administered at regional level. Spain has 17 autonomous regions and regional ministry responsible for mining matters is the competent jurisdiction. The permitting procedure consists of a multi-authorisation system, the application passing through both the regional Mining Authority and regional body for the Environment (Medio Ambiente) multiple times before its eventual approval. The regional mining authority has overall responsibility for steering the consultation process. The components included in the mandatory Environmental Impact Statement (EIS) are mandatory and the Agency for Medio Ambiente y de Industria (Environment and Industry) makes periodic inspection visits to the operational mining areas (see Table 53).

The Ley y Reglamento de Minas (Law and Mining Regulations) regulate the permitting process. Exploration/extraction permits are requested from the regional government by submitting a project work and restoration plan. The Work Plan is approved by the competent body for Industry and the Restoration Plan by the regional body for Medio Ambiente. Prior to the granting of the mining permit, a public consultation period is held, giving citizens the right to make representations and comments. In the case of this project under study, the Project Work Plan and the Environmental Impact Study were submitted to the public consultation process by the Servicio Territorial de Industria, Comercio y Turismo (Regional Office for Industry, Commerce and Tourism) in Salamanca through an announcement in the "Boletín official de Castilla y León" (Official Gazette of Castille and Leon) no. 240, December 14, 2012.

La Dirección General de Medio Natural (General Direction for the Environment) includes in its Bulletin of November 27, 2013, the “Informe de Evaluación de las Repercusiones sobre la Red Natura 2000” (IRNA) (Statement of Evaluation of the Impacts on the Nature 2000 Network) with a series of conditions for the operator to follow:

> Within the Environmental Impact Study, corrective, preventive and additional measures are taken into account. The project is not considered likely to cause significant burdens on the maintenance and conservation of the habitats of public interest present in the area, assuming that the conditions set forth at the end of this IRNA report are strictly adhered to. For the execution of the proposed preventive and corrective measures, and for the restoration works, the advice and technical indications of the Servicio Territorial de Medio Ambiente (Regional Environmental Agency) in Salamanca must be obtained. There will be an environmental coordinator to contact in relation to the Environmental Surveillance Plan and in relation to the development of all the intervention and mitigation plans that are required.”

The National Mining Authority (Ministry of Industry) and the National Environmental Authority (Ministry of Environment) are the responsible authorities when the mining permit issuance has implications for a protected area. In such instances, permitting decisions happen at a national level (Figure 32).

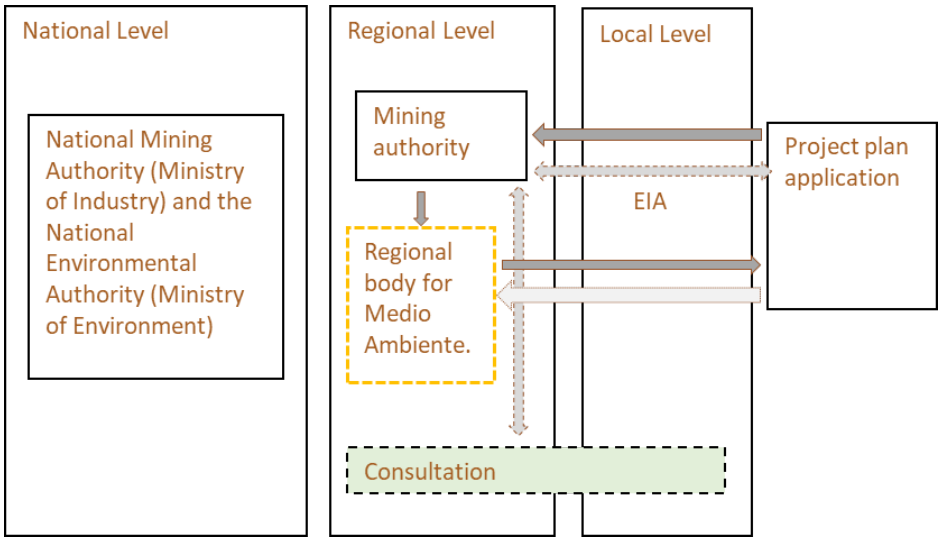

Figure 32 – Three jurisdictional level mine-permitting process.

The authorities involved in permitting the case study under consideration are:

- Mining: Regional Government (Junta de Castilla y León).
- Environment: Regional Government (Junta de Castilla y León).
- Water: Duero Confederation Water Council (Confederación Hidrográfica del Duero), Central Government

2.8.4 Environmental governance

Several actions have been implemented to mitigate impacts of mining activity resulting from a legal consultation process provided in the regional mining regulations. The preferred evaluation methodology for assessing potential impacts consists of a cause-effect matrix that includes, on the one hand, the mining actions on the environment and, on the other hand, the environmental factors affected by these actions. The objective is to arrive at a numerical value of the total impact caused by mining, with a series of intermediate steps in the total mining operational sequences that can qualitatively classify the changes produced in the different environmental receptors. Once the actions on the environment have been identified and characterized, they are analysed in relation to the effects they have caused on the environment and their severity. The analytical approach selects certain environmental indicators to measure the degrees of impact on the ecosystem of various mining procedures, using specific environmental factors, consistently characterized, and expressed in uniform and impartially applied impact units. Some transformation functions are performed for each element and factor from the environment with the expected impacts.

During the assessment, the impacts on human health and biodiversity have been taken into account using the following evaluation guidelines:

- Ley (Law) 22/2011, of July 28, on Waste and Contaminated Soils.
- Real Decreto (Royal Decree) 975/2009, of June 12, on the management of waste from the extractive industries and the protection and rehabilitation of the space affected by mining activities.

  Ley (Law) 5/2009, of June 4, on Noise in Castilla y León regarding sound emission levels.
- Real Decreto (Royal Decree) 212/2002, of February 22, which regulates noise emissions in the environment due to the use of certain machines outdoors.
- Real Decreto (Royal Decree) 100/2011, of January 28, which updates the catalogue of potentially polluting activities of the atmosphere and establishes the basic provisions for its application, Standard UNE-EN 15259:2008 or its update.
- Regulation of the Hydraulic Public Domain for the protection of waters.
- Decreto (Decree) 54/2007, of May 24, which regulates the commercialisation of forest reproduction materials in the Community of Castilla y León.
- "Cuaderno de Zona" (Zone Guidance) no. 26 "Dehesas-Sayago" edited by the Ministry of the Environment of the Junta de Castilla y León for restoration.
- Those measures established by IRNA for the protection of fauna.
-

Table 54 – Good practices - environmental governance and practice.

Aspects	Description
Case land use conflict	The area where the project is located has been dedicated mainly to mining and agricultural activities. It was an area impacted by historical mining activity but some animal species (birds, amphibians, and mammals) found it as favourable ecosystem. The project is not considered to entail significant effects on the maintenance and conservation of the habitats of community interest present in the area if activity is performed according to the conditions set in the permit. The mineral deposit was known prior to the declaration of the protected area. The exploitation of the old mines began in 1902. The protected area was already defined prior to the start of this new mining project. The protected

	area coincides territorially with the Recovery Plan for the Black Stork. All mining activity is included within the protected area.
Measures of prevention	In hot, dry periods at high risk of forest fires, no work in the forest is allowed using equipment that can generate sparks or directly set a fire. There are no other environmental restrictions.
Impact assessment	Exhaustive monitoring of nesting bird species during tree felling periods has been carried out. The visual impact of the mine has been studied, and a socioeconomic study of the area has been carried out. In 2011, permits for mining exploitation were presented. The project was carried out by the Asturian company SADIM. One year later, the final feasibility study of the project was completed and was possible to proceed with the financing and its development. In addition, documentation was submitted on the final environmental and exploitation impact study.
Measures for reduction of impacts in EIA	Measures proposed in the case included: **Protection of fauna** - Conduct mining activities in seasons when nesting species are not present (September-February) causing minimal impacts and affects only the physical environment (the nesting platform or platforms). - Improvement of the bird feeding environment both by creating new ponds and by increasing rabbit numbers, creating high concentration points in the local rabbit population. A protected Bonelli's Eagle nest near the mine will be monitored by installing of a remote-control camera on site, in coordination with the staff of the Arribes del Duero Natural Park. - Conduct follow up studies during and in the post mining activity monitoring and reporting on endangered species (Black Stork, Egyptian Vulture, Peregrine Falcon, and Bonelli's Eagle). - Construction of bat shelters un-accessible to persons. Protection of vegetation: - Protection of existing forest and reforestation using native trees or shrub species. Progressive regeneration of meadow land for reuse as pastures. The annual report includes the results of monitoring and topographic plans showing the surfaces restored each year and the revegetated slopes. **Water protection** Water is treated and possible discharges into Public Domain Water Courses are done under permission. Risks of discharges of untreated water are minimized with the construction of a drainage network that deviate overflow and rainwater into runoff pools and into the mine pit that is used as temporary storage. The basins' impermeability and stability undergo periodic inspections. Ground water is monitored at defined intervals according to a groundwater sampling protocol approved by the Basin Agency.

	Preventive measures are also taken to ensure that oil, fuel, lubricants, or similar substances are not accidentally spilled or intentionally discharged onto the ground or into water courses. **Soil protection** Adoption of measures to avoid deterioration of soil physical and biological characteristics (low sloping areas to avoid compaction and runoff, short stoking time protecting it from degradation, erosion and uncontrolled revegetation). **Additional measures on vegetation** The activity involves the impact on about 40 hectares of trees, mainly oaks. Nearby areas will be repopulated with a number of specimens three times higher than those that are uprooted, in plots close to the southwest area of the farm; this repopulation is independent of mining restoration. In addition, a plant screen is projected between the facilities and the most sensitive areas such as the road and the urban area of Barruecopardo. **Habitat management** Adjacent habitats must be improved by clearing sub-humid pastures and clearing in scrub areas to enhance the said habitat. **Cultural heritage** The use traditional enclosure fencing will be respected and maintained. **Additional measures on soils and long-term pollutants** The responsibility for management of existing hazardous waste from the old mines, as well as any contaminated soils, will be assumed by the mine operator. Other proposed measures are the slight rerouting of a hiking trail and its signage.
Closure - remediation	**Mine use** If there are commercially viable mineral reserves still present at the mine site, it is proposed that continuation of mining operations will then be underground. If not, dismantling of the operational infrastructure and environmental restoration of the area is anticipated. The tailings piles and slopes will be remodelled to achieve an appropriate topography that enables planting of a vegetation cover that reduces soil loss or erosion through rain or wind; when complete a capping layer of ~25 cm of topsoil will be installed and the slopes will be revegetated. **At the end of the life of the mine** Part of the ponds are expected to be dismantled; and the construction of a natural reservoir is anticipated which would be located in the drainage basin that would flow directly into the tailings pond. Site roads and operational buildings will be dismantled, and the area revegetated. The felled areas will have special treatment; they will not be restored completely as before, but restoration work will be done on the final slopes at different heights in order to restore the potential nesting sites for different species of bird.

	Certain facilities, due to their cultural and historical interest as a witness to the industrial activity at site, may be preserved by agreement with the City Council and the competent administrations. A comprehensive Environmental Surveillance Program will be implemented embracing the control of surface water, groundwater, dust emissions, noise emissions, vegetation, and waste management.
Methodological solutions to reduce impacts	The resource recovery methods of the new phase of operations will take advantage of the old mine workings to minimise environmental impact from the new ones. The type of treatment planned at site is only for pre-concentration of the ore body and the use of potentially polluting materials in this part of the flowsheet is minimal. Exploration methods included: site surveys, surface geophysics, construction of exploration galleries.

2.8.5 Stakeholder engagement and communication

Previous consultations

In accordance with article 8.1 of the Law on Environmental Impact Assessment of Projects, approved by Royal Legislative Decree 1/2008, January 11, the responsible Environment Agency conducted a prior consultation with both the responsible public administrations and other stakeholder organisations, to determine the scope and level of detail of the requisite EIA. The reports received were sent to the mine operator for consideration and drafting of the EIA Scope of Work (see Table 55).

Public information

In compliance with the provisions of the EIA regulations, the Project Work Plan and the accompanying EIA were submitted for formal public review scrutiny, managed by the officers of the Territorial Service of Industry, Commerce and Tourism of Salamanca. An announcement was published in the «Boletín Oficial de Castilla y León» soliciting feedback from the public and subsequent comments, concerns and independent reports received by the officers were then forwarded to the mine operator, who then responded to all the points raised (See Table 55).

Table 55 – Good practices in Stakeholder engagement and communication.

Aspects	Description
Consultation	The project team conducted formal regulatory consultation and informal stakeholder engagement procedures as required by law. There were regular meetings at Barruecopardo Town Hall with the authorities of Barruecopardo itself and the neighbouring communities. The local communities did not oppose the mine due in part to Barruecopardo's cultural history of mining past and in part because of the prospect of new sources of employment. The NGO SEO/BirdLife opposed the project because in their opinion it would have significant adverse impact for protected bird species such as the Black Stork or the common vulture.
Benefit to community	Rental and/or purchase of municipal and private land. Contribution of annual taxes.

	Hiring employees from the community with consequent economic stimulus to the area. Collaboration with the Town Hall and the local school in the organisation of community events.

2.8.6 Concerns/disputes

In 2013, the NGO SEO/BirdLife requested the government of Castilla y León to issue an unfavourable impact statement for the mine due to its serious environmental impact. According to the NGO, the opening of the mine would have a great impact on the protected species. They pointed out that the entire mine area was located in the Arribes del Duero SPA which is part of the Natura 2000 Network. In the opinion of SEO/BirdLife, the project was incompatible with the conservation of the protected area and should have demonstrated the absence of alternatives and the need to carry out the project for compelling reasons of public interest of the highest priority (SEO Birdlife, 2013; Europa press society, 2013).

In 2015, the IU-Equo political parties criticised the urgency of the government of Castilla y León in granting the licence to reopen the Barruecopardo mine. Their intention was to present a parliamentary initiative to stop the mine project, arguing that it would have negative consequences on the economy of the area and the public health of the neighbouring communities as well as the environment. They also drew attention to the lack of experience of the company in charge of mining operations and the low price of the target metal (El Mundo, 2015).

By contrast, the Barruecopardo mine has been positively accepted by the local community for its socio-economic development benefits. The new mine is in a region that already has more than 400 extractive activities (Mireu, 2021) and to some extent the historical operation of the mine has caused environmental impacts which would be remediated by the new operations (Ecoticias.com, 2017).

The operation consequently passed the permitting procedures, received an operating licence and is operational. Appropriate risk mitigation measures were put in place (Méndez Álvarez,2017) and there is independent evidence that the mine has brought social and economic benefits to the local community, for example by employing staff from the surrounding area (Etxarri,2020).

2.8.7 Enablers

Key enablers of the Barruecopardo project are shown in Table 56.

Table 56 – Barruecopardo project key enablers.

Historical deposit	The site had a long history of mining activity that was well accepted by the community despite some negative impact to the environment in the past. Remediation of these legacy issues was included in the new project.
Focus on certain species and their habitat	Attention was given to preserve certain species habitat.
Methodological solutions to reduce impacts	It was decided that only part of the mineral processing happens on site, to reduce the environmental load.
Consultation and creation of an entity responsible for the nature protection area	Community and authorities have been engaged in regulatory and volunteer consultation.

2.9 Sweden – Mertainen mine and Våmb quarry

Two complementary cases are analysed:

- an area with different mining activities at different life cycle stages, adjacent to Nature 2000 sites (Mertainen and neighbouring mines, Table 57);
- a limestone quarry (Våmb, Table 58).

2.9.1 Case overview

The first case relates to an aggregated area comprising four mine workings in distinct stages of the mining life cycle. The common features are:

a. that they all have been granted permits in relation to in or adjacent to Natura2000 areas;

b. that their differing operations do not negatively affect the Natura2000 areas.

Table 57 – Mertainen - Case study summary.

Name	Northern Sweden polymetallic case
Country	Sweden
Region	Västerbotten and Norrbotten counties.
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Cu Liikavaara (Boliden), Cu and Zn (Blue Lakes Minerals, Stekenjokk, Liikavaara), precious metals (gold – Vindelgransele mines), iron ore (LKAB – Mertainen).
Open pit or underground mine	Open pit and underground (Vindelgransele gruvor, Stekkenjokk).
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Operation (Mertainen), commencement of operation (Liikavaara, Fäbodtjärn/ gruvor), application for mining and environmental permits (Blue Lake Minerals).
Period of activity	This is an aggregation of four different projects with a commonality of achieving Natura2000 permits. In three of the cases all the permits for starting a mining operation have been achieved. The fourth, Stekenjokk, is seeking a complete set of permits and in moving towards this goal has already been granted a Natura2000 permit. One further permit has resulted in an operating mine, while the Mertainen, Liikavaara and Vindelgransele gruvor are in the process of building the industrial infrastructure areas to start mining.
Companies involved	LKAB, Boliden, Botnia Exploration, Blue Lake Minerals (Vilhelmina Mineral AB).
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	Natura2000 areas.

Mertainen mine

The Mertainen mine is a project owned by the mining company LKAB. The mine site, which covers about 720 ha, is located in northern Sweden, near the town of Kiruna and the village of Svappavaara. It produces high-quality magnetite iron ore and apatite as a sub-product. The mineral deposit of magnetite in Mertainen was discovered in 1897. Mining concessions, according to historic mining law, were granted in the early 1900s. In 2000, in conformity to the Minerals Act (1991:45), the former mining “concessions” such as the then named concession K nr 1-3 now known as Mertainen, were transformed into mining “licences”.

Further exploration work has been done by LKAB since 2000, including a pilot mining operation of 380,000 tonnes in 2011. The Geological Survey of Sweden (SGU) declared Mertainen a mineral deposit of national interest in 2011. The environmental permit required for mineral extraction under the Swedish Environmental Code was issued by the regional Land and Environmental Court of Appeal in 2014 but production was put on care and maintenance in 2016 due to low commodity prices. During 2021, commodity prices increased again, and production restarted in October 2021, producing 1 million tonnes of iron ore. The mine has been closed since March 2022 but is kept on stand-by in anticipation of higher iron prices.

The Mertainen mine (Figure 33) used open-pit mining methods to extract ore. The ore was then processed on-site using crushing, grinding, and magnetic separation, and the concentrate was transported to LKAB's processing plant in Kiruna.

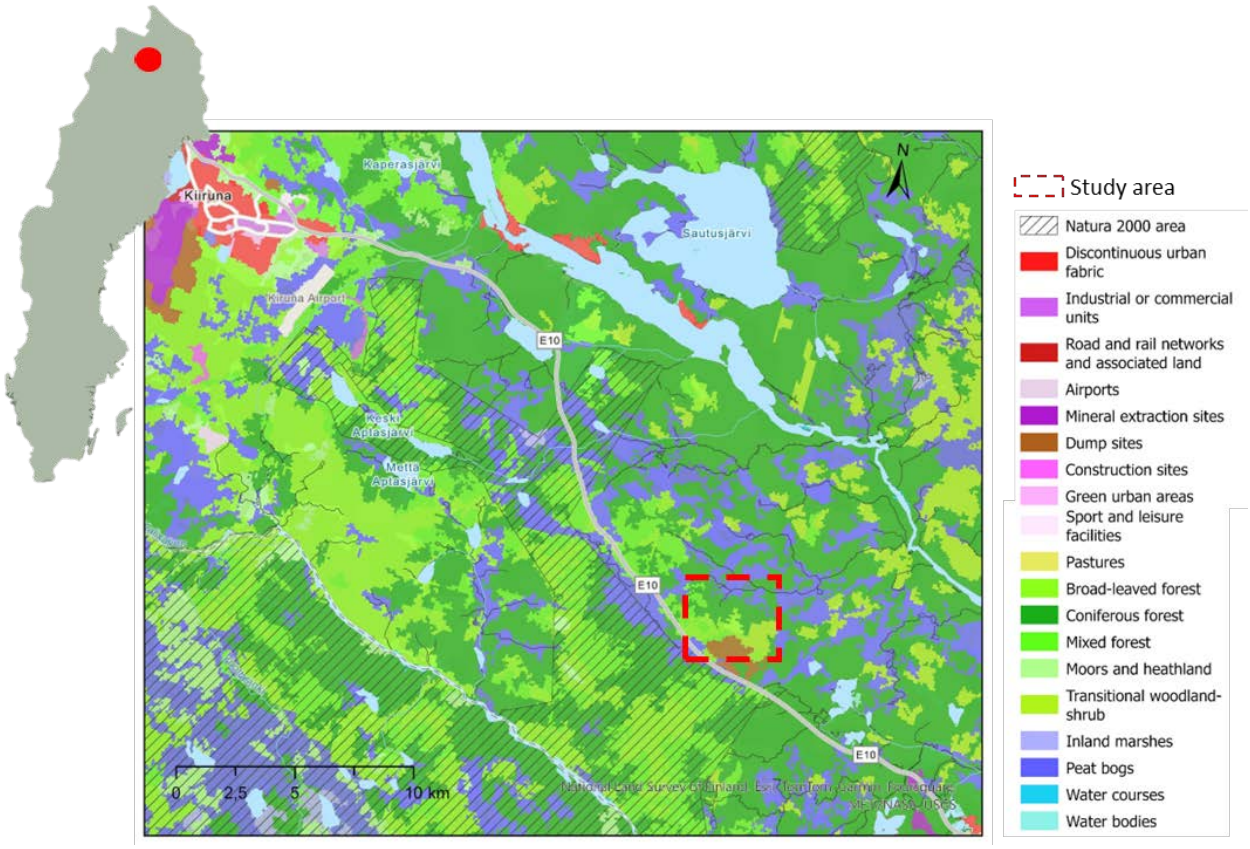

Figure 33 – Overall geographical localization of Mertainen mine. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and extractive activity area.

There are several protected areas adjacent to the Mertainen mine in Norrbotten, Sweden (Figures 33, 34). One of the closest is the Aptasvare fjällurskog which is located at the southern and western sides of the mine. There are also several smaller nature reserves and conservation areas in the region, including the Sjaunja and Stora Sjöfallet Nature Reserves. These are located to the south-west of the Mertainen mine and are both home to a variety of flora and fauna important for maintaining the ecological integrity of the region. Several Natura 2000 sites are located in the surrounding area, such as the Torne and Kalix River system and Rautas just to the south of the area. But none of the protected areas is in the direct vicinity of the mine.

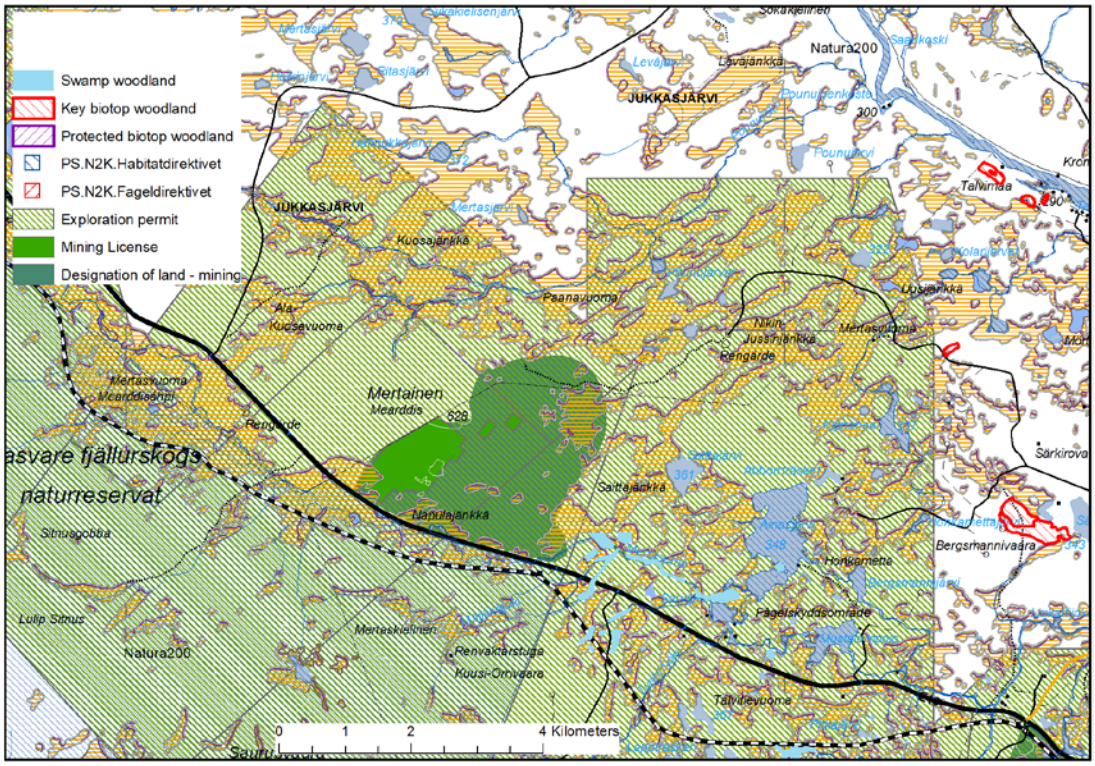

Fig. 34 – Mertainen area with areas for mining license, and Natura200 areas in detail.

The area surrounding Mertainen in northern Sweden is characterized by a mix of boreal forest and wetlands. The forest in the region is dominated by pine, spruce and birch, with occasional areas of aspen and rowan. The wetlands in the region are extensive, with large areas of peat bogs, fens, and marshes. The region is also known for its rich wildlife, including moose, reindeer, brown bears, lynx and wolves, as well as a variety of birds and fish. The natural conditions in the area around Mertainen are considered to be important for the region's ecological health and biodiversity, and efforts have been made to minimize the impact of the mine on the surrounding environment.

Liikavaara

The project aims to open an open pit copper mine at Liikavaara, adjacent to the large porphyry copper mine Aitik. Extraction is planned for about 57 Mt of ore. The land is used for forestry, it has a main highway, Natura 2000 areas, hosts a village community, is classified as national interest for mining and has exploration permits (Figure 35, 36). Exploration permits are considered a parallel activity with other land uses and not seen as a major infringement on other land uses.

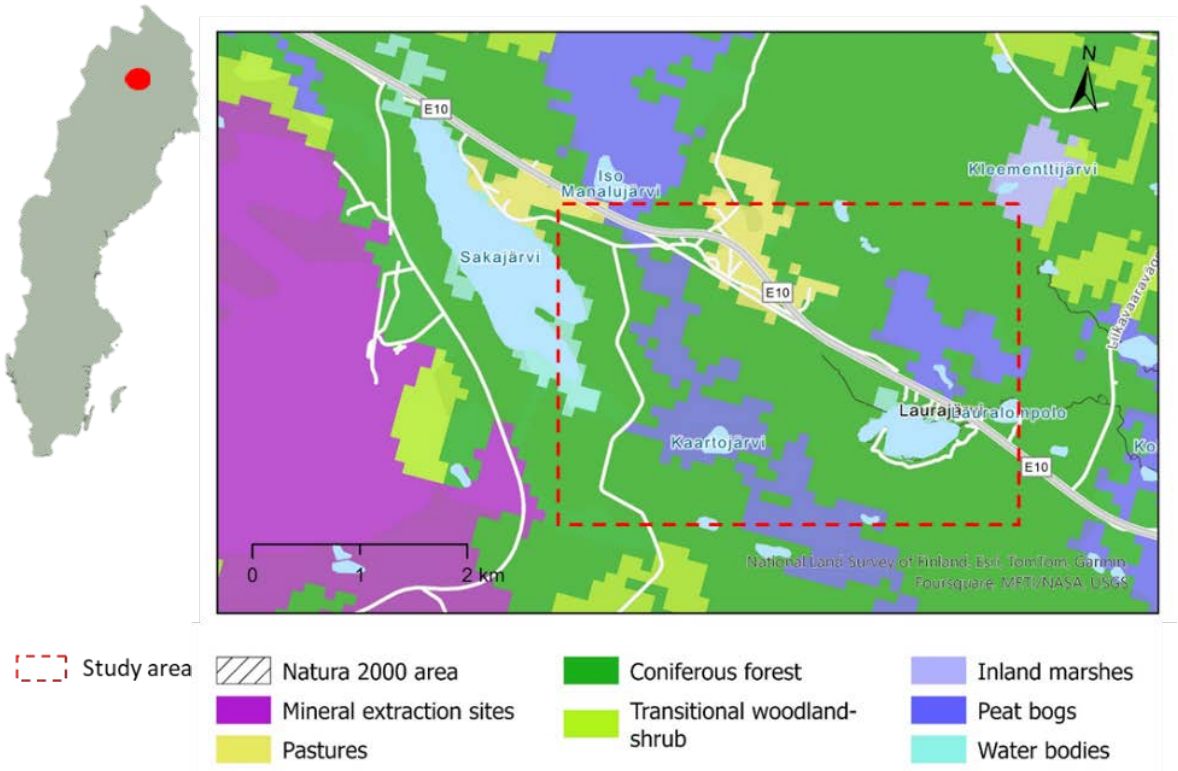

Figure 35 – Overall geographical localization. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and study area.

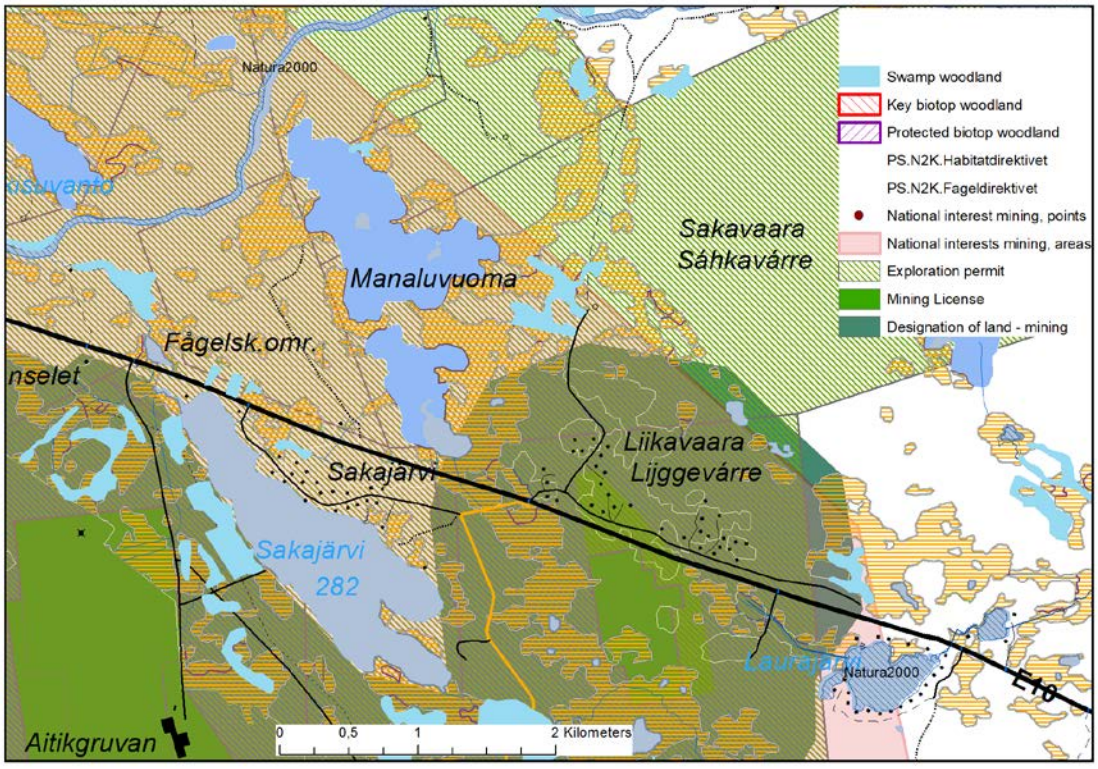

Figure 36 – Liikavaara. Map depicting exploration permits, mining license, Natura2000 areas in detail.

Vindelgransele

The project plans to open two small-scale gold mines at Vindelgransele, Västerbotten County, Sweden (Figure 37). The area is situated at the fringe of the Skellefte mining field and in close vicinity to one of the few non-exploited major and also protected rivers, Vindelälven. There is one village in the locality, Vindelgransele. Major mining operations at the Kristineberg mine 20 km to the east are managed by the Boliden company (Figure 37).

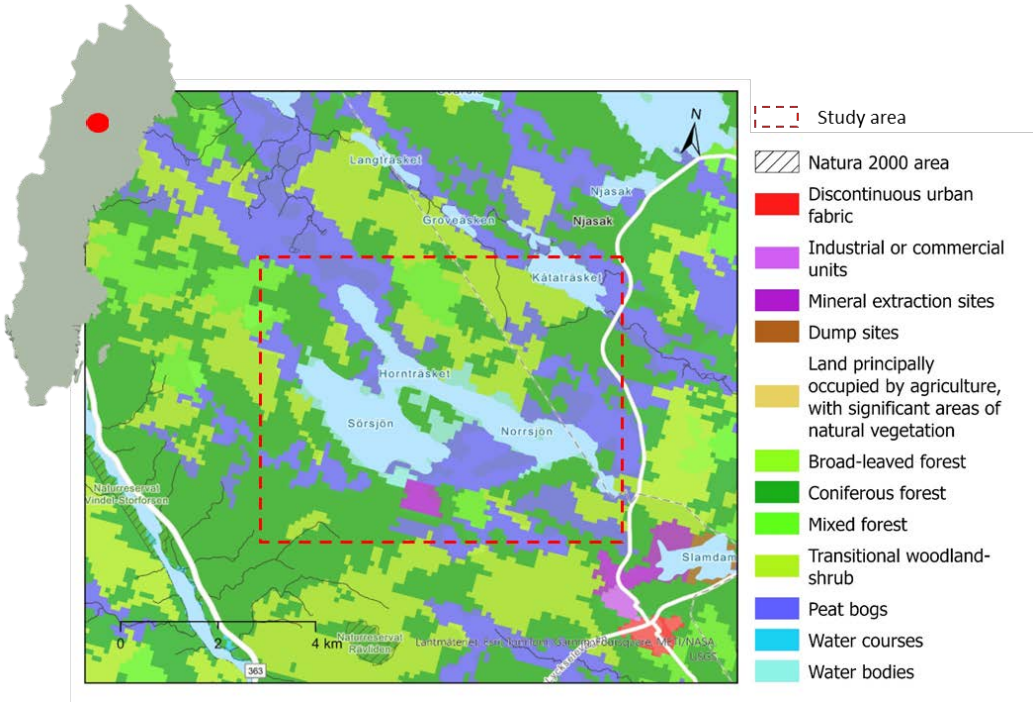

Figure 37 – Overall geographical localization. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and study area.

The area is used for forestry, reindeer husbandry and there are farmlands and a village nearby. A major road runs beside the river and minor roads which are also used for timber transportation connect to the surrounding villages. The land hosts a Natura2000 protected river and some other areas of a sensitive nature.

The two proposed mining sites are Fäbodtjärn and Vargbäcken (where comminution and beneficiation will take place). Initially, extraction will take place at Fäbodtjärn and then in a later stage expand to Vargbäcken. Processing of the ore may also take place at other sites not just those part of the project.

The project has been granted mining licences and an environmental permit.

The Fäbodtjärn has currently mineral reserves of 116 ktonnes (7.7g/t Au) and mineral resources of 86 ktonnes (5.9 g/t Au). Vargbäcken has over 2 Mtonnes of mineral resources (Botnia Exploration Holding AB, 2022).

The land is used for forestry, a main highway, Natura 2000 areas, village community, is designated of national interest for mining and issues exploration permits. It also hosts an important habitat in the unexploited Vindelälven river. Exploration permits are considered a parallel activity with other land uses and not seen as a major infringement on other land uses. The area hosts reindeer herding.

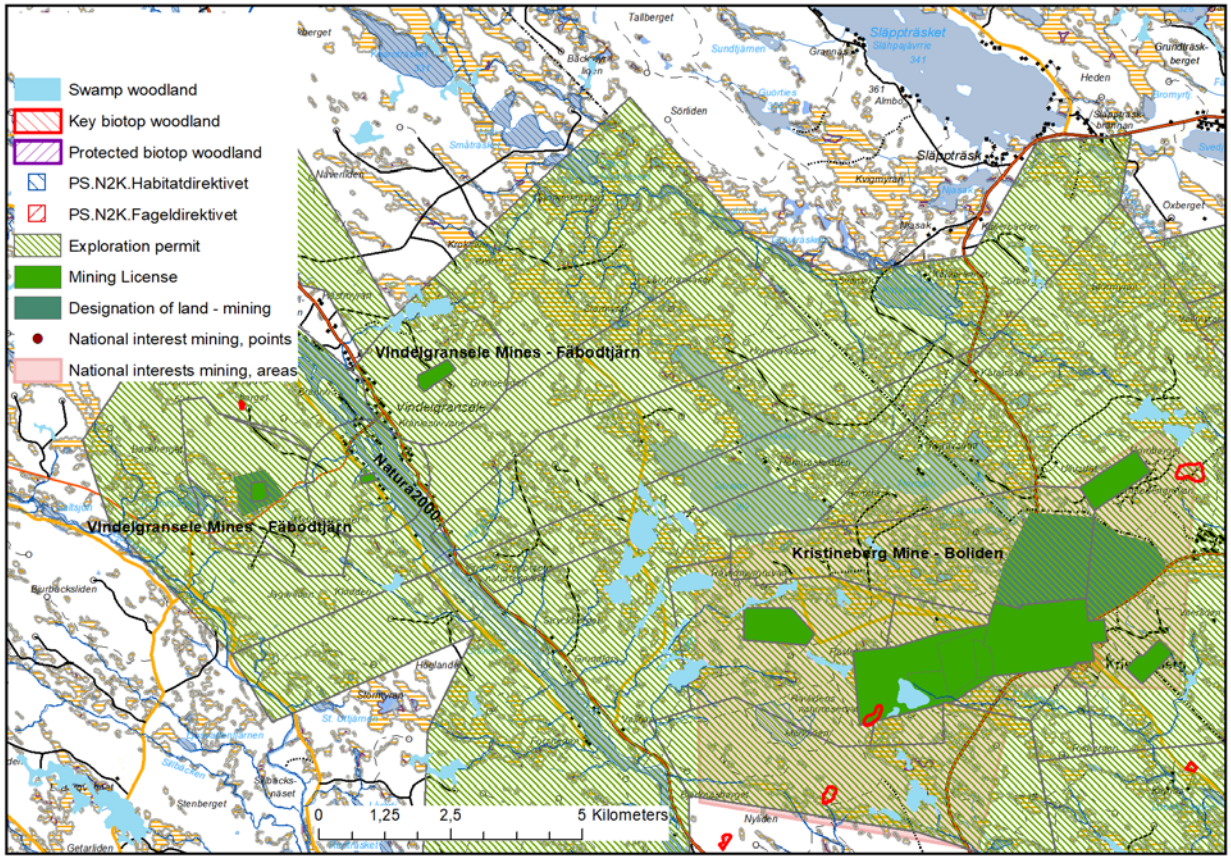

Figure 38 – Vindelgransele Mines - Fäbodtjärn.

Stekenjokk mine

The Stekenjokk copper mine is located in north-west Sweden (Figure 39). It is located in Vilhelmina municipality and was opened in 1976 by Boliden Mineral AB. From 1976 to 1988, Boliden recovered around 7.1 million tonnes of copper and zinc ore from the mine. The remaining ore reserves are estimated to be ~7.4 million tonnes.

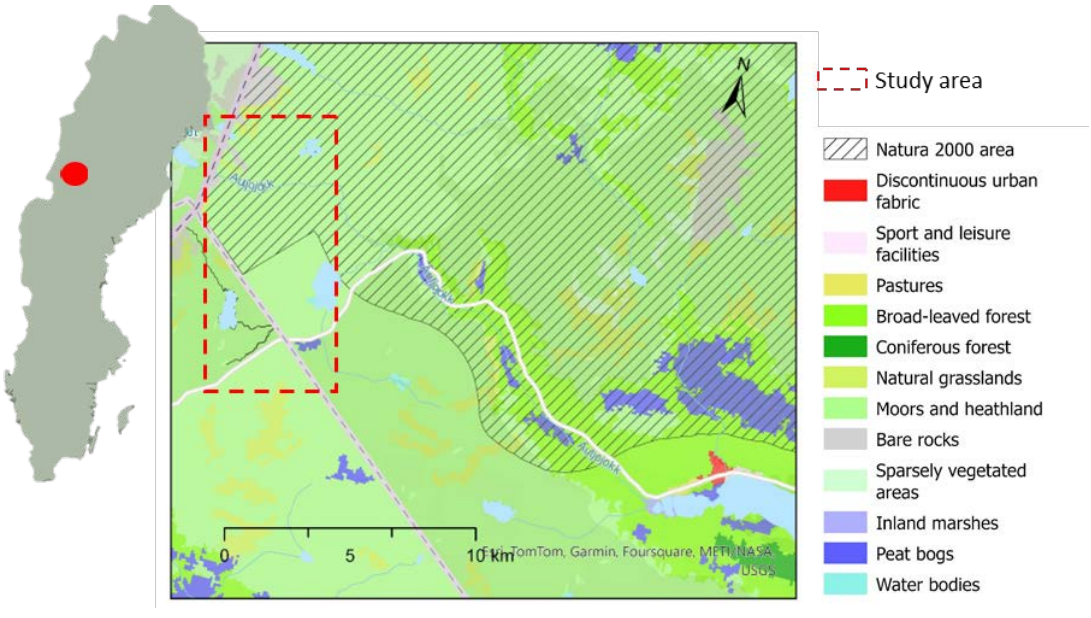

Figure 39 – Overall geographical localization of Stekenjokk mine. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and study area.

In 2011, Bluelake Mineral AB's subsidiary, Vilhelmina Mineral AB, submitted an application to the Swedish Mining Inspectorate (“Bergsstaten”) for an exploitation concession for copper and zinc deposits in the Stekenjokk area. The application was later modified to include a processing concession. After consultations in 2013, both the Chief Mining Inspector (“Bergmästaren”) and the County Administrative Board in Jämtland (CAB J) suggested rejection of the application because it is "one of the most important areas for reindeer husbandry in the county". This refusal was appealed by the company. The municipality of Strömsund approved of the mining because it would "provide more jobs and a stronger business life". According to Vilhemina Mineral, the mine could provide 150 jobs. The County Administrative Board in Västerbotten (CAB V) expressed its concern about the proximity to the Natura 2000 area *Vardo, Laster and Fjäll* mountains.

In order to minimise or completely avoid any negative impact on local reindeer husbandry, in 2017 the company developed an alternative which involves:

- underground mining during the period November/December to April/May, i.e. when reindeer are not normally present in the area
- coarse crushing underground with subsequent transport of the ore to Joma in Norway to be enriched. Production of concentrate and disposal of residual products will also take place in Joma.

These adjustments to the application meant a reduced land claim and that the company no longer needed to manage a new Tailings Storage Facility (TSF) (Golder Associates, 2017).

The CAB J approved the concession for Stekenjokk in May in 2019. In its opinion on the alternative proposal with half-yearly breaks, the CAB J maintained its position and assessed that coexistence with the reindeer industry was now also possible. The CAB J proposed that the concession could be granted on the condition of protecting reindeer husbandry and also submitted proposals for the wording of permitting conditions.

Later that May, the Mining Inspectorate requested that the company supplement its application due to the comments of the CAB V regarding the Natura 2000 area of the *Vardo, Laster and Fjäll* mountains. CAB V stated in its comments that the company should further evaluate the assessed impact on designated habitat types and species in the area and the potential impact on the current "favourable conservation status” classification of these sites. In addition, the impact on water temperatures and the flow regime should be evaluated.

An investigation was undertaken in late May between CAB V and the company and a consultative report was submitted in July to CAB V. CAV V then announced that a Natura 2000 permit would be required for the concession to be approved. In June 2022, CAB V decided to grant Vilhelmina Mineral AB permission according to chapter 7. Section 28a of the Swedish Environmental Code for mining activities in connection with and within the specific Natura 2000 area in Vilhelmina municipality. The decision was open for appeal for five weeks until July 7, 2022. The permission was appealed by Vilhelmina Southern Sámi village within the statutory time, but this was later withdrawn. In June 2022, CAB V decided that the company could be granted a permit for mining operations in connection with and within the Natura 2000 area *Vardo, Laster and Fjäll* mountains. Bluelake Minerals' EIA thus met the requirements of the Environmental Code, which results in the grant of a permit valid for the next 30 years (se Figure 40). The decision entered into law during the fourth quarter of 2022, which means that it cannot be appealed.

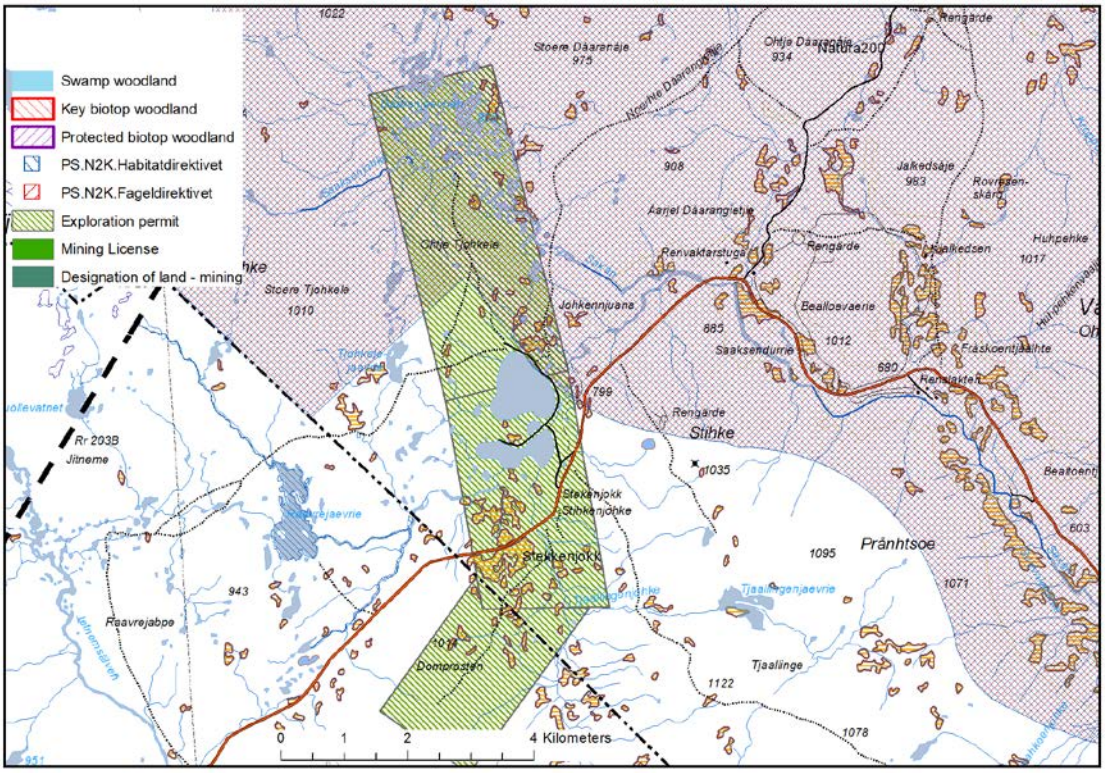

Figure 40 – Map of the permits and protected areas in Stekenjokk.

Stekenjokk is a remote area located in northern Sweden, characterised by a subarctic climate and mountainous terrain (Figure 39, 40). Natural background conditions there can vary depending on the specific location and environmental factors. Stekenjokk is located in a watershed area where the rivers and lakes are fed by snowmelt and precipitation, the water being generally clean and clear, with low levels of dissolved minerals.

The vegetation in Stekenjokk is dominated by low-growing shrubs such as dwarf birch and willow, along with mosses and lichens. The tree line is at around 800-900 meters above sea level: above that altitude the landscape is characterized by barren rocky terrain. The fauna in Stekenjokk is relatively diverse, although it is mainly limited to cold-tolerant species that are adapted to the harsh environmental conditions. Mammals represented in the area include reindeer, moose, red fox, arctic fox, wolverine and brown bear. Smaller mammals such as stoat, weasel, and lemming are also found.

There are no permanent villages or settlements located in the Stekenjokk area but some small cabins and shelters that are used by hikers, hunters, and fishers during the summer months. The nearest settlement to Stekenjokk is the village of Klimpfjäll, which is located approximately 30 kilometers to the south. Klimpfjäll is a small village that serves as a hub for outdoor recreation in the area, with a range of services and amenities available to visitors, including a grocery store, gas station, and several tourist accommodations.

Vardo, Långfjället and Fjäll mountains were designated a Natura 2000 site in the late 1990s due to their unique biodiversity and inherent natural value. The area is characterised by a complex landscape of high mountains, deep valleys, and forests, which provides habitat for a range of rare and endangered species.

Vårnb quarry, Cementa

The second case study relates to limestone mining operation providing feedstock for cement production in the nearby Cementa/Heidelberg Materials Skövde plant (Table 58, Figure 41,42).

Table 58 – Vâmb quaryy - Case study summary-

Name	Vâmb quarry, Cementa, Skövde
Country	Sweden
Type of mineral resources? (primary commodities and associated commodities)	Limestone
Open pit or underground mine	Open pit
Stage of life cycle	Operation
Companies involved	Cementa / Heidelberg group

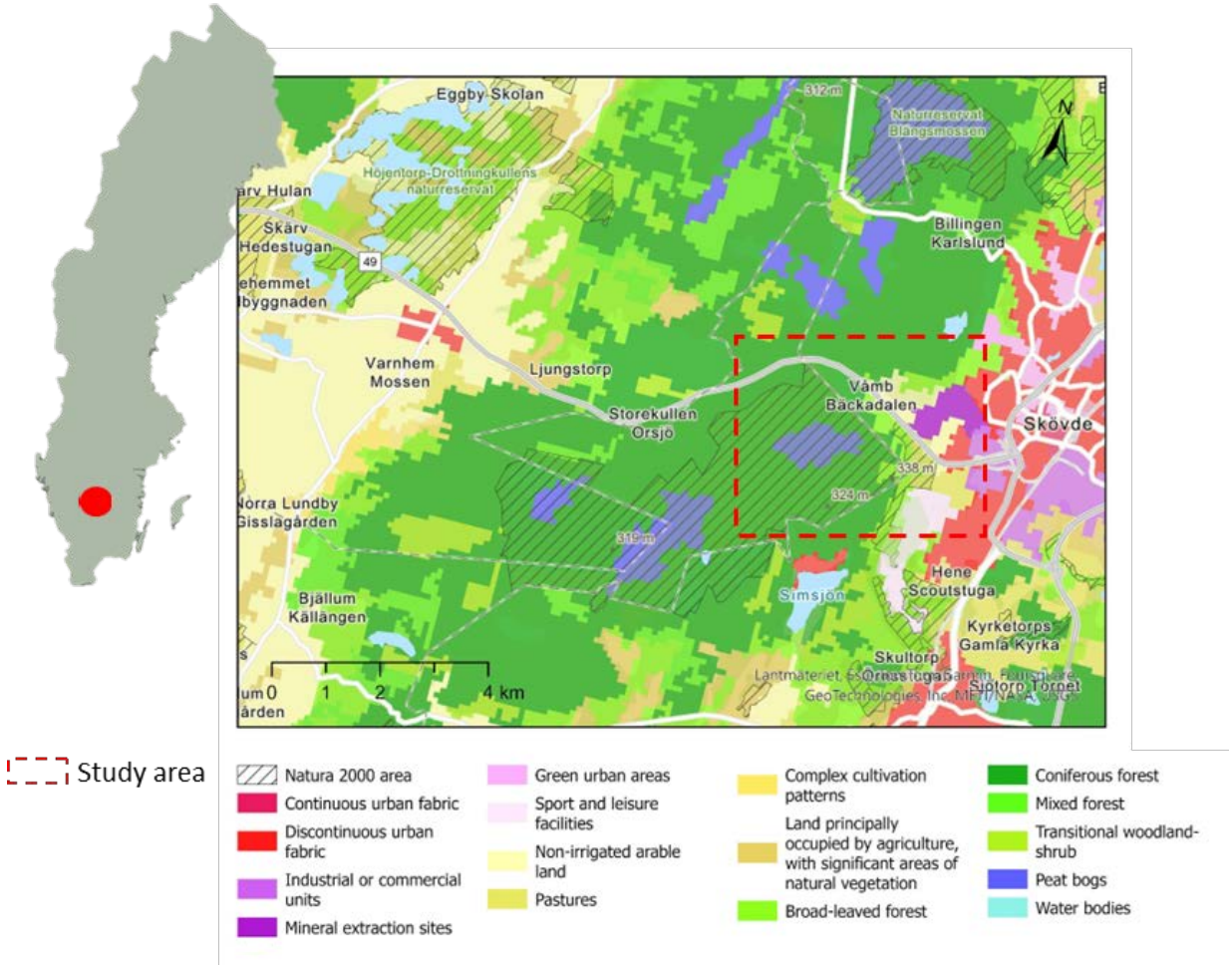

Figure 41 – Overall geographical localization. Corine Land data cover classification 2018 + Natura 2000 map (EEA) and extractive activity area.

Figure 42 – Våmb Quarry, Skövde, Sweden, operated by Cementa/Heidelberg Materials.

Previous land use in the area includes farming, forestry and rural residences. Adjacent land use typology includes farming, forestry, nature protection, transportation, as well as both planned and informal rural residential areas.

To some extent there is, and has been, conflict in the domain of nature protection, stimulated as the quarry expands its footprint into areas with different kinds of designated biotopes/habitats. Expansion also impacts an “Area of national interest for nature conservation” (“Riksintresse för naturvård”) and an “Area of national interest for outdoor recreation” (“Riksintresse för friluftsliv”).

The impact on residents living in the vicinity of the quarry has likewise been addressed. Next to the quarry, to the south, there is a Natura2000 habitat (“Klasborgs och Våmbs ängar”), separated from the quarry by regional road 49 connecting the cities of Skövde and Skara (Figure 43). There are several other smaller or larger nature reserves and Natura2000 areas within a 10 km radius.

Environmental impact on the surroundings including Natura2000 area has been determined and includes measures for handling water runoff and cleaning so that no negative impact occurs. The remediation plan for the quarry after closure aims to create a varied environment and topography, in part dressed with stockpiled overburden (topsoil) containing many different elements, to diversify the habitats of the local cultural and natural landscape to maximise biodiversity. Measures include building stonewalls (common element in the local rural landscape), creating a wetland area/small pond, preserving some rock crests and steep scree slopes, while leaving an area with weathered barren limestone rock with no topsoil present (“Alvarmark”), described as “Nordic alvar”, code 6280 in the EU habitats directive).

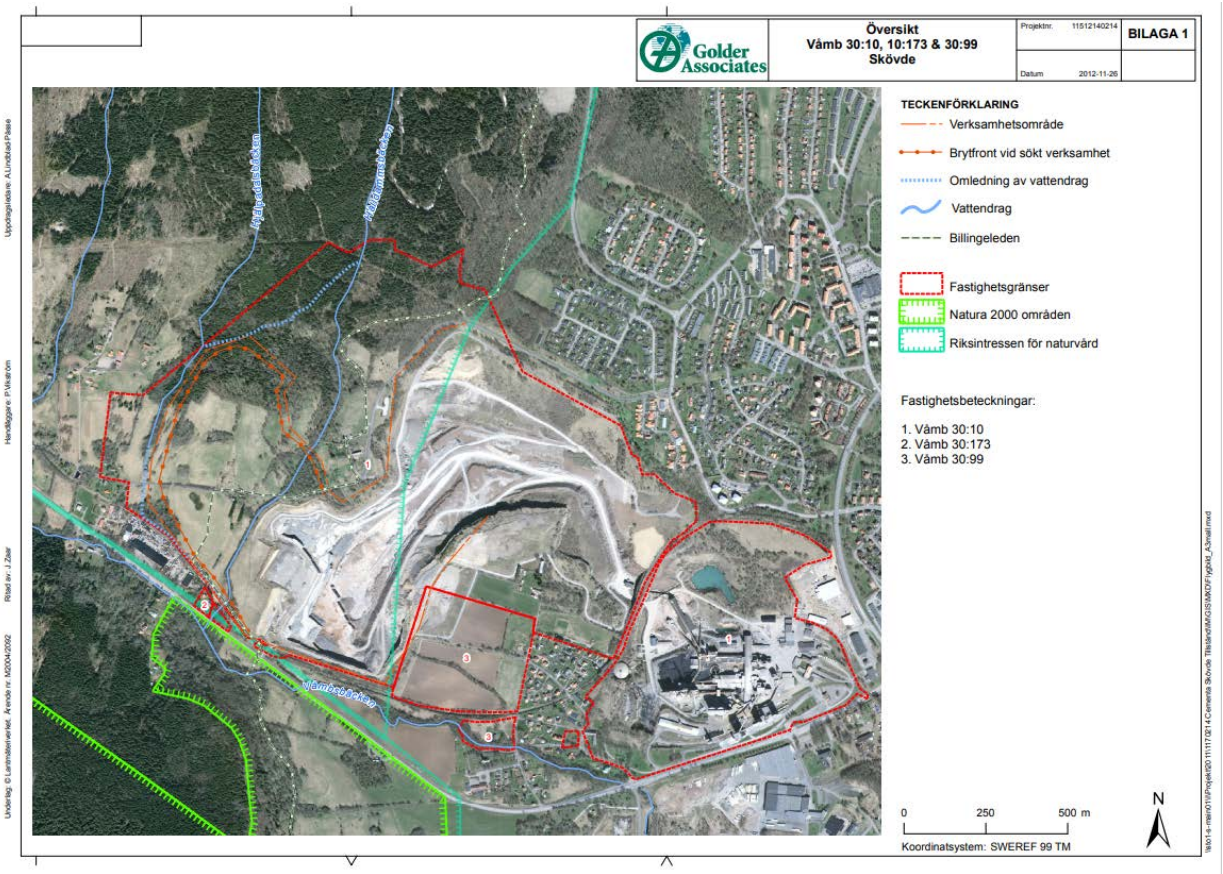

Figure 43 – Land use (map courtesy of Golder associates).

2.9.2 Spatial planning

In Sweden, spatial plans are indicative at national and regional levels, while at local level approval of plans is subject to binding regulations (Table 59). The land use planning process is guided by a set of national planning principles that emphasise the importance of sustainable development, public participation and environmental protection. National planning principles also recognise the importance of regional cooperation and coordination in addressing land use issues that cross municipal boundaries.

Table 59 – Spatial planning organisation.

Level	Duties
National land use objectives	The state provides national objectives that act as guidelines for regional and local planning. Strategic land use is partly defined by the instrument National Interests, which consists of specific land use objectives including Natura 2000 and minerals (where objective is use for extraction at some future point). The identification of areas of national interest is done at this level by different authorities appointed for their expertise in respective area. Geological Survey of Sweden assess mineral deposits of national interest.
Regional development strategy	Detailed regional spatial planning is not compulsory outside Stockholm regions, but at regional level there can be regional development strategy including spatial aspects and addressing land use. County Administrative Boards are responsible for this part.
Municipal plan	The municipalities have two land use plans. Firstly, strategic land use plans, so-called comprehensive plans and secondly detailed land use plans, so-called

	detailed zoning plans that include area regulations and detailed development plans that comprise zoning. This is normally only for the developed areas of the municipalities. The municipalities are normally by EU standards rather large with large areas covered by forestry, farming, and other activities that are usually only planned on the strategic level. The municipality regulates the basic characteristics of its land and water use.

In Sweden, land use planning is the responsibility of the municipalities, each municipality is responsible for developing its own comprehensive plan ("översiktsplan") for strategic land use that sets out the long-term vision for land use and development in the area. The comprehensive plan is a legally binding document that guides decisions related to zoning, building permits and other land use issues. Legislation of reference is the Planning and Building Code.

The comprehensive plan is developed through a participatory consultation process with stakeholders, including local residents, businesses and interest groups. This process typically begins with an analysis of existing conditions and an assessment of future needs and trends, such as population growth, economic development and environmental concerns. Based on this analysis, the municipality develops a set of goals and policies related to land use and development, which are then incorporated into the comprehensive plan.

One of the tools to develop the comprehensive, strategic land use plan is to balance various national interests for the best land use. Areas "of national interest" are those defined in 12 different categories of which minerals is one. The strategic land use for minerals, including managing mineral deposits of national interest, is the responsibility of the Geological Survey of Sweden. Natura2000 areas and reindeer herding are other related and sometimes conflicted national interests. The legislation is found in the Environmental Code chapter 3 and 4 (SGU, 2020).

In addition to the comprehensive plan, municipalities also develop detailed zoning plans ("detaljplaner") that specify the permitted land uses and building regulations for specific areas within the municipality. Zoning plans are more detailed than the comprehensive plan and but are likewise developed in consultation with stakeholders and affected landowners.

Overall, the land use planning process in Sweden is characterised by a high degree of transparency, public participation, and collaboration among stakeholders, which helps to ensure that land use decisions are responsive to local needs and concerns while also promoting sustainable and equitable development.

The Swedish National Board of Housing, Building, and Planning ("Boverket") provides guidance and support to municipalities and other planning authorities in implementing sustainable development principles in their planning processes.

Designation procedure for Natura 2000 protected sites.

In the first establishment of Natura 2000 area the Government requested to the Swedish Environmental Protection Agency to provide a list of sites. This was seconded to the county administrative boards, who included areas already listed for nature protection and did not require consultation. Today County boards are responsible for developing proposals for new Natura 2000 areas. It is the areas that have the highest natural values and that contribute in the best way to the network that will become Natura 2000 areas. The provisions of the EU habitat and bird directives are implemented in Swedish legislation through the Environmental Code and in the regulation (1998:1252) on protected areas in accordance with the Environmental Code. There are approximately 4,000 Natura 2000 areas in Sweden, with a total area of just over 6 million hectares or approximately 15 percent of Sweden's surface. In the selection process of Natura 2000 areas a consultation of local municipalities, landowners and relevant authorities is performed. The areas are evaluated by the National Environmental Protection Agency (EPA), after which the government can propose to EU commission. County Administrative Boards suggest to EPA that then makes the review and makes suggestions to the government.

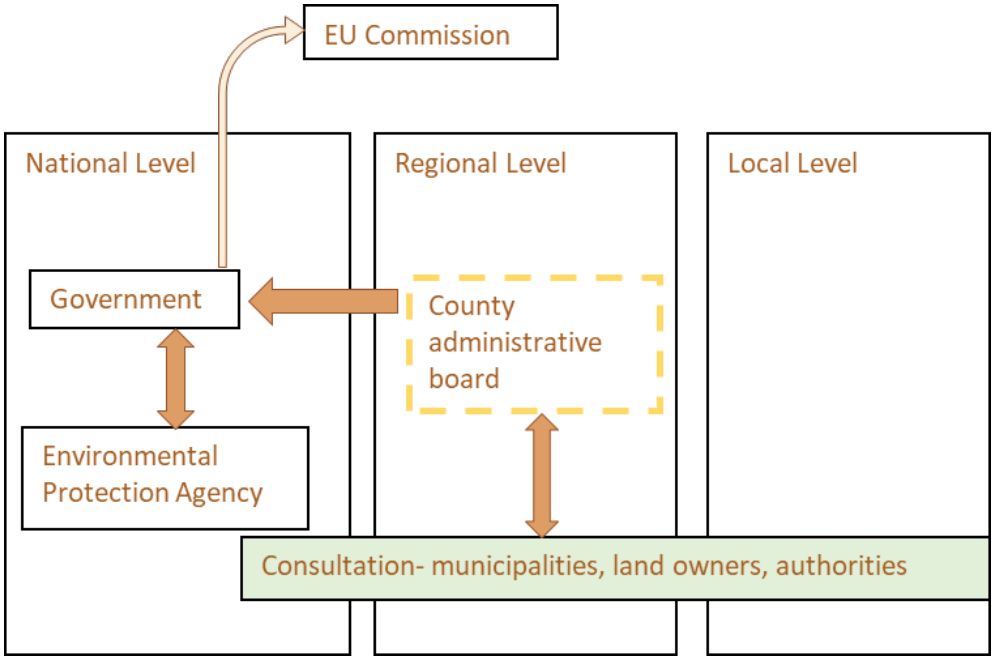

Figure 44 – Formal procedure for designating protected areas.
Terminology in Swedish: Local municipalities ("kommun"), (Regional) county administrative board, CAB ("Länsstyrelsen"), The Environmental Protection Agency, EPA ("Naturvårdsverket")

The Swedish EPA (national authority) coordinates the protected site designation process with Natura 2000 while the County Administrative Boards (regional authority) manage the care, maintenance, and protection of the site. Measures concerning forest lands are managed by the Swedish Forest Agency (national authority) whereas nature reserves are managed by municipalities. County Administrative boards (CAB) are responsible for producing proposals for new Natura 2000 areas and the ensuing approval process involves stakeholder engagement before the Swedish EPA takes a final decision on protection.

The Natura2000 Rautas site was designated in accordance with the rules and methods specified by the EU and includes the identification of species regulated under the Habitats Directive and the Birds Directive. Once the site had been selected as a Natura 2000 area, it was formally designated as such through a legal procedure. This involves formally notifying the European Commission of the site's designation and publishing its boundaries in the national gazette (Swedish EPA database). The Rautas Natura 2000 area was designated in May 2000. The iron ore deposit at Mertainen was discovered in 1897[6] and briefly mined from 1968-58 which means that the ore deposit at that site was known long before the Natura 2000 site was delineated.

In Liikavaara, the natural system-based boundaries have been defined taking into account run-off areas to protected rivers (Lina River) and river systems (Kalix and Torneå rivers) and sensitive environments bounded by water and/or water run-off areas.

In Vindelgransele there was prior knowledge of valuable mineral deposits hosted there but the Natura2000 was developed before the national interest on mining. Timing in this case would not have an impact on Natura 2000 decision.

Vardo, Långfjället, and Fjäll mountains, was designated as a Natura 2000 site due to its unique biodiversity and natural values. The area is characterized by a complex landscape of high mountains, deep valleys, and forests, which provides habitat for a range of rare and endangered species.

[6] See https://www.minland.eu/wp-content/uploads/08_sweden_minland_factsheet.pdf

The process of designating the Vindelfjällen Nature Reserve as a Natura 2000 site began in the late 1990s, when Sweden submitted a list of potential sites to the European Commission for consideration. After a period of consultation and evaluation, the area was officially designated as a Natura 2000 site in 1998.

Before the Vindelfjällen Nature Reserve was designated as a Natura 2000 site, a series of assessments were conducted to evaluate the area's biodiversity and natural values. These assessments were necessary to determine whether the site met the criteria for designation under the EU's Birds Directive and Habitats Directive. The assessments included a thorough inventory of the area's habitats, vegetation, and wildlife, as well as an analysis of the threats and pressures affecting the site. The information gathered through these assessments was used to develop a management plan for the area, which outlines the conservation measures necessary to protect and enhance the site's natural values (Table 60).

For the limestone quarry, the nearest Natura 2000 area, “Klasborgs och Vånbs ängar” is delimited by the road 49 (Skövde-Skara) on the north side. On the western Natura2000 border, a change in geology (different bedrock type) and resulting change in topography and vegetation/land use marks the habitat perimeter. During the environmental impact assessment connected with the current extraction permit, mapping, and evaluation of e.g. habitats, endangered species, elements of cultural and historic value has been performed by professional expertise.

Table 60 – Good practices in spatial planning.

Aspects	Description
Presence of mineral information in the land use plans	Areas of national interest are identified at national level, including protected areas and mineral resources. All mineral resources if deemed of importance for the crown can be assigned “Areas of national interest for valuable raw materials and mineral.” Designation is made by the Geological Survey of Sweden and the object is to point out areas of national interest for raw materials supply to society and industry. When land-use is disputed between different interests the different designations will be evaluated against other competing land use. This instrument can be used in strategic and detailed land use planning also including decisions by mining inspectorate (mining licences) and by the environmental court when either granting or denying permits for extraction of raw materials.

2.9.3 Mineral governance

The right to extract concession minerals is granted by a series of permits:

- exploration permit which gives exclusive right to explore, including drilling (a plan for the exploration must be presented including of how and when drilling can be performed, in sensitive areas only specific times of the year for protection of the ground or e.g., hatching birds)
- mining licence granting rights to extract resources from the evaluated deposit
- environmental permit and Natura 2000 permits and designation of land for the extractive industrial area granting rights to extract.

Exploration and extraction permits are granted by the mining inspectorate, the EIA is handled by CAB and Environmental court.

There are two main stages to the obtaining the EIA permit. First, is the permit to access to the area for exploration and test, the so-called “Natura2000” EIA permit to determine that there should be no negative consequences due to release of hazardous substances in such an area. Second, is the submission of the full

EIA needed at the end of the application process to gain the operating licence, with all impacts described together with the mitigation and management procedures. Acceptance of the EIA and grant of the operating licence is finally decided upon by the environmental court.

If the project is shown to meet public interest acceptance criteria (for mining in a protected site) and that impacts on the protected site are either negligible or of minimal impact, the EIA permit may finally be granted. In the past few years, a full EIA has even been mandated only at the actual mining licensing stage, whereas it was originally intended to come at a much earlier point where a decision by company had been taken to apply for a full permit and where resources had been determined as sufficiently well documented to justify such a next step in the resource progression. The intention now seems to be to turn back the permitting procedure to the former state where the EIA acts as a decision-gate in the approval process preceding the actual operational work plan.

Permit procedure

The first step in permitting procedures is that the industry has reason to believe that a specific area may hold valuable raw materials.

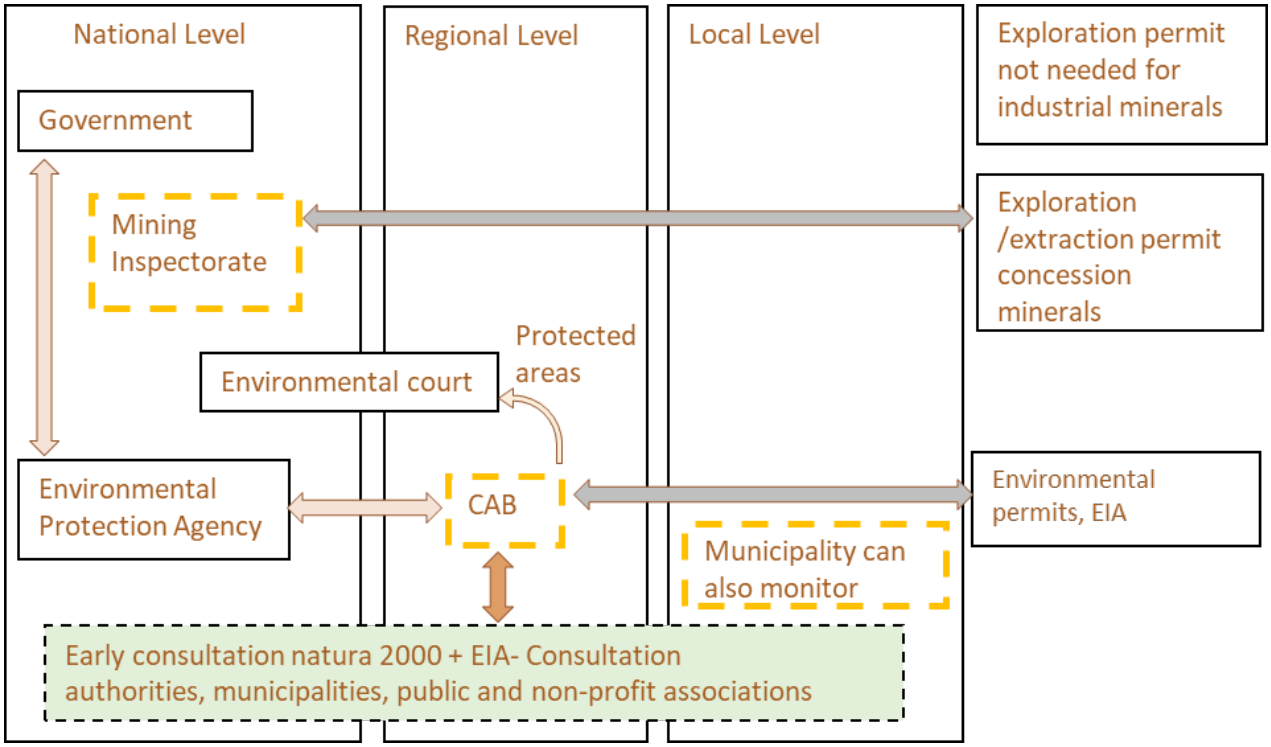

Figure 45 – Permitting procedures at varying levels of responsibility.
CAB County administrative board; Environmental court ("Mark- och miljödomstolen")
Authorities and the aspects handled:
Mining inspectorate: exploration permits, mining concession, formal access to land for mining
County Board: Natura2000 permit
Environmental protection agency, County Board: Environmental permit - EIA, environmental court

A supporting explanation as to the evidential grounds for this belief as well as an accompanying project workplan needs to be submitted for an application to be granted for receiving an exploration permit for a delimited block of land – first come first serve. The permit gives exclusive rights to exploration for the raw materials indicated in the application.

The application is submitted to the mining inspectorate (see Figure 45). Before a decision is made, affected parties or interested stakeholders are informed and these also have the right to appeal any eventual decision. Typically, exploration is not considered a major intrusion upon other land uses and permits are therefore

mostly granted. Certain activities though need agreement and /or communication with affected landowners or relevant existing land uses activities such as reindeer herding.

The competent authority for mining is the Mining Inspectorate, headed by the Chief Mining Inspector (a government appointee), who issues the permits for mineral exploration (exploration permits) and extraction (exploitation or mining concessions) for mineral deposits associated with the Minerals Act.

The local County Administrative Board (CAB) is involved in the process for exploration permits and is also entitled to comment on the application. Regarding the extraction concession procedure, the County Administrative Board takes part in the evaluation of land use issues connected to the location of the extraction area applied for 12 out of 21 County Administrative Boards may also issue environmental permits according to Chapter 9 of the Swedish Environmental Code. Regarding exploitation concessions, CAB also states if the area is appropriate for mining according to Chapter 3 and 4 of the Environmental Code in the EIA for the concession permit.

The application for an environmental permit required under the Environmental Code is handled by the Land and Environmental Court (e.g. chapter 9 and 11). If there is a risk that the exploration, mining, or other related activities may affect a protected area, such as Natura 2000 sites, or protected species, separate permits may be required. Such permits are often decided by the Land and Environment Court as part of the application for an environmental permit.

Municipalities are involved in the process for granting exploration permits and are entitled to comment on the application. The local municipality is also responsible for permissions required under the Planning and Building Act.

If a potential project is located within their territory and reindeer herding rights exist there, the Sámi Parliament (the Parliament of the Sámi indigenous peoples) may express a legally non-binding opinion or statement prior to any decision made by the Mining Inspectorate regarding the award of exploration and extraction permits. Since March 1, 2022, a new Duty to Consult came into force for governmental authorities overseeing operations affecting the Sámi indigenous peoples' culture and livelihoods. Mine permitting procedures are within the scope of this Duty to Consult. The Sámi Parliament may likewise take part in the consultation procedures for environmental permitting within the jurisdiction of the Land and Environmental Courts. Legally, they may also be a party to a specific case and under law all parties have a right to appeal a decision whether that decision comes from a court or from an administrative authority.

Decisions on both the Mining licence (by the Mining Inspectorate) and the EIA (by the Environmental Court) can be appealed to the government; and beyond that, decisions of the government can be appealed to the supreme administrative court ("högsta förvaltningsdomstolen"). The EIA can also be appealed to the highest Environmental Court.

During an application for an environmental permit, several additional public entities may take part in the process such as the Swedish Civil Contingencies Agency, the Swedish Agency for Marine and Water Management and the Swedish Environmental Protection Agency. The involvement of these entities is mainly through providing their expertise in different stakeholder sectors in negotiations within the Land and Environmental court. Applicable complementary legislation to the Mining Act and the Environmental Code are: the Planning and Building Act (2010:900), the Heritage Conservation Act (1988:950) and the Off-Road Driving Act (1975:1313), Work Environment Act (1977:1160), Forestry Act (1979:429), Civil Protection Act (2003:778), the Act on measures to prevent and limit the consequences of major chemical accidents (1999:381), and the Administrative Procedure Act (1986:223).

Most industrial minerals are treated differently from the so-called concession minerals (subject to the mineral law) but included in the concession minerals are e.g., fluorite. Industrial minerals are owned by the landowner, who also has the right to extract "non-concession minerals" (such as aggregates, dimensional stone, limestone) which belong to the landowner as well. The permitting process is not included in the mining licence but is guided by the Environmental Code ("Miljöbalken"). If the developer does not own the land in question themselves, the right to explore and extract must be regulated by a contract with the landowner.

Irrespective of ownership rights, an environmental permit is needed for any project, and in addition a Natura2000 permit is required when there is potential encroachment upon Natura2000 protected lands. The

process to apply for and obtain an EIA permit is similar to that for concession minerals. Access to and extraction from a particular site requires a formal agreement between a landowner and a mining company. But this is not necessary for concession minerals even though operators are typically careful about this aspect, either coming to a financial agreement with the Landowner on mineral rights or buying the land outright. Either way, an environmental permit is essential and the County Administrative Board is the administrative counterpart. An exploration permit is not needed for industrial minerals. Generally accpted good practices in governance and management are shown in Table 61.

Table 61 – Good practices in mineral governance and management.

Aspects	Description
Knowledge of the deposit	Mertainen mine is of the apatite-iron ore type. It was first explored in the late 1800s. After the recent exploration campaign in 2011 Mertainen was declared as a mineral deposit of national interest. Liikavaara has recently been developed by the Boliden company; it is also part of an area designated as of national interest for Minerals. Boliden has been granted a mining licence with an EIA permit and designation of land. Vindelgransele has all permits granted. Vindelgransele contains Au in veins where the focus for extraction currently is planned for Fäbodtjärn and later Vargbäcken deposits. The Stekenjokk mine was opened in 1976 and operated during the period 1976 to 1988. Copper and zinc were the main target commodities. Remaining ore reserves are estimated to be around 7.4 million tonnes. It has both an exploration permit and a Natura2000 permit, and a mining licence has been applied for Stekenjokk is a Cu-Zn sulphide deposit. Limestone deposit: The occurrence of the limestone mineral deposit was mapped in the 19th century by the Geological Survey of Sweden and was well-known. Detailed knowledge of the deposit was only available in areas subject to, or next to, quarry operations where more detailed exploration drillings had been carried out.

2.9.4 Environmental Governance

In principle, exploration work is permissible on most sites. There are exceptions: national parks are usually not accessible and for encroachment upon Natura2000 and other sensitive areas there is a case-by-case decision-making system.

There are specific regulations in Sweden that prevent or limit exploration or mining activities adjacent to, or inside, protected areas. These regulations are aimed at protecting the natural environment and the biodiversity of these sites, which may be particularly vulnerable to the impacts of mining and exploration activities.

A key regulation is the Environmental Code, which provides a legal framework for the protection of the environment and natural resources in Sweden. The Environmental Code establishes a system of environmental permits for certain types of activities, including mining and exploration, that may have significant impacts on the environment. These permits are issued by the Environmental Court and may be subject to a range of conditions and restrictions to ensure that environmental and social impacts are minimized.

In addition to the Environmental Code, there are also several other regulations and guidelines in Sweden that are aimed at protecting specific types of protected areas, such as national parks, nature reserves, and Natura 2000 sites. For example, the Swedish Environmental Protection Agency has developed guidelines for mining

and exploration activities in Natura 2000 sites, which emphasizes the need to avoid or minimize impacts on protected species and habitats.

The Cultural Environment Act (“Kulturmiljölagen”) is another key regulation that protects cultural heritage sites in Sweden. The Act establishes a legal framework for the protection and management of cultural heritage, including buildings, archaeological sites, and cultural landscapes. Under the Act, any activities that may impact cultural heritage sites, including mining and exploration activities, must be assessed for their potential impacts on cultural heritage and may be subject to permits and conditions.

Overall, the regulations and guidelines in Sweden aim to balance the economic benefits of mining and exploration with the need to protect the natural environment and biodiversity of protected areas. Mining and exploration activities may be permitted in certain circumstances, but only if they can be carried out in a way that is consistent with sustainable development principles and does not significantly harm the environment or local communities.

Since 1 July 2001, all Natura 2000 areas have been classified as “national interests” (4 chapter 1 and 8 § of the Environmental Code). Interventions may only be made if they do not significantly damage the natural and cultural values of the areas. Thus, it is prohibited to "conduct activities or take measures that can significantly affect the environment" in Natura 2000 areas without a permit. The provisions on special protected areas (“särskilt skyddade områden”) are found in Chapter 7, 27–29 b §§ of the Environmental Code. A permit or dispensation may be required for exploration work. What is allowed or can be allowed differs greatly between the individual areas. 60 percent of Natura 2000 areas in Sweden are also covered by other protection status types, such as national parks or nature reserves.

Interventions, alone or together with other ongoing or planned actions or activities, that may cause damage to a habitat intended to be protected or cause a species intended to be protected to be exposed to a disturbance that may significantly hinder the conservation of the species is not permissible (Chapter 7, Section 28 b of the Environmental Code). In some cases, however, exceptions can be granted with the government's permission (Environmental Code). If there is a risk of significant impact, consultations according to Chapter 12 § 6 in the Code must be held and an application for permission submitted. Consultation is not required at trial mining, because the operation is subject to a permit according to other regulations in Chapter 9 of the Environmental Code. Sometimes consultation with the European Commission is also required. In order, for an area to receive the government's permission, very strong reasons are required, and the intervention must be compensated for by, for example, designating a new Natura 2000 area to replace the lost area and its natural values. Compensation measures are described in Chapter 7, Section 29 of the Environmental Code.

Mining operations, but also extensive exploration measures such as trial mining, which will be carried out in or near a protected area, may require a Natura 2000 permit. According to Chapter 7 Section 29 b first paragraph of the Environmental Code, Natura 2000 permit applications must first be heard by the county administrative board where the land area of interest is located. This is also the case if a Natura 2000 permit is applied for before or in connection with the application for a concession licence. There is, however, no formal obstacle to applying for a permit for mining operations to the Land and Environmental Court before or in parallel with the application for a processing concession processed by the Mining Inspectorate. If a Natura 2000 permit is applied for at the same time as the environmental permit for the mining operation, it is instead usually the land and environmental court that examines the application for a Natura 2000 permit.

A granted Natura 2000 permit does not normally need to be reviewed. However, changes in the planned activities may result in that a new Natura 2000 permit must be applied for. It is the responsibility of the applicant, licensing authorities and the court to assess if changes in planned activities or additional information in the decision document causes the need for a new application for a Natura 2000 permit.

A new investigation on the issue of examination of Natura 2000 permits when applying for processing concessions according to the Minerals Act has just been finalized in Sweden. The investigation was initiated due to an issue that has created uncertainty in the permit processes which is when in the permitting process the issue of Natura 2000 permits should take place. Practice through court decisions has developed to that the issuing takes place in connection with decisions on concessions. This practice risks inhibiting the

development of mining projects as large resources must be invested at an early stage, often at a stage before details of the business are specified such as e.g. the design of the operational area.

Against the background of this risk, to the extent possible regarding EU law, the investigator has now produced proposals for constitutional amendments. The purpose of the constitutional amendments is that a Natura 2000 permit, in cases where such a permit is required, should not be a prerequisite for an application for a processing concession under the Minerals Act to be granted. The department memorandum is now complete and has been presented within the Ministry of Climate and Business.

There are no specific regulations preventing or banning exploration or mining within or near protected area. However, exploration and mining (as well as any type of other infrastructure or construction projects) within or near a protected area might result in a negative impact on the protected species/object/habitat etc. and thus be restricted. Potential restrictions depend on the type of protection and what is to be protected in a designated area. Generally, regulations regarding protected areas are based on the environmental legislation ("Miljöbalken"). There may be relevant regulations limiting access and use of a protected area (but usually not specifically relating to exploration and mining) stipulated in the descriptive text/the designation motivation awarding protective status for a nature/cultural heritage or similar specific area.

Mining operations within a protected area is granted according to the environmental legislation ("Miljöbalken") if the benefits for the society outweigh negative local and environmental effects. These conditions are be proven in the environmental court ("Mark- och miljödomstolen") within the permission process. Compensation measures may be necessary.

Monitoring authorities such as the county administrative board, "Länsstyrelsen" or the Environmental Protection Agency "Naturvårdsverket" may stipulate regulations based on specific protection requirements of the area/species/habitat etc. or on the environmental legislation ("Miljöbalken").

A permit denial may be appealed to higher instances and the final decision is made by the government. For a general synopsis of environmental aspects see Table 62.

Table 62 – Synopsis of examples of good environmental governance and practice.

Aspects	Description
Case land use conflict	Previous land use in the limestone quarrying area has been farming, forestry, rural residence. Parallel land use of adjacent land is farming, forestry, nature protection, transportation, as well as both planned and rural residential areas. To some extent there is and has been a conflict in nature protection, as the quarry expands into areas with various kinds of designated biotopes/habitats as well as "Area of national interest for nature conservation" ("Riksintresse för naturvård") and "Area of national interest for outdoor recreation" ("Riksintresse för friluftsliv"). Mertainen is adjacent to several protected areas. Liikavaara is in an area cut by a main road, with a local village settlement but without main industries. In Vindelgransele the land is used for forestry, has a main highway, Natura 2000 areas and a village community. It is an area of national interest for mining and has exploration permits. The area is also used for reindeer herding. Exploration permits are considered a parallel activity with other land uses and not seen as a major infringement on other land uses. The Natura2000 site was designated before the national interest on mining status was conferred on the area.

Aspects	Description
	In Stekenjokk the Natura 2000 area was designated in 1998, ten years after Boliden closed its operations in the area. Hence, the mineral deposit was well known before designation of the Natura 2000 area. The mine is located outside the Natura 2000 area and only marginal land claims have been made. The new areas claimed are all located within the already affected area adjacent to the mine. The industrial area will also be located outside the Natura 2000 area and the operation will utilise existing roads. Competition between different current and prospective land uses and related legislative aspects are to be handled and ruled in the permitting process, such as public consultation and environmental court hearings. Sensitive environments such as Natura2000 must also be taken into consideration.
Natura survey	Impact assessment is done in the environmental impact study and related documents addressing impacts to protected areas or areas requiring protection such as habitats/water wells/residential housing/Natura2000 areas etc. Potential impact pathways caused by extractive activity are also assessed. The studies aim at mapping the present situation and the possible impacts of mining on the site itself and surrounding land. Previous mapping and monitoring programmes conducted on the site are used as a baseline for evaluating the new exploration campaign and contextualizing it. The EIA includes a range of investigations and analyses: *Geological surveys to assess the ore reserves and identify the rock types in the area. *Hydrological surveys to investigate groundwater and surface water to assess how the mine would affect water resources in the area. *Environmental surveys to assess how the mine would impact the environment in the area, including surveys of soil, vegetation, wildlife, air quality, and noise. *Archaeological surveys to identify any cultural heritage sites in the area. Models were developed of distribution of toxic metals in the hydrogeological system of the area at different distances and locations. Sampling, characterisation, and analysis including field work has been conducted to identify sensitive flora and fauna within the area. How the receptor has been affected by the vector - run-off - and what measures can be done to mitigate and avoid negative consequences has also been studied. In Vindelgransele the environmental impact study showed that two respective streams in the vicinity of the mine may have both positive and negative effects from the extractive activity. Positive effects included increase of pH (naturally low pH) and water level increase, reducing the risk of the streams running at excessively low flow rates during extended dry spells. Negative impacts addressed include risks of increased metal concentration due to the proximity to mine operations. Otherwise, the two small streams have not been judged to have any sensitive flora or fauna in need of preservation. No species that needs to be preserved and protected according to the habitat (directive) were found. The background levels for all dangerous substances have been measured and used in the overall assessment. Modelling shows that once the water reaches the river no substantial effect will be seen and

Aspects	Description
	that the limits for different metals like Arsenic and Uranium are below the limits of detection. In Stekenjokk the Mining Inspectorate requested that the company should report the assessed impact on designated habitat types and species in Natura 2000 area of the *Vardo, Laster and Fjäll* mountains and the impact on "favourable conservation status" on these as well as the impact on water temperature and flow regime. Species observation and presence of suitable habitats was performed on the bases of the "Species Observation System", which is a voluntary initiative. The estimated effects on wildlife in the surroundings are assessed as small because most of the native species are not present in the area during wintertime when mining takes place. The Arctic fox is the only species that lives in the area all year round. Measures to counteract barrier effects on this species will be reviewed (Golder, 2021). GIS analyses have been made to see which hydrologically sensitive nature types are present within the impact area. Experts were brought in to assess impact factors unaffected by groundwater lowering. For assessment of the impact on designated species and nature types, impact areas for groundwater in bedrock have also been used for groundwater impact in soil. This is a conservative method that most likely overestimates the extent of the impact area in soil.
Measures for reduction of impacts in EIA	A variety of impact mitigation measures has been adopted such as: - Restrictions for driving wheeled or tracked machines in the protected areas to minimize impacts e.g., avoiding nesting seasons for birds, drilling when ground is frozen. Aspects addressed might also come from landowners and other residents living close to site. - Exploration permits regulate what machinery can be used and when (particularly drill riggs and all-terrain vehicles). - A workplan is necessary for the permit in which it is clearly spelled out what and when it is done drilling and other work that significantly affect the environment or stakeholders. - Exemptions may be decided by the county administrative board, (“Länsstyrelsen”) and if applicable, the Environmental Protection Agency (“Naturvårdsverket”) - Preventive measures for pollution control, dust and emissions prevention and control eg., water sparging of site, use of biodegradable hydraulic oil or if relevant, regulation of handling of drill cuttings, etc. Water treatment is in place. - Establishment/continuation of a monitoring program to monitor and assess impact on (ground) water, nature biodiversity, environmental aspects, and health of nearby residents. Some examples are handling water runoff based on hydrological modelling, relocation of a small creek in Skövde, where flora and fauna have been transferred into the new site in order to safeguard the aquatic environment. - Measures to avoid disturbance on fishes and other living organisms , as for example the creation of passages over waterways.

Aspects	Description
	- Modelling and Control of limits of specific pollutants. For example, prediction of As in the vicinity Vindelgranselegruvor that is in the runoff area for the Vindelälven River (Natura2000), showed that the As effect diminished with distance with no discernible effects on the sensitive species and water quality in the river. Monitoring of Nitrogen (N) load from the limestone quarry Skövde where water emerging from the quarry may contain different chemicals originating from spent explosives in mining operations. As Phosphorous (P) content is very low in the water and thus the biological impact of the Nitrogen will be negligible, the N content is considered insignificant. Ditches and ponds necessary for water handling and flow retention are designed to optimise natural Nitrogen reduction processes, but no further treatment regarding chemical quality is considered necessary. - Measures to avoid negative impacts on reindeer husbandry in the case of Stekenjokk, eg., underground mining in periods when reindeer are not normally present in the area, November/December to April/May, and transport of the ore to separate treatment site.
Compensatory measures	As an example of compensatory or offset measures, LKAB has signed an agreement to protect an area at least equal in size to the mine-impacted area of 1220 hectares. The company's offset plan includes restoration, protection and management measures for forest land and wetlands in an area which, without formal protection, risks being used for forestry purposes. The proposal is based on the idea that the company will help create new nature values, rather than simply protecting a particular area. In the limestone quarry area, a designated regional hiking path ("Billingeleden") that runs through the permitted quarry area from north to south will also be relocated. The company agrees to finance construction of a new path segment west of the permitted quarry, along the diverted creek "Hållsdammsbäcken."
Conflicts arising from land use and water	Sustainable access to potable drinking water resources (ground- and surface water) has the highest priority. Modelling based upon measurements has been a major tool to show that there will be no impact of concern.
Closure- remediation	The remediation plan for the limestone quarry after closure aims to provide a more varied and biodiverse landscape than the one that previously existed in the area, containing many different elements and habitats of the local cultural and natural landscape in order to achieve maximum amount of biodiversity. It is in parts enhanced, using stored overburden (topsoil) as growing medium. Example of specific habitats that can be created are: - building stonewalls (common element in the local rural landscape), - creating a wetland area/small pond, - preserving some rock crests and steep scree slopes, - leaving an area with weathered barren limestone rock with no topsoil present ("Alvarmark"). Mertainen is put on hold for potential reopening in 2022. In the plans, after decommissioning of the mine, the open pit will be filled with water in a natural way. The edges will be chamfered and marked. Deposits of waste rock will be sloped off and provided with a covering of moraine (possibly with soil improvers) and vegetated. Drainage ditches will be constructed. Remaining

Aspects	Description
	moraine deposits will be sloped off and vegetated. The crushing and sorting facility as well as buildings for staff, storage, etc. will be removed if they cannot be used further in any other business. If necessary, ground investigations and remediation will be carried out. The industrial areas will then be provided with unqualified cover and vegetated. In Liikavaara, the area will be remediated with new cover so that vegetation should be similar to that in the nearby environment, forestation of the different types of trees will be adjusted to the various sectors of the remodelled landscape. Landforms will be adapted to fit within the overall environment. The open mine pit will be left as a lake but with protective fencing where necessary. Reindeer herding areas will be restored. The area of Vindelgransele is currently used for forestry; and the area will be restored to use for forestry once mining operations have ceased and the area has been remediated. There are plans to stabilise the mine tailings to prevent acid leakage by use of fly ash, and install a cover to protect humans, animals, the environment, and reforestation. Further, the mine tailings and overburden will also be used for back fill such that the volumes of material left on the surface will be significantly reduced. One mine Fäbodtjärn is underground whereas the other Vargbäcken is planned as an open pit.

2.9.5 Stakeholder engagement and communication

The public consultation and permitting process evaluates the suitability of an extraction and production method in respect of its impact on other land use, nearby housing etc., such as noise, dust, affecting the ground water table etc. (see Table 63). If necessary, protective measures or restrictions to minimize impact are proposed and adopted. The mandatory consultation process ("samråd") is part of the EIA specified by the Environmental Code inviting affected citizens, companies, associations, NGOs, municipalities ("kommuner") and governmental authorities to engage in the process. Stakeholder consultations are statutory in the EIA process.

As an example, the local population's main concerns during statutory consultation in Vargbäcken were:

- effect on water wells
- risks of rupture or failure of tailings dams
- effect upon local roads.

EPA e.g., commented upon the size of the requisite financial guarantee, bond or insurance policy for End of Life closure and remediation. There is always a need for a financial security for remediation in case the company goes bankrupt before operations are complete and/or before remediation has been finished. An example of the consultation process at work is the Vindelgransele report from Ramboll (Ramboll, 2018).

At the stage of the concession permit process in Stekenjokk, several stakeholder engagements were carried out. For example: these included one or more consultation referrals with the county administrative board. Stakeholders are also given the opportunity to comment on the planned activities. Both affected county boards, CAB J and CAB V, were involved in referrals as well as the one Sámi village.

The company responds to findings/questions/doubts and may suggest measures and compensations or offsets. This is then added to the EIA and used in the application. Effects and compensation measures as well as practical coexistence have been suggested and formalized in the EIA for all the companies.

Table 63 – Good practices in Stakeholder engagement and communication.

Aspects	Description
Voluntary actions to preserve antiques	Regarding all kinds of infrastructure construction, mining, excavation or similar projects, the unexpected discovery of archaeological remains generally results in pausing the project until the monitoring authority (the county administrative board, “Länsstyrelsen”) has assessed the finds. If the finds are significant the monitoring authority may decide that a complete archaeological excavation and/or evaluation at the expense of the company or organisation conducting the project in question may be mandatory. In the meantime, excavation/mining/construction activities are halted in the relevant area. Occurrences of (paleontological) fossil remains are usually abundant and expected to occur in sedimentary limestone quarries. Generally, this will not require any mandatory action from the side of the company or monitoring authority, but voluntary action to remove and preserve spectacular fossil findings is not uncommon as this will deliver positive publicity for the company. Many companies for the same reason collaborate with academia and communicate findings to the researchers, or researchers may visit quarries on a regular basis

Economic and social benefits

The municipality of Strömsund approved mining because it would "provide more jobs and a stronger business life".

Benefits for local communities in Vargbäcken identified in the application were jobs and contracts to local contractors; the costs were potential additional expenses for maintenance of local roads and loss of some forestry area.

2.9.6 Concerns/disputes

Concerns are solved during permitting process.

After consultations in 2013, both the Chief Mining Inspector (“Bergmästaren”) and the County Administrative Board in Jämtland (CAB J) suggested rejection of the application because it is "one of the most important areas for reindeer husbandry in the county" and the County Administrative Board in Västerbotten (CAB V) expressed its concern about the proximity to the Natura 2000 area *Vardo, Laster and Fjäll* mountains.

2.9.7 Enablers

A summary of the key project enablers is shown in Table 64.

Table 64 – Key project enablers.

Minerals in the land use plans at National level	Mineral deposits of national interest are evaluated against other national level interests such as water allowing a balanced assessment of the best potential uses of the land
Evaluation of impacts	The mining sites in Västerbotten and Norrbotten counties have referenced application of predictive modelling of water runoff from mining sites based upon observed data to evaluate the impact on protected areas and the surrounding environment
Extensive compensation and remediation activities	The quarry case presents post-mining remediation with a deliberately planned and engineered "biology as a service" approach, creating an enhanced, more biodiverse and overall richer habitat. Even during the mining phase relevant protected or sensitive habitats been relocated intermixed with new land use activities, such as the creation of a trail path near the creek. The mining sites in Västerbotten region have shown remediation and restoration activities after closure, actions to minimize the environmental impacts and compensation actions during operations.
Early consultation	Activities that impact Natura 2000 sites require Early and continuous consultation, flexibility, problem solving and a similar participative approach to consultation during EIA. These consultations are mandatory and also used when assessing likely project impacts on Natura 2000 sites for so-called Natura2000 permits. Further, currently the mining companies are developing a process where consultations with the local population and NGOs is taken at a early strategic stage and tailored to the needs of respective site, sometimes outside of the compulsory consultations in order to meet local and site-specific needs for information

2.10 United Kingdom

Exploration and extraction of critical or strategic minerals tungsten, tin and copper are selected as indicative cases for the UK, from two polymetallic projects, Drakelands (Devon) and Redmoor (Cornwall).

2.10.1 Case overview - Drakelands

The first case is the Drakelands Mine/Herdon Mine in SW England, Devon (Table 65, Figure 46).

Table 65 – Drakelands Case study summary.

Name	Drakelands Mine, also known as Hemerdon Mine; Hemerdon Ball Mine Owner: Tungsten West[7] (see Map Figure 46)
Country	UK
Region	SW England (Devon)
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Tungsten and Tin – primary raw. The estimated deposit of over 300,000 tonnes of tungsten metal places Drakelands among the largest tungsten deposits in the world. A ground up review initiated after the 2019 takeover led to the recognition that the Drakelands orebody is not in fact wolframite but is a related ore, Ferberite. As a result, changes were needed to improve extraction efficiencies. In addition, a subsidiary company is being set up to enhance the mine with sales of aggregate (the overburden material) as a by-product of mining.
Open pit or underground mine	The mine is open pit: 850m long x 540m wide x 200m deep (current state as of June 2023).
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	In operation. 2019–2023 (ongoing) 6th cycle of development since first opening 1867. Current operations owned and led by Tungsten West plc.
Period of activity	Tungsten and tin were discovered in the area in 1867. Further exploration took place in 1916 and found more deposits within the granite. The area was mined in 1919 and 1920, and again between 1934 and 1944. The mine has been out of operation since 1944, except for the brief operation of a trial mine in the 1980s. Work to re-open the mine started in 2014 and has continued intermittently to the present.
Companies involved:	Tungsten West since 2019

[7] Tungsten West see https://www.tungstenwest.com/

Name	Drakelands Mine, also known as Hemerdon Mine; Hemerdon Ball Mine Owner: Tungsten West[7] (see Map Figure 46)
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National Park (e.g. biodiversity areas, nature reserves)	Mine is situated ~4km from the SW boundary of the Dartmoor National Park. A unique feature is that Drakelands (Hemerdon) is legally simultaneously a) a Protected Site of Special Scientific Interest on environmental and ecological grounds and b) a Safeguarded site in terms of its strategic mineral resources. This has been the case since 1986.

History

The Hemerdon tungsten-tin deposit was discovered in 1867 (Wardell-Armstrong Competent Persons Report).

The mine started operation during WW1. After the war the decrease of tungsten price led to the suspension of the milling operation. In 1934 increased tungsten prices resulted in renewed prospecting of the deposit, along with new metallurgical test work.

The Ministry of Supply carried out extensive evaluation of tungsten deposits in the UK, and it was concluded by 1942 that Hemerdon offered the most potential for producing tungsten on a large scale. Mining activity grew during WWII but was interrupted in 1944 once to access to overseas supplies was restored.

Between 1960 and 1980 various exploration activities were performed by different companies. Eventually a more detailed mining feasibility study concluded in 1982 that of a global resource of 73 million tonnes of ore, at grades of 0.143% tungsten trioxide and 0.026% tin, there was an in-pit reserve of 38 million tonnes, at grades of 0.183% tungsten trioxide and 0.029% tin.

An initial planning application made in 1981 by a joint venture was refused. After making a revised application, permission was finally obtained in 1986. But by then a collapse in the prices of both tin and tungsten had undermined the economic feasibility of making an investment in opening the mine. In subsequent years, the tungsten assets changed hands among a succession of companies.

In the early 2000, sustained tungsten metal price rises resulted in a five-fold increase in the price of ammonium paratungstate ("the most important raw material for all other tungsten products"), from around US$60 per STU in 2003, to in excess of US$240 per STU by 2006. This rise resulted from increased tungsten mining exploration and development activities globally after 2005.

In June 2007, an ASX-listed specialty metal exploration and development company, Wolf Minerals, suspended trading of shares pending the acquisition of mineral leases. On 5 December 2007, trading recommenced following the public announcement of acquiring the mineral leases for the Hemerdon Mine project. The mineral leases were agreed for a period of 40 years, with the Hemerdon Mineral Trust and the Olver Trust. An agreement with Imerys to purchase remaining mineral rights and freehold land was also made. Following agreements with local landowners to acquire surface rights, Wolf Minerals renamed the project the Drakelands Mine.

The estimated resource of over 300,000 tonnes of tungsten metal makes Drakelands (Figure 46) the third largest tungsten deposit in the world and the largest outside China. A DFS (definitive feasibility study) was completed in 2009 and mining operations commenced in 2014. In 2015 the price of tungsten on world markets began to fall and in 2018 the mine once again closed operations.

In 2019 Tungsten West bought the mine and restarted operations in 2023[8].

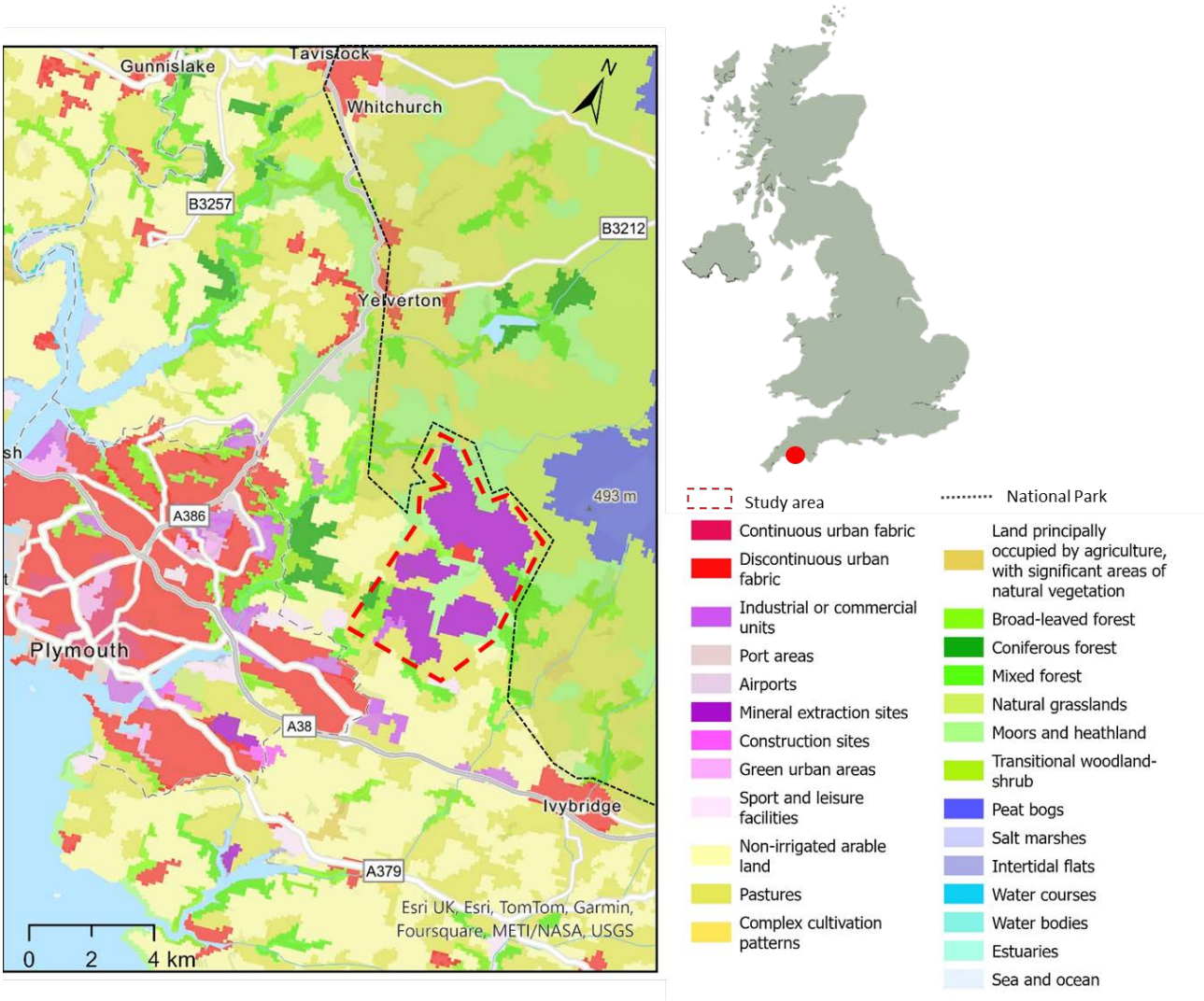

Figure 46 – Geographical location. Corine Land data cover classification 2018 (EEA), boundaries of Dartmoor National Park and Location of Drakelands Mine.

The Mine is situated ~4km from the SW boundary of the Dartmoor National Park (see Figure 46). Drakelands is a Protected Area, type Site of Special Scientific Interest (SSRI) a status first conferred on it in 1986 because of the presence of rare mosses and lichens. Unusually therefore, the mine and the SSRI coexist.

In that context, it is understood and accepted by all parties that it is, at least by association, in an environmentally, ecologically but also socially highly sensitive area. Hence, Tungsten West voluntarily applies non-statutory as well as statutory measures for protecting flora and fauna potentially at risk as well as wider sustainability and biodiversity targets.

[8] See Wikipedia, Drakelands Mine https://en.wikipedia.org/wiki/Drakelands_Mine

Figure 47 – Drakelands Mine - main open-cast pit (Image by Southwesterner - Transferred from en.wikipedia to Commons by Liftarn using CommonsHelper. Public Domain[9]).

When the mine was active there were other land uses interacting with the area, such as agriculture, forestry, recreation and tourism, and urban development. According to the land use statistics for England, the region of Southwest England, where the Drakelands project is located, uses some 70% of its land area as agricultural land, 11% as natural land, 9% as built-up area, 7% as woodland and 3% allocated other land uses.

In regard to:

- mining and quarrying - the surrounding are hosts some 6 mines/mineshafts, several quarries and china clay pits in the vicinity of Hemerdon Ball. Some of these facilities date back to the 18th and 19th centuries when tungsten and tin were first discovered and exploited in the region.
- agriculture - the surrounding land is mostly farmland, used for grazing livestock and growing crops. Agricultural activity has been affected by the mining operations, as some land has been acquired or leased by the mining company, and some farmers have raised concerns about the environmental impacts of the mine.
- recreation – the area has many prominent landmarks that attract walkers, cyclists, and nature lovers. There are also trout lakes and a transmitter mast nearby that offer recreational opportunities. Some leisure activities have been restricted or prohibited by the mining company for safety reasons.
- conservation - the location of the mine is in a designated Area of Outstanding Natural Beauty (AONB) and includes a Site of Special Scientific Interest (SSSI). The area hosts a variety of habitats and species, such as heathland, woodland, grassland, wetland, birds, bats, and butterflies. The mining company has implemented various measures to protect and enhance the biodiversity of the site, such as

[9] See https://commons.wikimedia.org/w/index.php?curid=12096044)

creating wildlife corridors, restoring habitats, monitoring species, and supporting conservation projects.

These cited land uses may have conflicting or parallel impacts on the environment, economy and social fabric of the area. For example, mining may affect water quality, biodiversity, and landscape, while agriculture may provide food security, employment, and ecosystem services. The biggest challenge is to balance the economic benefits of the mine with the environmental and social impacts on the land and its users.

2.10.2 Case overview - Redmoor

The second case is the Redmoor project (see Summary Table 66, Figure 48).

The Redmoor Project is a tin-tungsten-copper mining project located in east Cornwall, UK. The project, operated by Cornwall Resources Ltd.[10], aims at developing a world-class underground mine that can produce high-grade ore and multiple products (ref. Holmbush Mine). The area has a long, well-established, and broadly accepted history of mining and quarrying, both open-pit and underground, notably for tin, copper, iron ore, silver, granite, china clay, but also other resources such as lithium and tungsten which are now classed in UK as Critical Raw Materials.

Table 66 – Redmoor - Case study summary.

Name	Project: Redmoor, includes Kelly Bray and Hornchuch former mines
Country	UK
Region	South-west (County of Cornwall)
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Tungsten and Tin The belt on which the Redmoor Project sits is part of the same formation as the Drakelands (Hemerdon) mine and contains wolframite and chalcopyrite mineralisation.
Open pit or underground mine	Underground (when operational)
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Exploration (Core Sampling, Trenching) and Planning (2022-ongoing)
Period of activity	Exploration restart January 2017. First phase completed 2018. Positive findings. Findings regarding resource assessment trigger Phase 2 Exploration (2022-ongoing).
Companies and stakeholders involved:	Cornwall Resources Ltd (CRL) subsidiary of Strategic Minerals PLC[11] Camborne School of Mines Exeter University
Environmental protected area designation: International (e.g. world heritage site,	The Redmoor Project is not located in any National Park or Site of Special Scientific Interest (SSRI), but it encroaches

[10] See Cornwall Resources Ltd. https://www.cornwallresources.com/the-redmoor-project

[11] See Strategic Minerals Ltd. https://www.strategicminerals.net/projects/redmoor-tin-tungsten-exploration.html

RAMSAR; EU (e.g. SAC, SPA); National Park (e.g. biodiversity areas, nature reserves)	on a "non-statutory" sensitive area, in this case the sensitivity being on biological grounds.

Cornwall, United Kingdom has hosted mining projects continuously since before Roman times until the end of World War 2. Since then, projects have been more sporadic, but extraction of china clay has continued throughout, and the Littlejohn pit claims to be the world's largest china clay production site.

The current exploration licence for Redmoor was acquired by Cornwall Resources Limited (CRL) in 2016 and provides the right to explore the area for a period of 15 years.

Cornwall Resources Limited (CRL) is actively exploring for tin and tungsten. CRL is owned by AIM listed Strategic Minerals PLC (SML). Personnel involved in the Redmoor project are employed through the joint venture vehicle (Cornwall Resources Limited) and, as such, are not directly employed by SML. The SML management team is largely Australian and operates out of Australia.

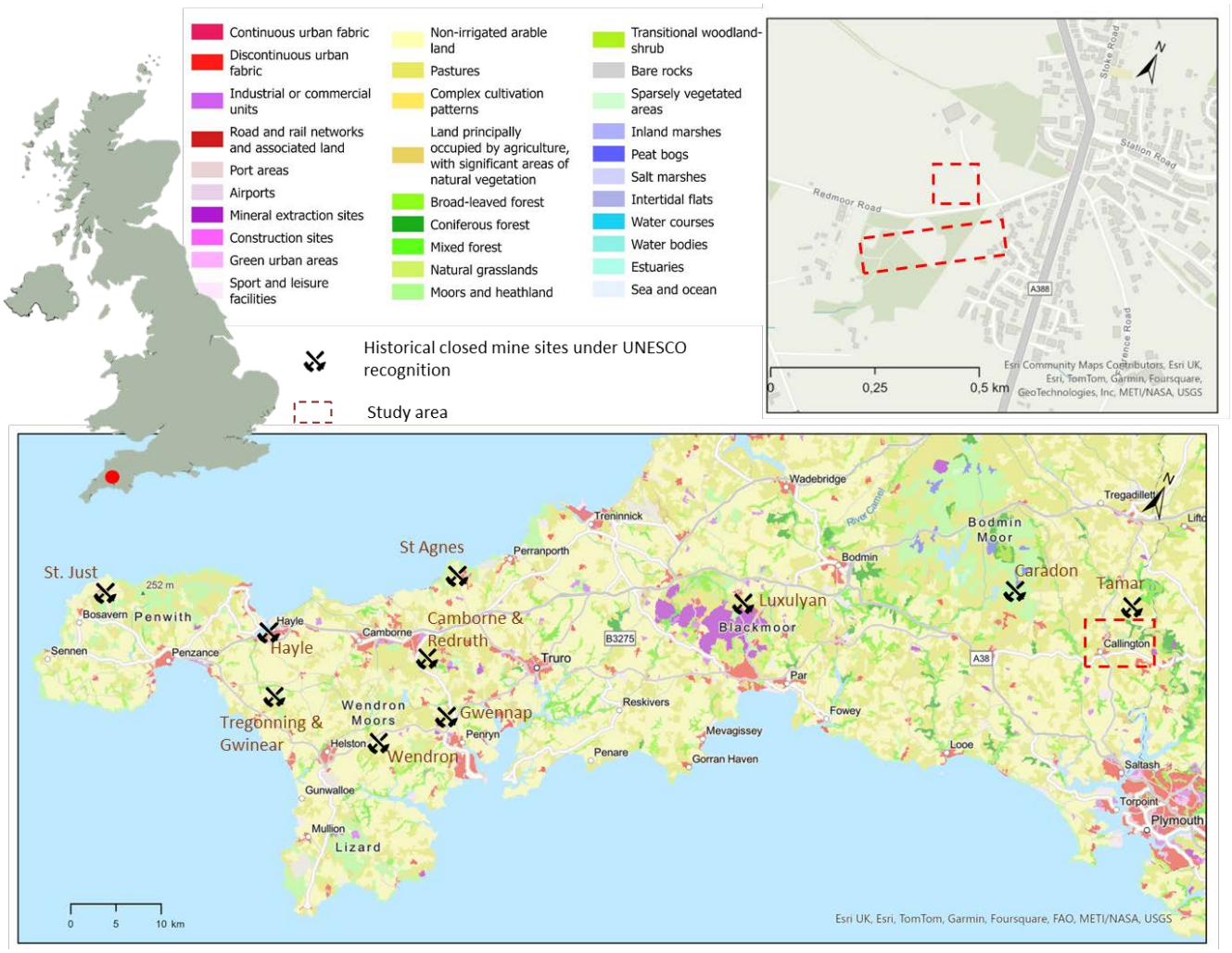

Figure 48 – Redmoor Tungsten-Tin project site in Callington, Cornwall, SW England. Corine Land data cover classification 2018 (EEA) + location of UNESCO recognized historical mine sites. Spot on drilling and trenching sites (phase 1, 2017-18).

Mining natural resources in the area covered by the Redmoor Project goes back in documented form to the 16th Century and given that the Romans are known to have mined in Cornwall, e.g., for silver, permitting de facto has accompanied mining throughout its history.

The Redmoor Project ("Redmoor") is located in the tin and tungsten mining belt of eastern Cornwall, southwest England (Figure 48). This belt has seen numerous projects over the past centuries, some enjoying periods of profitability notably when tin prices were high. These include the former Redmoor mine and the adjacent Kelly Bray and Holmbush mines, the latter of which, Holmbush, is now a historic landmark.

Land Use Cornwall

In terms of wider land use, Cornwall's temperate maritime climate with relatively high rainfall makes it a suitable location for dairy farming, producing milk, cheese, and various other dairy products such as ice cream. Cereal crops such as wheat and barley, are grown in significant quantities and there is a complementary livestock industry. It is also a very popular tourist destination, particularly in summer for its beaches, but year-round for its many areas of outstanding natural beauty.

The long mining history of both Cornwall and Devon dating back long before Roman times, also has led to recognition of the area as a whole as a UNESCO World Heritage Site (UNESCO Site Id: 1215). Nevertheless, by comparison with the South-east of the UK Cornwall is economically less prosperous with a relatively low proportion of well-paid jobs in scientific, technical, and engineering professions, as compared with low-wage employment in tourism and hospitality, which makes new investments in mining attractive from a regional economic perspective.

The Redmoor project is currently in a new exploration phase designed to reassess and remeasure the full extent of the tungsten and tin resources found in the deposit.

Immediate past and current (2023) exploration activity is located between the village of Kelly Bray and the small town of Callington in southeast Cornwall, United Kingdom, see Figure 48, area marked in red. The exploration site is approximately 25 km by road from the city and port of Plymouth, and 40 km from the recently commissioned Drakelands (Hemerdon) tungsten mine and processing plant (see companion Case Study).

Some of the potential conflicting activities in the area related to land use are:

- Agricultural development: Land use change for agricultural purposes can cause environmental degradation, loss of biodiversity, and displacement of local communities. It can also compete with mining for water and land resources.
- Urban development: Land use change for urban expansion can increase pressure on infrastructure, services, and natural resources. It can also create social and economic challenges such as housing affordability, congestion, and pollution. Urban development can also encroach on mining areas and create conflicts over land rights and compensation.
- Environmental conservation: Land use change for conservation purposes can protect ecosystems, biodiversity, and cultural heritage. However, it can also restrict access to mineral resources and create conflicts with mining interests over land values and environmental impacts.
- Logistics and transportation infrastructure: located at the extreme south-west of the UK in a long peninsula reaching into the North Atlantic Road, rail and air connectivity is relatively poor leading to significant challenges for mining companies in managing movements of heavy equipment and fleets of heavy trucks.

The Redmoor High Grade Resource is one of the world's five highest grade tin-tungsten projects (SnEq Basis) and in the top 3 new projects. The Redmoor Inferred Resource has 45,000 tonnes of contained tin equivalent and the Exploration Target has the potential to increase this to 100,000 tonnes via further drilling planned for 2018.

The Redmoor project is operating under licence from the landowner, the Crown Estate. The Redmoor project is located within the Tamar Valley Area of Outstanding Natural Beauty (AONB), which is a nationally

designated protected landscape (Figure 49). The AONB covers 190 square kilometres and has diverse habitats and wildlife.

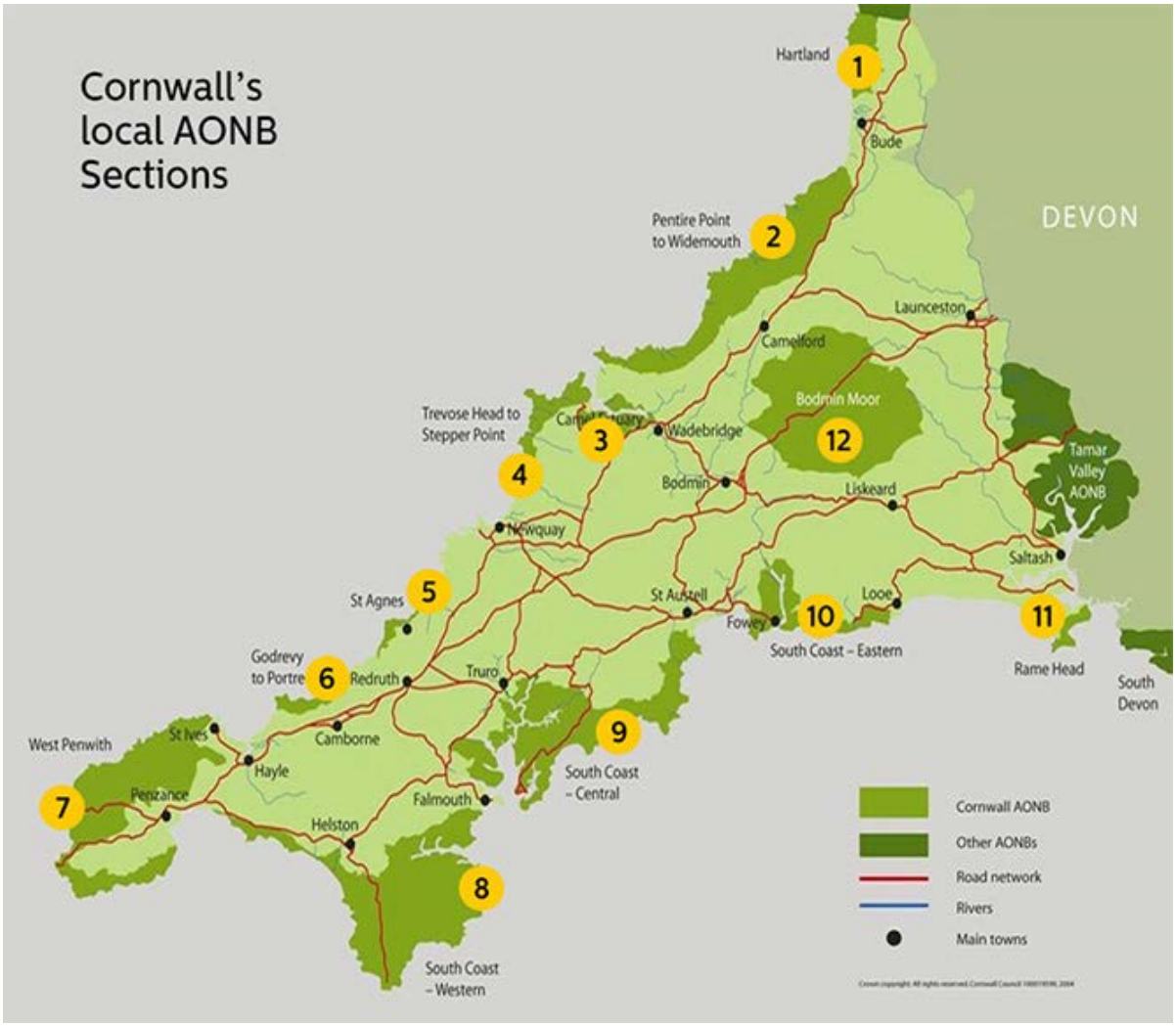

Figure 49 – Areas of Outstanding Natural Beauty (Aspects Holidays).

Ways have been found successfully to combine protection of Areas of Outstanding Natural Beauty with recognition of World Heritage Mining Areas, their land footprints considerably overlapping. It is also increasingly understood worldwide that active mining sites can be presented successfully as tourist destinations, subject of course to suitable protective measures for both visitors and the environment.

2.10.3 Spatial planning

UK is formed by England, Wales, Scotland, and Northern Ireland that are following common central government regulations but also have own pieces of legislations that regulates the establishment of regional development plans (Table 67).

Table 67 – Spatial planning organisation.

Level	Duties
National level	This is framed by central government jurisdictions in various ways such as: National planning policy framework for England and planning policy statements for Northern Ireland, The Department of Levelling up, Housing and Communities and the Ministry of Housing, Communities and Local Government provide national planning policies and guidance for minerals extraction in England.
Regional level	Regions are regulated by regional planning guidance with regional strategy and regional plans
County and district level	Local development framework that regulates the local plan. The Local Planning Authorities (LPAs) are responsible for preparing minerals plans that set out the vision and policies for minerals department in their areas, taking into account the national policies and guidance, as well as the local circumstances and needs.

Mineral extraction is taken into consideration also in the planning process at various levels. In the National Planning Policy Framework there is a chapter dedicated to Facilitating the sustainable use of minerals in which is also stated to "safeguard mineral resources by defining Mineral Safeguarding Areas (designated by minerals planning authorities covering known deposits of minerals to be safeguarded from sterilisation by non-mineral development) and Mineral Consultation Areas (where district or borough council should consult the Mineral Planning Authority for any proposals for non-minerals development)". Mineral resources of local and national importance include those minerals necessary to meet society's needs.

Various steps and stakeholders are involved in the land use planning policy preparation process. For Hemerdon, Devon for example is involved:

- Devon County Council is the Minerals and Waste Planning Authority for most of Devon. It has responsibility for determining planning applications relating to minerals and waste development and applications for its own use. It also provides landscape policy and guidance based on Devon's landscape character assessments.
- Local district, borough, and city councils deal with planning applications for residential development and business needs. Hemerdon is located within the South Hams District Council area, which has its own Local Plan and Supplementary Planning Documents.
- Plymouth City Council is responsible for all planning matters within its designated area. Hemerdon is close to the boundary of Plymouth, and may be affected by its policies and plans, such as the Plymouth and Southwest Devon Joint Local Plan.
- Dartmoor National Park, is responsible for all planning matters within its designated area. Hemerdon is adjacent to the boundary of Dartmoor National Park, and may be influenced by its policies and plans, such as the Dartmoor National Park Management Plan and the Dartmoor Local Plan.
- Devon Landscape Policy Group, which is a partnership of local authorities and statutory agencies that provides advice on landscape issues in Devon. It has produced several advice notes on topics such as wind and solar pv developments, undeveloped coast, and neighbourhood planning.

- Other stakeholders, such as landowners, developers, communities, environmental groups, statutory consultees, etc. that may have an interest or influence on the land use planning policy preparation process for Hemerdon.

The land use planning process may vary depending on the type and scale of development proposed, but generally it involves the following stages:

- **Pre-application advice:** This is where potential applicants can seek advice from the relevant planning authority or authorities on the feasibility and acceptability of their proposals before submitting a formal application. This can help to identify any issues or constraints that may affect the development, such as landscape character, biodiversity, heritage, traffic, etc. It can also help to avoid unnecessary costs and delays later on.
- **Application submission:** This is where applicants submit their formal planning applications to the relevant planning authority or authorities, along with supporting documents such as plans, drawings, environmental statements, etc. The applications are then validated and registered by the planning authority or authorities.
- **Consultation:** This is where the planning authority or authorities consult with various parties on the planning applications, such as statutory consultees (e.g., Natural England, Historic England, Environment Agency), neighbouring authorities (e.g., Plymouth City Council), parish councils (e.g., Sparkwell Parish Council), local communities (e.g., Hemerdon residents), etc. The consultation period usually lasts for 21 days but may be extended for complex or controversial applications.
- **Decision:** This is where the planning authority or authorities make a decision on whether to grant or refuse planning permission for the applications, based on their policies and plans, national guidance, consultation responses, site visits, etc. The decision may be made by delegated officers or by elected members in a committee meeting. The decision may be subject to conditions or legal agreements that need to be fulfilled by the applicants.
- **Appeal:** This is where applicants or other interested parties can challenge the decision of the planning authority or authorities if they are unhappy with it. Appeals are usually made to the Planning Inspectorate, an independent body that deals with planning appeals in England (Google map, Tungsten west). Appeals can take several months or even years to be resolved.

Denomination procedure for protected sites

When UK left EU, the Natura 2000 areas stopped belonging to the EU network and became part of a national site network regulated by the "Conservation of Habitats and Species 2019 regulation, that set up their management objectives and appointed competent authorities within UK.

Authority differs according to the type of protected areas:

- Conservation Areas are designated and managed by local planning authority under guidance of Historic England.
- Internationally or European protected sites: These include special areas of conservation (SACs), special protection areas (SPAs), Ramsar wetlands, potential SPAs, possible SACs or proposed Ramsar wetlands. They are designated under European directives and international conventions to protect habitats and species of European or global importance.

2.10.4 Good practices in spatial planning

Councils in SW England pride themselves on their good practices in spatial planning, grounded in their very long history of hosting mining projects. These are documented back to Roman times and even earlier. Good practices applicable and responsible authorities are shown in Table 68.

Table 68 – Good practice aspects in spatial planning.

Aspects	Description
Independent authorities	The four nations of the UK each have responsibility for protecting habitats and species of national European or global importance. They are classified by: - Natural England with the Secretary of State for Environment, Food and Rural Affairs (Defra) in England, - the Welsh Ministers in Wales, - Scottish Ministers in Scotland - Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland. Natural England, JNCC (Joint Nature Conservation Committee) or NRW (Natural resources Wales) publish and execute public consultation and report to ministers.
Case by case identification	Identification of competent authority case by case, with cooperation between local, count and national authorities.
Safeguarding of minerals	National Planning Policy Framework states that "Local planning authorities should not normally permit other development proposals in Mineral Safeguarding Areas if it might constrain potential future use for mineral working."

Drakelands

The Drakelands project is regulated under DEFRA, England but also in consultation with the environment Agency and Dartmoor National Park.

For Drakelands, Devon Council is the overall responsible party for regulating protected areas. But because of its close proximity to Dartmoor National Park conditions for operation of the mine are essentially the same as those applied had the mine been located within the National Park itself. Is also the case for Redmoor, nearby in Cornwall.

The Dartmoor National Park is managed by the Dartmoor National Park Authority (DNPA) which "is required to protect and enhance wildlife habitats, species, and geological sites through the planning process. Some habitats and species are protected through legislation, others are protected through national and local policy. On Dartmoor examples of protected species include bats, dormice, nesting birds, and reptiles. Examples of protected habitats include hedgerows, species-rich grassland, and wetland" (Dartmoor National Park Authority, 2021).

As Drakelands Mine (Hemerdon) is in an area designated as a Site of Special Scientific Interest (SSRI) a mandatory Habitats Regulation Assessment (HRA) was conducted in 2017 as part of the extension to the mine operating permit and planning permission (Plymouth & S W Devon joint plan, 2017).

With respect to the tungsten mine at Hemerdon, potential impacts on a number of European Sites are identified, with a HRA having been undertaken for the Modification Order at Hemerdon [Drakelands] to ensure that the existing permission does not impact on the SACs. A criteria-based policy was introduced to the state that any development that could have an adverse effect on the integrity of a European site will not be permitted. Extractions [of china clay] at Lee Moor are to be within the existing Mineral Working Area and no Load-serving Entities (LSE) for additional energy provisions are predicted.

Planning permission (GDPO - General Permitted Development Order) covers the rights and responsibilities of the Licence holder. As Drakelands is a long-established mine site, the conditions of planning permission will have been met including procedures for extending of varying permits as needed. Permits include full provision for eventual mine closure or placement under care and maintenance management procedures.

This includes restoration of disturbed surfaces, but also restrictions (statutory or self-imposed by the Exploration company) designed to protect a) habitats, b) affected species, c) biodiversity, but also d) noise disturbance and related mitigation and control measures. Penalties can also be applied for breaches of conditions. Tungsten West has established a level of confidence with the planning authority (Devon) based on good working relationships between the regulators and the on-site site development teams and their management.

Redmoor

In Redmoor case, GDPO covers the rights and responsibilities of the Exploration Licence holder. For drilling and trenching surface disturbance of a limited and controlled kind is a sine qua non of the process. So, the conditions of planning permission will include full provision for restoration of disturbed surfaces, but also restrictions (statutory or self-imposed by the Exploration company) designed to protect a) habitats, b) affected species, e.g., badgers as in this case, c) biodiversity, but also d) noise disturbance and related mitigation and control measures. Penalties can also be applied for breaches of conditions.

As CRL has already satisfactorily completed a first phase of drilling and trenching (2017-19) it has established a level of confidence with the planning authority (Cornwall) based on good working relationships between the regulators and the on-site drilling teams and their management.

The Hemerdon mine was designated as a Site of Special Scientific Interest (SSSI) in 1986 because of its rich diversity of lichens and mosses. However, the knowledge of mineral deposits at Hemerdon mine was already established long before that, as the first records of mining activity date back to 1867. It is likely that the minerals brought to the surface by mining created a favourable sub-strate for the rare lichens and mosses to settle. The protected SSSI area put in place at Hemerdon in 1986 in effect pre-empted future protected area designation as unnecessary. No records are available of any stakeholder consultation process applied. A recent Habitat Regulations Assessment (HRA) has reconfirmed that the site conforms to relevant environmental protection measures for such a site.

2.10.5 Mineral governance

Permitting procedure

The Mining Act 1992 is the main regulatory instrument for mining operations in the UK. The Act describes the objectives of the regulation and establishes rights, authorizations, restrictions, and renewals.

The UK compliance framework is supported by technical documents providing guidance on particular issues of mineral planning and in most cases mining and exploration companies will draw on the expertise of qualified and experienced independent consultants, as is the case for Redmoor.

Mining authority is decentralized, and the decisions are taken at local level by the mineral planning authorities (MPA) (Figure 50).

Mineral Planning Authorities (MPAs): These are local authority bodies that are responsible for mineral planning and decisions on planning applications for mining and quarrying. They also monitor the compliance of mine operators with the conditions of their planning permissions. In Wales, Scotland, and some parts of England, MPAs are Unitary Authorities. In other parts of England, MPAs are County Councils or National Park Authorities.

Mining projects also need to obtain various environmental permits, consents and approvals applied at governmental level from authorities, such as the Environment Agency, Natural England, Historic England, or local councils. The Crown Estate licence is granted by The Crown Estate (TCE) or the Forestry Commission to authorise exploration and extraction of minerals (other than coal, oil, and gas) from Crown land or land managed by TCE or the Forestry Commission.

Crown Estate licences can be either exploration licences or extraction licences, depending on the purpose and scope of the project. The Licence defines rights, limits and area of use, monitoring activity and remediation project. Crown Estate licence is granted by The Crown Estate (TCE) or the Forestry Commission

to authorise exploration and extraction of minerals (other than coal, oil, and gas) from Crown land or land managed by TCE or the Forestry Commission. Crown Estate licences can be either exploration licences or extraction licences, depending on the purpose and scope of the project.

Planning permission is granted by a mineral planning authority (usually a county council or unitary authority) to authorise the extraction of minerals (including coal, oil, and gas) from any land in England and Wales. Planning permission is required for any development that involves mining or quarrying operations, regardless of whether a licence from another authority is also needed.

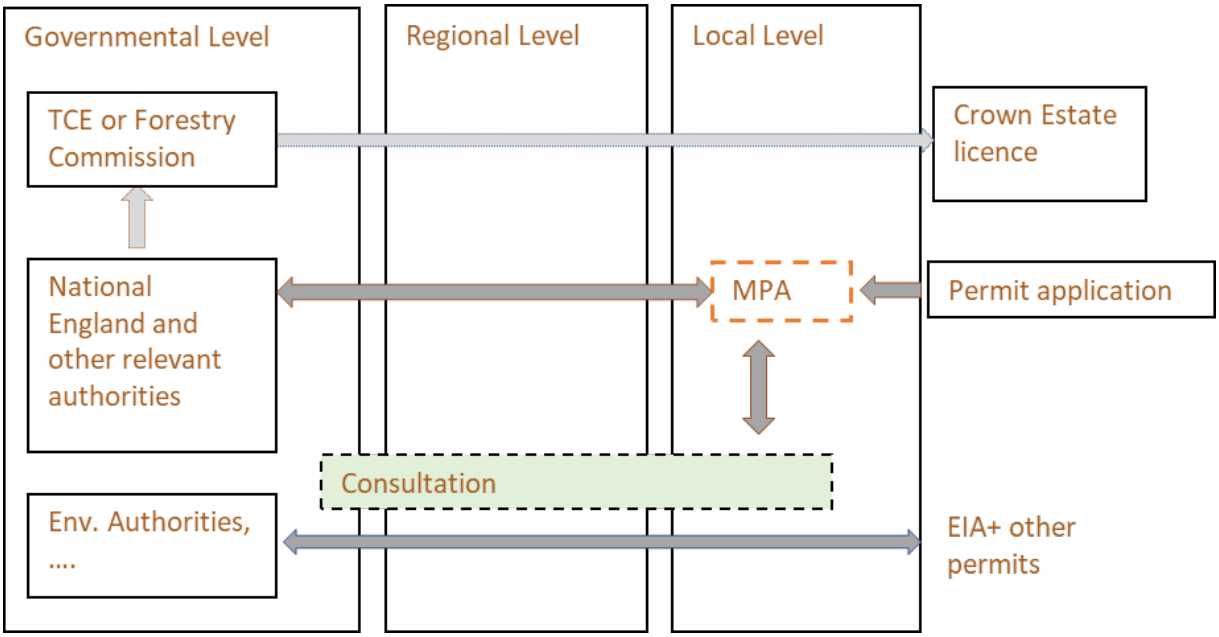

Figure 50 – Permitting process.
MPA Mineral Planning Authority

Local Planning Authorities (LPAs) are responsible for reviewing planning applications for mineral development and making decisions based on the development plan and other material considerations. They must consult National England and other relevant authorities and stakeholders before granting planning permission for mining activities that might affect protected sites in the area. According to the Campaign for national parks Policy Position Statement, under this Order National Parks are also Mineral Planning Authorities (MPAs).

The holder of an exploration licence does not have automatic rights to use the surface necessary or incidental to an exploration. The rights granted by landward licences do not include any rights of access and the licensees must also obtain any consent under current legislation, including planning permissions. The rights of the holder of Tin and Tungsten exploration licence in the UK depend on whether the minerals are privately owned or belong to the Crown. Therefore, the holder of an exploration licence must obtain permission from the landowner to access and explore the minerals. However, if the minerals are owned by the Crown such as Crown Estate land or under the seabed, the holder of an exploration licence must also obtain a separate licence from the relevant authority that manages the mineral rights on behalf of the Crown. No exploration activities are currently required by Drakelands as these were completed prior to the 2021 funding round.

Any application is considered a “major development” subject to passing the conditions of a major development test. The test only allows developments of this scale in a National Park in exceptional circumstances when they can be demonstrated to be in the public interest. Any minerals-related proposals not considered to be major, such as buildings within an existing quarry, must still be assessed in line with national planning policy which places great weight on conserving landscape and scenic beauty in National Parks (Government UK, 2012).

MPAs for adjacent areas are also expected to take account of the impact on the National Park when considering applications for minerals sites." The Drakelands project has been put to this test by Devon MPA and Dartmoor National Park – had it not passed these tests it would not be operational.

A summary of relevant good practices in minerals governance and management (both Drakelands and Redmoor) is shown in Table 69.

Table 69 – Good practices in minerals governance and management.

Aspects	Description
Minerals	In general, for first category material not energetic, the exploration licence is granted by, following a request from interested companies. In this case the exploration licence is not needed because the area of exploitation is individuated by mining plan. Drakelands deposit was historically mined and well-known resource. Redmoor is in an area that has well-established infrastructure and is located in the historically significant Cornish tin – tungsten – copper mining district. There is no related "before" and "after" assessment of knowledge about the mineral deposits. But the enhanced Deep Digital Mining techniques that are being applied to the current phase of exploration have certainly enhanced the quality of and confidence in the new knowledge baseline being built for the Redmoor Project.
Local authority	The Local Planning Authorities (LPAs), reference for permit application, must monitor and enforce the compliance with the planning conditions attached to the mining permissions to ensure that the sites operate to high environmental standards and are restored to a beneficial use.
Demanding non statutory documentation	The Redmoor Project is not located in any National Park or Site of Special Scientific Interest (SSRI). The mandatory Ecological Report to accompany the application for planning permission does, however, highlight the fact that it encroaches on a "non-statutory" sensitive area, in this case the sensitivity being on biological grounds, see also the mandatory Dormouse Licence (a protected species). "Non-statutory" status gives CRL discretion to ignore pertaining laws if it wishes to. But CRL, along with most mining companies in UK, goes out of its way to behave as if the area were under statutory protection. This in effect uses the "ALARA" principle in terms of the planned ecological and environmental impact, that risks should be "as low as reasonably achievable." Other previously mined areas in Cornwall are classed as UNESCO World Heritage sites so the regulatory culture in the jurisdiction is well versed and experienced in applying both "hard" (statutory) and "soft" (non-statutory) pressures to ensure good social acceptance and high sensitivity to environmental and ecological impact, including biodiversity.
Innovative methods	Innovative methods or technology adopted in Hemerdon:

Aspects	Description
	- New processing route – x-ray scanning technology: method developed by Tungsten West plc, the current owner of the Hemerdon mine, to improve the recovery of tungsten and tin from the ore by using gravity separation, magnetic separation, and flotation techniques. - 3D Digital resource modelling (Deep Mining, Cornwall) The "Redmoor Project" phase 2 (2022-) is using modern exploration techniques (Drilling Rigs/ Core sampling) and 3D computer modelling from data taken from borehole samples to form a much more accurate assessment of inferred resources for financial reporting to investors and fund raising. This aspect of Phase 2 exploration is included in the Deep Digital Cornwall EU funded project led from the Camborne School of Mines and Exeter University. The low impact, low visibility methods that Hemerdon include: - Open-cast mining, which involves extracting minerals from a pit or quarry. - SLIM, which uses advanced rock blasting and environmental technologies to achieve selective low impact mining solutions. - Selling waste granite as aggregate for the construction industry, which reduces the need for waste management and dump. For haulage, Hemerdon Devon proposed to increase the number of lorries to transport the minerals and waste from the site, up to 300 vehicles per day by 2026 and will focus on use of electric vehicles using renewable energy as source of power, notably wind a resource of significance in Cornwall and Devon. In Redmoor was performed Diamond drilling, Sheeted vein system (SVS) modelling, Metallurgical testing, and Resource estimation.

2.10.6 Environmental governance

At a more general level, in regard to best practices in independent assessments of the technoeconomic viability and socio-environmental acceptability of "major infrastructure" projects such as this in the UK (Hemerdon), some of the tools routinely used to assess the impacts on human health and biodiversity, of which most are either explicitly or implicitly mandatory in nature, are:

- Environmental Impact Assessment (EIA) to evaluate the likely environmental effects of a proposed project or development, taking into account inter-related socio-economic, cultural, and human-health impacts.
- Health Impact Assessment (HIA): to assess the health impacts of policies, plans and projects in diverse economic sectors using quantitative, qualitative, and participatory techniques.
- Biodiversity Impact Assessment (BIA): to identify and evaluate the potential effects of a proposed action on biodiversity and ecosystem services.

These means can help identify and mitigate potential negative impacts of mining activities on human health and biodiversity, such as:

- Air pollution: mining does generate dust, emissions and odours that can affect air quality and respiratory health.

- Noise pollution: mining can produce noise from blasting, drilling, machinery, and transport that can cause hearing loss, stress, and annoyance.
- Water pollution: mining can contaminate surface and groundwater with chemicals, metals and sediments that can harm aquatic life and human health.
- Soil erosion: mining can disturb the land surface and vegetation, leading to soil erosion and loss of soil fertility.
- Habitat loss: mining can destroy or fragment natural habitats, reducing biodiversity and ecosystem services.
- Waste management: mining can generate large amounts of waste rock, tailings and slag that need to be safely stored and disposed of.

For the Drakelands project the risks of noise pollution and of negative environmental consequences short and long-term from tailings management and risks from Acid Mine Drainage (AMD) are rightly given top priority, not least because over the full, very long history of the mine stretching back hundreds of years, such matters were given scant if any attention.

From a contemporary perspective, this history has been turned to advantage in rebooting the mine as there is no doubt or pushback from investors and operators that if these matters are not satisfactorily addressed no mine permit will be issued. Evidence to date suggests that impacts as are measurable are either environmentally neutral or even positive. From an empirical perspective, the long history of mining at the site does not appear to have adversely impacted it to the extent that the objectives of mineral resource recovery and protecting biodiversity both have to date been met. And since the declaration of the site in 1986 as a SSSI must have been founded on detailed baseline studies of local flora and fauna, especially the rare lichens and mosses, the SSSI designation did not bring with it stipulations to remediate a polluted or damaged site, rather to protect what was naturally occurring there.

Co-location of mining activities and protected areas – potential benefits

The general observation that an SSSI can coexist with a mine or other major infrastructure project can be made at various mine sites and major infrastructure projects around the world, many of which Aleff Group personnel have visited, where such projects have created islands of biodiversity protected from other forms of human contact or encroachment. Whether because the sites are fenced off, or simply remote, or actually themselves are creating conditions for promoting biodiversity has not been studied in detail. It is possible for example, that the lichens and mosses at Hemerdon have colonised the site because mining has exposed substrates or growing media conducive to this.

The company says it has implemented a number of initiatives to ensure a minimal impact on the surrounding environment and local community. These include optimising the plants low frequency noise to ensure minimal environmental impact and a fully cash funded £13.2 million restoration bond. However, some residents have expressed concerns that reopening the mine would lead to significant clouds of dust and dirt falling on properties and gardens in nearby villages, which happened when the mine was open previously.

As there are potential risks and impacts associated with and mining activities, such as land disturbance, water use, waste generation and emissions, the company is likely to have to conduct a fresh environmental impact assessment and obtain relevant permits and approvals before resuming operations.

Drakelands Mine is protected as a mine and mineral deposit under the Devon M2 policy category Minerals Safeguarding Area. Hence the underlying use of the land area will be protected from future development for any other purposes. In the event of a potentially long pause in mining operations such that any given project is deemed to have ceased financial and statutory provision is made for restoration of the site to its state prior to the new project being put in place.

Were this to occur – which is currently (August 2023) very unlikely – the only realistic option for mine closure comprises restoring the operational areas of the site to their natural state while future-proofing the mineral resources is hosts (BBC news, 2023, Gleeson 2021, Tungsten West).

Aspects of environmental governance and practice are shown in Table 70.

Table 70 – Environmental governance and good practice.

Aspects	Description
Case land use conflict	Both Redmoor and Drakelands are in proximity to protected areas. Drakelands near Site of Special Scientific Interest (SSSI) and Environmentally Protected Areas: is required to protect and enhance wildlife habitats, species, and geological sites through the planning process. Some habitats and species are protected through legislation, others are protected through national and local policy. The Redmoor project is located within the Tamar Valley Area of Outstanding Natural Beauty (AONB), which is a nationally designated protected landscape. The AONB covers 190 square kilometres and has diverse habitats and wildlife. It is a non-statutory sensitive area, but the company behaves as if had statutory protection.
Environmental documentation	Environmental documentation includes drilling and trenching exploration maps and descriptions, a general project report, an environmental and social impact assessment comprising an ecology report, an archaeology report, now aligned to principles of sustainability, a noise report and a non-statutory habitat report focused, in the case of Redmoor, on badgers and dormice, both protected species know to be found in the area.
Utilization of external certified experts	To get planning permission to extend current trenching and drilling campaign Redmoor is required to submit a detailed Ecological Report carried out by an independent, certified Expert
EIA and SIA assessed during permitting process	The Redmoor and Drakelands projects have been subject to environmental impact assessment (EIA) and social impact assessment (SIA) as part of the planning and permitting process. The EIA evaluates the potential environmental effects of the project, such as noise, dust, water quality, ecology, and landscape. The SIA assesses the potential social and economic impacts of the project, such as employment, community engagement, health and safety, and cultural heritage. Some of the impact assessment methods that have been used in the two study cases include: - Expert judgment: based on the professional opinion of experts that have considerable experience in the areas of assessed impacts such as on water, soil, biodiversity, and communities. - Quantitative physical and mathematical models: linking different aspects of the hydrological cycle, watershed-level impacts, impacts of changes in water and other land and ecosystems available for biodiversity and resources accessible for the surrounding communities. - Cumulative impact assessment: assessing the multiple and successive environmental and social impacts from existing developments that can reinforce each other, leading to more serious consequences on environment and people than each of the developments separately. - Matrices and interaction diagrams: using tables or diagrams to show the relationships between different components of the environment and the activities or impacts of the project.

Aspects	Description
	- Rapid Impact Assessment Matrix (RIAM): a scoring system that allows for a semi-quantitative evaluation of environmental and social impacts based on four criteria: magnitude, importance, significance, and value. - Battelle Environmental Evaluation System: a numerical weighting system that assigns scores to different environmental components based on their sensitivity, resilience, and importance.
Good performance in the past built trust	There are no specific conditions set by the Cornwall planning authority, probably because of the positive track record set by the 2017-18 drilling campaign. For the Redmoor project the overall finding is that "The residual impact of the proposed exploratory drilling is considered likely to have a neutral impact, at a local scale, on the ecology of the site, subject to the successful implementation of the mitigation outlined in this report".
Innovative methods for improved environmental performance	For the Redmoor project the website mentions that innovative methods, such as the use of straw bales for noise screening, were positively received by both community members and Cornwall Council. The project applies Deep Digital Mining techniques.
Sustainability	For Drakelands, Tungsten West aims to be a responsible, ethical, and sustainable mining operator. As such, the company is looking at renewable sources of energy to support production at the mine, as well as supplying secondary aggregates to the construction industry with by-products that would otherwise be considered as waste, and hence has approximately 25% of the carbon footprint of primary aggregates.
Mitigation measures	Measures include: - Control and reduction of vehicle movements per day during regular business hours. 300 movements per day in 2026 were allowed prior conduct of traffic-specific studies covering all types of on-road vehicle from cars to vans and lorries of varying sizes and capacities, but also off-road mining and excavation and product handling and movement equipment. - Acquisition of planning permission from the local authorities, which may impose conditions on the mine's activities to minimize environmental impacts and protect sensitive areas (Drakelands mine). Includes natural system-based boundaries for the mine's operations. - Adoption of comprehensive environmental management system that covers all aspects of the mine's operations, including water management, noise and dust control, waste management, and rehabilitation. - Adoption of biodiversity action plan that aims to enhance the ecological value of the site and its surroundings, including the creation of new habitats, restoration of existing habitats, and monitoring of flora and fauna. Drakelands mine works with local stakeholders, such as the Devon Wildlife Trust, to implement the plan.

Aspects	Description
	- Voluntary actions: In the mandatory Redmoor Project Ecology Report a non-statutory, ie voluntarily-designated, part of the drilling area is identified as sensitive for biological reasons – it is a known dormouse habitat - and CRL has accepted the condition to manage the drilling in such a way as to protect such habitats containing endangered species as far as reasonably possible.
Rehabilitation	Some of the rehabilitation measures foreseen for Hemerdon in their Devon Council permitting application/operation/closure include restoring the landscape by filling the open pit with tailings and soil, and planting native vegetation; monitoring and treating the water quality of the mine waste facility and the surrounding streams; reducing the noise and dust emissions from the site by using low-noise equipment and water sprays; engaging with the local community and stakeholders to address their concerns and expectations; and creating new opportunities for employment, education and recreation in the area.

2.10.7 Stakeholder engagement and communication

UK mining regulations regarding public consultations depend on the type and location of the mining project, the mineral in question, and the potential environmental and social impacts. In general requirements are:

- Formal consultations start when there is scope to influence the policy outcome.
- Consultations last for at least 12 weeks with consideration given to longer timescales where feasible and sensible.
- Consultation documents should be clear about the process, what is being proposed, the scope to influence and the expected costs and benefits of the proposals.
- Consultation exercises designed to be accessible to the people the exercise is intended to reach.
- Consultation responses to be analysed carefully and clear feedback to be provided to participants.
- Consultation complies with any specific public participation for installation and mining waste permit applications.
- Consultations involve relevant authorities and stakeholders: local authorities, environmental agencies, landowners, indigenous groups, and non-governmental organisations.

For planning in general, the permitting / planning application review stage is a legal obligation to be followed by the Planning Authority. Public consultation periods may formally be time limited (eg 20-28) days and appeals against decisions may also be allowable within a time-limited period after the decision is published. This may also be time-limited to 20-28 days while the planning authority will also have to review the appeals process within a period defined in statute.

Public consultation will, however, continue during the duration of an exploration project or during the operational and closure phases of a mine's life, including decommissioning and remediation as needed. The way this is conducted, and the frequency is likely to be site and project- or mine-specific. In the case of a strategic project such as Drakelands to a certain extent consultation will be a continuous but built-in process consisting of public access websites, consultation meetings with local community leaders and participation by mine personnel in local life, for example by volunteering or work with local charities.

In the case of Environmental Permits, the permitting body must start a Consultation Procedure within 30 days of an application being filed and typically consultation takes 20 days. Exceptions can of course be made. A very detailed Policy Paper, Environmental permits: when and how we consult, Updated 16 April 2019, including a full description of how the entire process works as set out by the Environment Agency, may be

found on its website. The obligation to hold a consultation process is legally binding on all parties and any proposed changes to consultation procedures are themselves subject to consultation.

Public consultation is an important part of the planning process for mining activities in the UK. It allows the public to have a say in the development proposals that may affect them and their environment.

Public consultation requirements and rights for mining activities vary depending on the type, scale, and location of the project. Some general principles likely to be applicable to all consultations are as follows:

- Mining projects that require an environmental impact assessment (EIA) must consult the public on the scope and content of the EIA, as well as on the environmental statement that reports the findings of the EIA.
- Mining projects that may affect a European site designated under the Habitats Directive must consult the public on the appropriate assessment that evaluates the potential impacts on the site's conservation objectives.
- Mining projects that involve extraction of minerals from Crown land or land managed by The Crown Estate (TCE) or the Forestry Commission must obtain exploration and extraction licences from TCE or the Forestry Commission, as well as access right permits (wayleaves) from the landowner.
- Mining projects that affect private landowners or lawful occupiers must give them notice of impending operations and consult with them on the terms and conditions of access and compensation.
- Mining projects that affect employees must make a formal agreement with them about what business information will be shared and when they will be consulted if there is a request from at least 10% of the employees or 15 employees (whichever is less) in a business with more than 50 employees.

Public consultation for mining activities should be carried out in a timely, transparent, and effective manner, taking into account the views and interests of all relevant stakeholders. Public consultation should also comply with any specific guidance or regulations issued by the relevant authorities, such as the Department for Levelling Up, Housing and Communities, the Ministry of Housing, Communities and Local Government, or the Financial Services Regulatory Authority.

Minimising community and environmental impacts are a precursor to any exploration activities undertaken at Redmoor. Positive community engagement was maintained throughout the 2017 drilling programme, with 14 community meetings held, and for phase 2 a further ten consultation meetings have been held, so total 24. No complaints were received from the local community despite operations being in relatively close proximity to residential and rural properties. Redmoor has also aimed to maximise local employment and collaboration with local universities, notably Camborne School of Mines and Exeter University. CRL claims that it has consistently maintained positive community engagement throughout its drilling programs, with over 24 community meetings held to date. CRL also states that it aims to minimize community and environmental impacts and comply with all relevant regulations and standards.

Good practices in stakeholder engagement for the cases are shown in Table 71.

Table 71 – Good aspects related to Stakeholder engagement and communication.

Aspects	Description
Planning and denomination of Natura 2000 areas	Planning and environmental authorizations may require successive phases of public consultation
Consultation	The statutory stakeholder consultation process for major infrastructure projects in the UK is guided by the Planning Act 2008 and the OECD Due Diligence Guidance for Meaningful Stakeholder Engagement in the Extractive Sector. The process involves identifying and engaging with

	stakeholders who are interested or affected by the proposed extractive operation, such as local communities, landowners, regulators, NGOs, and indigenous peoples. The process aims to provide stakeholders with timely and relevant information, solicit their feedback and concerns, and incorporate their views into the project design and decision-making. In Redmoor according to CRL's website, the company has been conducting stakeholder engagement activities since 2016, including community meetings, newsletters, site visits, and media releases. In Drakelands, Tungsten West has accepted "non-statutory" ecological and environmental conditions for operation as determined by independent experts and consultants and agreed with the Planning Authority, Devon, and Dartmoor National Park. In consequence social acceptance is generally good and Tungsten West is committed to keeping good relations with both local stakeholders and regulators. A project of this size and significance also attracts national attention and scrutiny, not least because of the status of Tungsten and Tin on the UK CRM List (HM Government, 2022). There has not been explicit opposition to the Redmoor project, but concerns have been presented. It is understood the project is still at exploration stage. The CRL website states that minimising community and environmental impacts is a priority for CRL in all exploration activities undertaken at Redmoor, and that positive community engagement has been maintained throughout CRL's drilling programs. There have been more than 24 community meetings. Informal stakeholder engagement strategies for the Redmoor project are ways of building relationships and communicating with stakeholders who are affected by or interested in the mining project, without following formal procedures or protocols. Some examples of informal stakeholder engagement strategies performed by the mining company during the relevant stage of the Redmoor project are: - holding public meetings and consultations, - establishing a community liaison group consisting of representatives from various stakeholder groups - publishing newsletters and updates on the company website and social media on progress - supporting local initiatives and events that promote social, economic, and environmental sustainability in the region.
Collaborations	Funding for and collaboration with stakeholders such as the Camborne School of Mines, Exeter University, the initial (2017-18) and current (2022-) exploration stages (drilling and trenching) has come from the EU Regional Development Fund, the Deep Digital Cornwall project.

2.10.8 Economic benefits

Drakelands

The benefits and costs to the communities were evaluated by various factors, such as:

- economic value of the tungsten and tin deposits, which are considered critical minerals for many industries and technologies
- employment opportunities for about 300 people who would work at the mine
- a positive multiplier effect of 300 jobs into the wider local economy to create a potential 750 full - and part-time jobs servicing the mine (multiplier of 2.5)
- the environmental impact of the mining and waste disposal activities, which could cause damage to the nearby Dartmoor National Park and affect the local wildlife and water quality
- social impact of the increased traffic and noise from the heavy goods vehicles that would transport the ore and the waste granite.

These factors were taken into account by the mining company, Tungsten West, and the local authorities, who had to balance the benefits and costs of the project. They were also presented to local stakeholders both when activities were paused in 2022 and when they resumed in 2023. The plans to reopen the mine were put on hold in April 2022 due to rising costs and low tungsten prices but were resumed in July 2022 with a new development plan that would cut costs and streamline processes.

Tungsten West is set to directly employ approximately 200 members of staff once operational.

It is estimated that the presence of the mine will indirectly support a further 1,200 jobs throughout the broader supply chain which are required to support the operation.

The benefits and costs were evaluated by various methods, such as:

- A public consultation on the proposal for more lorries to pass through the site, which aimed to minimise the impact on the surrounding communities and build trust.
- A BS4142 assessment on the noise impact of the processing plant, which considered the existing and proposed noise levels, background noise levels, and noise mitigation measures.
- An environmental planning process that involved the Environment Agency, Dartmoor National Park Authority, and other stakeholders, which assessed the potential flooding danger, landscape restoration, and aftercare of the mine.
- A legal agreement with the Mineral Planning Authority in the form of a Unilateral Undertaking, which committed the operator to implement a revised restoration concept and other improvements.

These methods were intended to balance the economic benefits of the mine, such as employment and production of tungsten and tin, with the environmental and social costs, such as noise, traffic, and visual impact.

Redmoor

The project also claims to have a strong focus on community engagement and environmental responsibility. However, some local residents and environmental groups have expressed concerns about the potential impacts of mining on the landscape, wildlife, water quality and public health. They have also questioned the economic viability and sustainability of the project, given the volatility of metal prices and the uncertainty of global demand.

Therefore, the benefits and costs to the communities regarding the extractive operation in the Redmoor project are not clear-cut and like any other mining project will depend on a range of factors such as market conditions, **regulatory** approvals, social acceptance, and environmental performance. The project is still in the exploration stage and has not yet applied for planning permission to start mining. Therefore, more studies and consultations are needed to evaluate the potential impacts and benefits of the project in a comprehensive and transparent manner, but there is no evidence that the public concerns raised are of a nature that would, if properly addressed, give grounds for refusing an operational mining licence.

2.10.9 Concerns/disputes

Local media do not report any specific information on whether local communities or NGOs have objected to the Redmoor project outside the statutory processes, but the absence of such reports suggests that no objections or comments outside the statutory process have been lodged.

There were some objections from local communities and NGOs to the Hemerdon Devon mine outside the statutory processes. In particular, Devon County Council received numerous objections to an application by Tungsten West to increase lorry movements to and from their mine at Hemerdon [Drakelands]. The proposals were for a total of 400 lorry movements per day at the site. Some residents also expressed their fears about the noise, dust, and traffic that the mine reopening would cause. The planning permission extension application took these objections into account but were satisfied with the mitigation measures taken by Tungsten West. The planning permission extension application took these objections into account but were satisfied with the mitigation measures taken by Tungsten West (Plymouth Chronicle, 2022; Dowrick Molly, 2021; BBC News,2011,2022: BBC home, 2014).

2.10.10 Enablers

Potential enablers for streamlined planning and permitting procedures while also devolving much of the decision-making to local or regional level in UK are summarised in Table 72, Project Enablers.

Table 72 – Project Enablers.

Separate jurisdictions support own regional development	Since UK is formed by separate jurisdictions, each of the four UK nations has its own strategies and plans.
Minerals assessed in plans	Mineral availability (supply security) and criticality levels are assessed in plans already at governmental level. UK identifies specific minerals safeguarding areas. “Since minerals are a non-renewable resource, minerals safeguarding is the process of ensuring that non-minerals development does not needlessly prevent the future extraction of mineral resources, of local and national importance.” (Gov.uk) These areas are defined in consultation with industry, national and local authorities, local communities and other interested parties.
Permit application approved by local authorities	Local authorities evaluate projects against local plans, and governmental authorities are consulted according to their areas of responsibility and competence.
Extensive and diversified communication actions	Stakeholder engagement activities are highly diversified and inclusive, such as community meetings, newsletters, site visits, press releases, social media, chat groups, establishment of a community liaison group with representatives from various stakeholders, outreach to schools, public institutions, faith groups.

2.11 Australia

2.11.1 Case overview

Ranger Uranium Mine (Table 73) consists of a series of uranium deposits discovered in the 1960s.

Table 73 – Case study summary.

Name	Ranger Uranium Mine
Country	Australia
Region	Northern Territory
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)	Uranium
Open pit or underground mine	Two open pits; underground resource investigated but not exploited
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Currently in remediation
Period of activity	Discovered 1969 Mining commenced Pit 1 1980 to 1995 Mining Pit 3 commenced 1997 ended December 2012 Milling of stockpiled ore finished in January 2021 Remediation underway Remediation was due to finish 9 January 2026, but this is being extended
Companies involved	Energy Resources of Australia Ltd (ERA), which is 86.33% owned by Rio Tinto Group; balance is public shareholding
*Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	Totally surrounded by Kakadu National Park which is World Heritage listed. Listing commenced in 1970s. Kakadu wetlands are also RAMSAR listed

Many small deposits were identified but only a few were deemed likely to be techno-economically viable. Eventually only two were mined - Ranger 1 and Ranger 3. There were also other major deposits nearby at Jabiluka and Koongarra. Both were explored and the ore body at Jabiluka was accessed with an exploration decline; but following objections from local traditional aboriginal owners and the community at large neither was granted an operational permit.

Ranger was the subject of an inquiry by a three-person commission headed by Mr Justice Fox – The Ranger Uranium Environmental Inquiry - the first of its kind in Australia. The Inquiry generated two reports, Fox 1 and Fox 2. Fox 1 (1976) decided Australia could become involved in uranium mining and Fox 2 (1977) determined the conditions for the possible set-up of the three mines Ranger, Jabiluka and Koongarra within the boundaries of the proposed Kakadu National Park.

A Ranger project area of 64 km^2 was then created by an Authorisation issued under s.41 of the Atomic Energy Act. It is an open pit uranium mine and mill with on-site disposal of waste rock and tailings. All tailings were required to be disposed of in pits below ground level at closure. The site is surrounded by Kakadu National

Park and double listed on the UNESCO World Heritage register for both natural and cultural matters. The Mine is currently under remediation to create a landform/landscape that would enable the area to be incorporated into Kakadu if so desired. The Ranger project operated from 1980 until mining ceased in 2012.Milling ended on January 9, 2021.

2.11.2 Spatial planning

Land use planning policy was determined under appropriate NTG legislation although on Native Title land special provisions may apply. The park was established after the Ranger Project Area and the mine lease for the other two had been established. Thus, the mines were never part of the National Park although Koongarra has been handed over to the Park by the traditional owner in recent years now that the mining lease has ceased. The park determines some restrictions to the operations as at some locations (sacred sites), where for example heavy machinery may be restricted or banned. Federal Environment Minister oversees World Heritage sites in Australia. Kakadu was set up following RUEI (Fox Inquiry) and the consultation required refers to Land Rights Act, Native Title Act, and various other legislations. Procedures are usually controlled by Aboriginal Land Councils acting on behalf of ATO.

2.11.3 Mineral governance

At the time of the Ranger mine establishment the authority to develop uranium resources was issued by the Commonwealth (Federal) Government under the Atomic Energy Act. However, as the Commonwealth had no mining legislation the day-to-day regulation of mining was delegated to the Northern Territory Government (NTG) with oversight and supervision by a special series of agreements and protocols. Also, there were agreements between the Northern Land Council (representing traditional owners) and the mining company regarding various requirements and conditions for rent, royalties etc.

The system remained in place to the present with few major changes other than a gradual increase in the position of the aboriginal traditional owners (ATO) at the table in terms of consultation to the point today where they have a significant influence on events at the operation. This is in part related to general political changes in Australia over the same time, development of Land Rights and Native Title legislation also contributed to the ATO having a stronger position in consultations and negotiations. Effectively to the point where the development of the Ranger 3 Deeps underground Resource and the Jabiluka underground resource were stopped by them.

NT Mining Management Act and Mining Titles Act control exploration and mining and remediation. NT Water Act applies to off lease activity. Ranger was operating under an authority from the Atomic Energy Act as it was the only control for radioactive minerals at the time (1976). Permitting authorities are Commonwealth Government and NTG, that is also monitoring authority with additional oversights from Office of the Supervising Scientist (OSS).

Before designation of the protected area full exploration had been carried out and ore body delineation for multiple deposits. Only two were permitted to be mined. No natural system-based boundaries been used to define protected areas. The natural background conditions of the mine site before mining operation were open schlerophyl forests.

2.11.4 Environmental governance

EIA and Habitats Directives requirements are enforced through Mining Management Act by conditions in authorisation to operate. Commonwealth has a dedicated unit - Office of the Supervising Scientist (OSS) - to oversee all uranium mining activity in the Alligator Rivers Region; also has a research function to develop standards for environmental protection from effects of U mining.

Commonwealth administers Kakadu National Park through Environmental Protection ad Biodiversity Conservation Act and works with other agencies regarding the mining operation. Commonwealth controls also uranium exports by permit process as well as Safeguards provisions

NTG has Mining Management Act, Mineral Titles Act and Water Act amongst others as well as industrial safety etc.

Studies performed for permitting have been Ranger Uranium Environment Inquiry and full EIA process under Federal legislation. During permitting a set of Environmental Requirements (ER) over and above normal legislative requirements were enshrined in three laws relating to operations at Ranger. ER were added to the authorisation to mine under the NTG Mining Management Act. It was used a source-path reception model to identify potential risks from extractive activities in or near the protected area, while social assessment was performed according to old style tools from 1960s and 1970s.

After closure the mine site reverts to traditional owners as a natural landscape and may be considered for incorporation into Kakadu National Park. Rehabilitation measures are still to be agreed with stakeholders but tailings into pits and establishment of natural landscape were set at time of original operation commencing. Standards and completion criteria were developed progressively throughout mine life to be agreed by all major stakeholders: Federal and NT governments and traditional owners.

In Australia are not laws or regulations in place specifically on the management of extractive waste, instead are general provisions under authorisation conditions. There are also no mandatory/voluntary compensation measures foreseen in the framework legislation procedures, that instead are project specific.

2.11.5 Stakeholder engagement and communication

There are statutory meetings foreseen by legislation. Statutory meetings with agents of Traditional owners under legislation such as Land Rights Act. Development of a mine-site technical committee comprising Commonwealth and NT Governments and Aboriginal traditional owners meets monthly. At an informal stakeholder engagement level, the company kept irregular meetings as opportunity arose as well as project specific meetings for introduction of innovative technology or after incidents. There was objection outside statutory process. ERA and Ngo carried out own studies on benefits and costs with opposing results.

3. Highlights and interim conclusions

In a number of the case studies in this Report, to recover and valorise natural resources across a range of countries mining activity has long preceded the designation of parts of those areas mined as protected or environmentally sensitive. This comes as no surprise given how closely intertwined the history of Europe and the history of mining in Europe are socially, culturally and economically. But, as well as the obvious conclusion that this evidence points to that there is no fundamental reason why good mining practices and good environmental practices should be mutually exclusive or conflicted concepts, it is clear that where needed as in the public interest, and if properly conducted, mining activities and protected areas can be mutually enhancing and therefore in outcome value additive not value-destructive in nature.

Good practices in protect areas

Good practices for mining operation in protected areas were identified in all cases. From the corporate perspective, the application of low impact technologies, underground mining, ecological compensation and offset, active and wide stakeholder engagement and communication are emphasised. From the authority perspective, protected areas embed several values: social, environmental, and economical, to be taken in account in any responsible mining project. But in protected areas, additional requirements both for mining and for mineral exploration well beyond normal permitting procedures are seen as essential to obtain and maintain social acceptance and to ensure the least possible impact on the protected areas themselves, especially their eco-systems and biodiversity.

Spatial planning and governance

Good practices relative to spatial planning assume the **inclusion of accurate, contemporary mineral resource information** as a key resource for planners and decision-makers at both strategic and operational levels especially when mining and processing activities for critical or strategic raw materials may be under active consideration for land use and land use balance in protected areas. As examples, mineral-rich areas have been safeguarded in Sweden, UK, and Austria; and in UK the same body that administers local government, the County Council, is simultaneously, but much less visibly, the Mineral Authority responsible for mine permitting.

This means that the responsible land-use planning and mining authorities must be able to avail themselves directly of in-house expert geological knowledge concerning deposits classified as “of national interest”, or “critical” or “strategic”, whether for economic, political or social reasons. This policy-driven resource classification determines that a specific deposit, so classified, will not be sterilised by the use assignment for other purposes incompatible with mining, of the land on or in which the resources are found such that it would jeopardise the current or future extraction of minerals from that source.

Land use determination

As a result, the designation of particular areas in Austria dedicated to mineral extraction include an evaluation of potentially conflicting uses of land in those areas, based on identifying during their land use master planning where access to and extraction of safeguarded resources would or would not conflict with other more favoured or better accepted land use options. This formalised, policy-driven decision-making procedure helps a) preserve social cohesion by conflict prevention at social and economic levels in access to critical resources, but also b) greatly facilitates the task of the mine operating company by creating prima facie conditions of social acceptance among the local community for mining activities before any activity actually takes place. At the same time, the option to research and plan mining operations inside dedicated or safeguarded areas is not excluded either if significant new deposits of CRMs are located using innovative exploration techniques, or due to changes in materials science, materials previously not included in any CRM list are for the first time included.

In other jurisdictions, mineral governance and spatial planning have discrete legislative provisions, but the decisions affecting miner permitting are made by a single, unified authority, as in France. Minerals do not appear as such in land use plans, but mineral and spatial planning governance are assigned to a regional

authority of reference in an oversight framework where governance is decentralised. The Prefect (the regional authority, acting as the state representative of both the Ministries of Economy and Ecology) has a key role in both designation of protected areas and in permitting and monitoring extractive activity within them.

The conflicts and impacts of a project may also need to be managed at EIA level across several jurisdictions, whether national or regional (ie across state boundaries). Even if not all countries assess Natura 2000 criteria as part of the EIA, some countries such as Ireland and the UK have a dedicated assessment called either Appropriate Assessment (IE) or Habitats Regulations Assessment (UK) having an equivalent purpose.

Roles and responsibilities in the regulatory and permitting process

The assignment of responsibilities at national, regional, or local level varies in method according to individual countries' regimes. On the one hand, in centralised systems **local and regional governments may bring a unified focus to local and regional development goals, coordinated centrally;** on the other, in countries with decentralised governments, **the presence of a national policy setting national goals** has still proven beneficial. This applies both to harmonisation of environmental goals and to policies on mineral exploitation. It is a good practice though that both national, regional and local levels of government and the public are in general, especially those in communities directly affected, are involved in land use planning procedures including the designation of protected sites and decisions of extractive activities.

In respect of environmental considerations, the designation of initial Natura 2000 sites happened in something of a rush in the 1980s and 90s. As a result, the freshly designated areas were subsequently reassessed for consistency in accordance with the reporting requirements of the directives (art.17, Habitats, art.12 birds). Most of the areas adopted into Natura 2000 had been based on sites already protected at national level, ie the **prior national designation of a site as protected was not overridden by incorporation into Natura 2000 status**. Many Natura 2000 sites therefore, have boundaries that are not principally determined by ecological, bio-diversity or habitat factors, their boundaries being based on different principles of protected area status designation.

Permitting processes

All the countries studied follow a **more or less linear and transparent (ie publicly accountable) permitting process**. In some countries for certain procedures within the whole linear process, however, tasks are run in parallel, managed through a "one-stop shop" approach; other countries, such as Spain and Ireland, have an iterative process involving different authorities at each iteration. We have not looked at the time and complexity of the permitting process in detail but, with the policy objectives of the 2023 CRM Act in mind, where multiple agencies follow different evaluation methods for the same task, presumably some even significant streamlining could occur by conducting some procedures in parallel not in series, or even in advance before any specific permit is applied for.

In general, it appears that when the permitting applies to Natura 2000 areas, the process in all jurisdictions is largely similar; but some aspects may require more detailed, exhaustive and even longitudinal impact studies and some may require additional inputs from national authorities and local academic-scientific centres with specific, locally grounded capabilities and experience. Mineral exploration in Natura 2000 areas for example commonly requires a level of ecological and environmental assessment, which under normal permitting rules would not be mandatory. To meet CRM Act requirements, a streamlined and systematic permitting process will be required and a harmonisation and normalisation of the permitting process in all EU countries would be a significant advance, even though projects should still be examined case by case.

Expert knowledge of deposits and UNFC classification

A key factor in all cases is extensive expert **knowledge of the deposit** on the basis of which its socio-economic significance can be decided in a manner free from conflict of interest. UNFC resource assessments as now

required under the CRM Act[12], but also the CRIRSCO[13] approach commonly used by industry can be valuable tools in the resource assessment and permitting activity.

UNFC uses a three axis EFG classification of projects with respect to their environmental-social- economic (E) and technical feasibility (F) and their level of geological certainty and confidence (G) to build a body of metrics for both users and decision-makers to apply in the resource-assessment and permitting process. It is designed for projects concerning any kind of natural resources, primary and secondary, whether in mining, petroleum, anthropogenic resource enhancements, injection, renewable energy and groundwater, and thereby facilitates comparisons of and consistency of approach to diverse projects and purposes. It is therefore also included in the EU CRM Act where it is mandated for use.

Knowledge of a deposit is fundamental to the assessment of a project's potential. Even at the deposit exploration stage, basic studies that can demonstrate the economic potential and suitability for investment of the deposit may be taken fully into account when permitting a mine in general, or for specific CRM projects, or in locations that might impact Natura 2000 sites either by proximity to or colocation in them. These kinds of special instance are typically site specific and commonly need additional specialist studies to better balance their benefits, costs and social and environmental impacts.

Exploration

The exploration phase in some jurisdictions can happen in areas that have other land use, while mining activity requires that the land use is dedicated to the extractive activity. Exploration has thus more flexibility in operation, but even when for compelling reasons of public interest exploration is needed in protected areas, the applicable legislation is strict. Natura 2000 designation generally does not prohibit activities that do not cause significant harm to the habitat. The use of **low impact and remote sensing technologies** supports the research team in the creation of a trusted and accurate knowledge baseline with no or low impacts on the protected areas and will materially strengthen public confidence in the robustness of the public good case.

Technology selection and the wider choice of mining method are always key factors in permitting decision making. Several cases dealt with in this report consider the merits of underground mining in preference to open pit as a significantly less environmentally and socially invasive form of mining. In fact, there is an emerging trend in granting mining licence extensions to mandate that new activities taken place wholly underground, including administrative installations and offices. Examples include Neves Corvo in Portugal, Mittersill in Austria, and Redmoor in the UK.

Permitting and impact mitigation or prevention

Permits for new mines also start from the premise that underground mining mitigates mining impacts such as Sakatti in Finland, Nussir in Norway, and Stekenjokk in Sweden. Sub-surface operations are likely to reduce or eliminate negative impacts on the surface eco-system whether designated as a Nature protected site, or in general when used for other quite different sensitive purposes, such as recreation or reindeer herding. In the cases examined, specific procedures such as location of mining infrastructure, resource transportation for processing and milling operations have increasingly been conducted underground. In some cases, procedures that may involve higher environmental risks and hence need specialist facilities, suitably situated at another site away from the min. For example, processing of Stekenjokk ore which will be done offsite in

[12] See United Nations Framework Classification for Resources, Update 2019, ECE/Energy/125, UN Geneva, (2020) https://unece.org/sites/default/files/2023-10/UNFC_ES61_Update_2019.pdf

[13] CRIRSCO is recognized as the international organization that represents the mining industry in matters relating to the standardization of codes for public statements, as a Strategic Partner of ICMM and also accredited by the United Nations Economic Commission for Europe (UNECE) and the International Accounting Standards Board (IASB), an organization that brings together stock exchanges around the world and dictates accounting rules, by international standards IFRS (International Financial Reporting Standards). https://crirsco.com/about-us/

Joma, nearby in Norway, has been relocated voluntarily by the mine operating company to alleviate public concerns. And processing operations at Mittersill were similarly conducted remotely from the mine.

Certified or suitably experienced expertise, with no conflict of interest

A good, often mandatory, practice is to engage **independent certified or otherwise recognised experts to perform the necessary research and compile the reports needed to underpin the permitting decision-making process**. Companies are likewise required to plan and implement environmental management and monitoring programs (EMMPs) based on the findings of related EIAs with the inclusion of emergency management and response protocols or standard operating procedures with the primary objective of protecting occupational, public and environmental health and safety. Employee training programmes to promote social and environmental values, and encouragement of and support for activities promoting climate action (GHG reduction) and biodiversity promotion are strongly recommended and, in some instances, a regulatory requirement, typically where occupational and environmental health and safety factors are concerned.

Ecology, environment, biodiversity

In all cases as required by law, extensive **ecological and environmental studies** are routinely performed during the EIA component of the environmental permit application. Assessment of ecological impact, for example, is an overarching statutory demand of Swedish law which requires (using recognized sampling and laboratory characterisation protocols and technologies, using related and tools/software) that contaminants and pollutants such as heavy metals, biological and chemical contaminants, radionuclides etc, where found, are below the limits fixed by national or regional laws. Extensive ecological and environmental studies are key requirements in the application of permit to mine in Natura 2000 areas.

Application of GIS and predictive modelling to evaluate the impacts on basin hydrogeological systems and the wider environment of which these are part, as for example is executed in the cases examined in Västerbotten and Norrbotten counties, and laboratory and field research on the impacts on biota performed for the Nussir mine in Norway, are some examples.

The cases also show extensive and continuous adoption of measures to improve environmental performance in several segments of the mine life cycle aiming at **mitigating environmental impacts** with a rich set of **compensatory or offset actions** to preserve the ecological value of the areas under pressure from those segments. In a classic EIA assessment these compensatory measures are typically tailored to the specific context and needs of habitat and species impacted. Measures include dust reduction, timetabling mining and processing activities seasonally to protect certain natural cycles that might otherwise be disrupted such as nesting or reproduction seasons. Standard requirements may also include avoidance of use heavy machinery during exploration, recycling of water, reduction of visual impacts, and seasonal work/reduced activity to avoid interference with transmigration periods. In Serra de Aires e Candeeiros, for example, more than 100 mitigation measures are defined in the environmental impact statements to safeguard nature and human health. Adoption of alternative techniques to reduce emissions was undertaken in several instances, resulting in **improvement in the technology, enhanced efficacy in production and in environmental performance** both in exploration, and in extraction and processing.

Mine End of Life

In cases where an area was compelled to host mining and processing, compensatory and offset measures were in place to accompany the project such as the relocation and reconstruction of habitats for nature and provision of social programmes or leisure facilities for local inhabitants. Mine End of Life (EOL) closure and remediation measures are also included as a component of the EIA and have been adopted in some of the cases presented in this Report. Examples of End of Life remediation goals include creation of more diverse and richer terrestrial and water habitat, contemplation of alternative land use activities, creation of rocky habitats or revegetation according to the local environment.

Stakeholder engagement, communication and public consultation

Stakeholder engagement, communication and public consultation are increasingly found as statutory elements in land use planning and extraction permitting processes. Encouragingly, the **communication and engagement activities** performed by the companies increasingly go **beyond the statutory requirements**. During permitting, extensive consultation with relevant stakeholders and the public is often conducted without reaching unanimous consent. Realistically, it must be expected that, as in democracy itself, unanimous consent is rarely if ever achieved for mining projects which worldwide arouse strong feelings and opinions.

Early, continuous, patient varied and flexible engagement is essential to accompany day to day company operations, especially when the mine has a long life cycle stretching at times over more than one generation. Meetings, open door events, and social media campaigns have offered varied means for outreach and engagement and communications strategies must evolve in-step with the mining cycle, sometimes as leader sometimes as follower. This is in line with the findings of the project NEXT, that also showed that companies performing exploration near protected areas have been more active and creative in stakeholder communication and engagement, improving transparency of operations compared with the approach of other operators with no experience of mining in protected or sensitive areas.

Context

Context and external factors beyond the mine's control or direct purpose are always of high significance. The adoption of a formal **plan for stakeholder communication and engagement** by a company has on occasion facilitated the management interaction with local communities and interest groups. Government and industry are both incentivised to ensure that these operations are as clear and efficient as possible. They share the costs of project failure as well as the economic benefits of success through the fiscal and regulatory system and otherwise. **Socio-economic benefits distributed by a mining company** operative in the community are not just monetary in nature stemming from tax or permit revenue, or royalties or dividends to local individuals and organisations but also include adoption of policies such as local content issuing contracts to local suppliers, providing employment to the local work force, support and sponsorship of community activities, investment in local social enterprises, cooperatives and voluntary groups. Companies engage also in education programmes with local schools and training bodies. Costs of failures will normally be expensed, meaning that their tax value is paid by Government.

Heritage

In terms of social and cultural heritage, which correlates closely with likely social acceptance of new mining projects or reopening or extension of existing ones, several case studies such as in Italy, Portugal and UK address activity that originated several decades ago, before the EU environmental legislation and the creation of Natura 2000 areas formalise consultation procedures between mining operators, local authorities and local communities. It is typical of the history of mining through time that there are alternating periods of production and closure, both of unpredictable length, which have decisively shaped the local environment and the socio-economic development of the areas where the mineral deposits are the sources of employment and wealth.

To be sustainable, these communities must learn and practice the habits of resilience which can cope with the vagaries of minerals markets. In some cases, inspecting and investing in mining cultural heritage converts into living history and tourism attractions, such as UNESCO World Heritage sites in Cornwall UK, which have hosted minerals mining since the bronze age, or the Mittersill mine museum in Austria. Figure 51 summarises some interim conclusions from this analysis.

Given that the mining projects in general are slow relative to technological changes, such as moving from fossil energy to electricity, or moving from one battery chemistry to another, the mining industry must prepare its capability development to lead to dynamic capabilities, meaning that they are prepared to

capture opportunities that open and mitigate the risks of losing their markets and reforms unfold. Capabilities are in this context used for organisational qualification and capacity.

Public (national) interest

Even though governments have the option of permitting extraction projects according to "Imperative Reasons of Overriding Public Interest" (**IROPI**)**, none of the cases addressed in this study cites this justification as the basis for requesting and granting approval**. The exploration and mining projects reviewed have been developed adjacent to or overlapping with protected areas. But they share a founding assumption of the need for respecting the operational outcome of causing the minimum disturbance possible and for mitigating or preventing potential negative impacts on people or the environment, to the extent reasonably possible. That said, opposition has arisen in many cases even when a good environmental performance has been demonstrably delivered. For example, in the Norwegian case, the mining company planned to adopt underwater waste disposal to operate according to best environmental practices determined at national level and approved by the government and the environmental agency. But despite that, eleven organizations complained about the practice leading to four years of legal and social wrangling as to the merits of the practice.

Several cases (Finland, Ireland, France, Norway) show that the projects solicit widely different, even contradictory opinions. For example, in both the Finnish cases, although widely approved by the local communities and respective municipality administration, both faced opposition from local and/or national NGOs. In reality, a split vote between those for and against a mining project is a common feature across many of the cases reviewed. Protected areas are one of those sensitive contexts in which mining and mineral exploration disputes are expected to occur. But such divisions are not restricted to projects seeking permits in sensitive areas nor even more likely to happen because of the protected nature of the site.

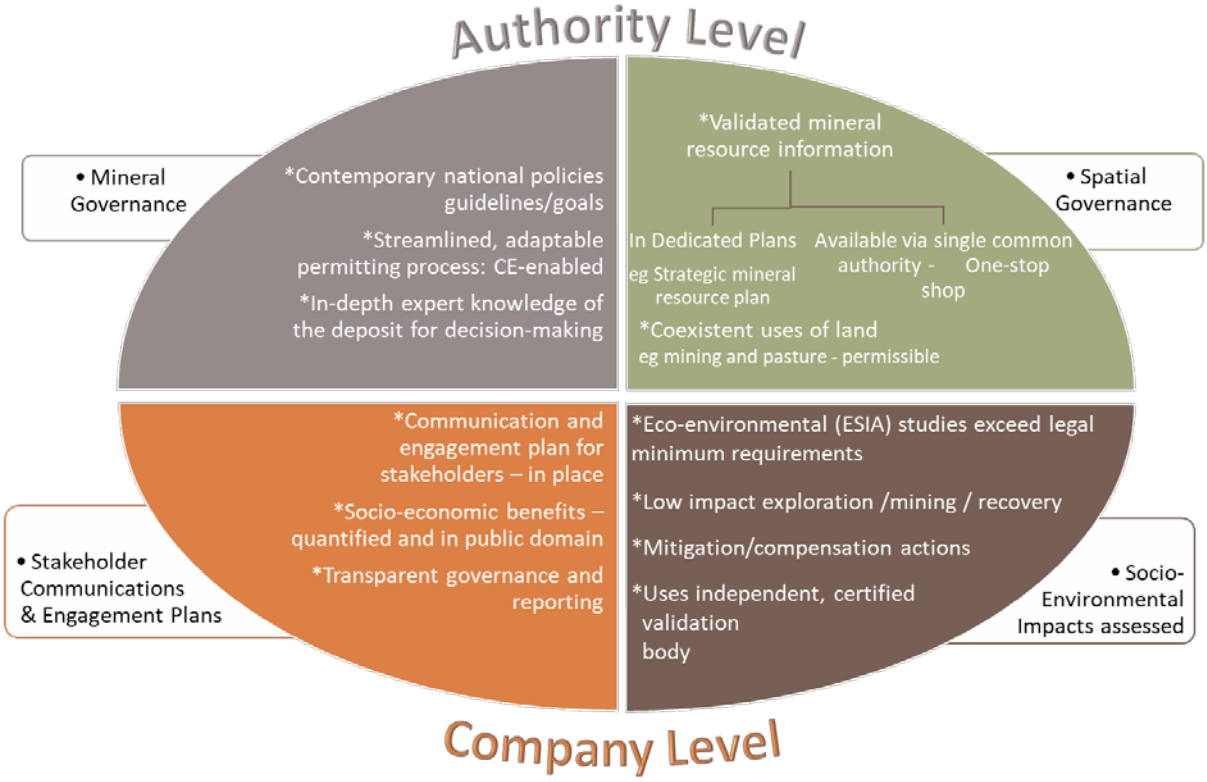

Figure 51 – Good practices as captured from the case studies.

Figure 51 presents a four quadrant synthesis of the factors summarised in this section seen simultaneously at authority (government) and company levels.

It embraces fiscal, regulatory and contractual regulations, as well as the broader social and environmental function, supply chain regulations, common standards for data management, model contacts accounting standards and much more. This reminds us that mineral governance needs to be transparent and adaptive, reaching well beyond setting goals, issuing permits and submitting annual reports to owners, investors and stock markets.

Within the cases operative near protected areas the procedures have been intensively scrutinised for their ecological and socio-economic impacts. Wider socio-economic need is usually a reason for these projects, most obviously for CRM projects; and the impact of stakeholders raising social and environmental concerns has been prevailingly positive leading to technical innovation and adoption of creative and socially sensitive new solutions, and more sustainable environmental safeguarding and management techniques.

Trust, disputes and doing the right thing

All the case studies summarised here have in common the 4 interdependent pillars of sustainable extractive activity: i. spatial governance, ii. mineral governance, iii. environmental governance, iv. stakeholder engagement and communication. Common to all four aspects of governance is the objective of either preventing or resolving disputes.

Disputes over mining seems to be more about the trustworthiness or otherwise of both mining companies and governments and the more the proposed project is found in an area noted for its social, economic and cultural history of mining the higher its likely acceptance, with employment opportunities and economic stimulus to the local economy being the main factor in the reasons for why the project gains that acceptance. Alignment of economic interest between different stakeholders of the local resources is also an important aspects to be considered, as one party might receive the economic benefits and the other the costs, producing hidden agenda for blocking projects, not related necessarily to the issue in dispute.

From the cases analysed it appears that requirements from authorities have been higher when impacting protected areas, but the companies have in many cases exceeded the mandatory conditions whether or not the operational context is a protected site. As they see it, it is simply the right thing to do, and significantly derisks the business and investment case. While social acceptance is never guaranteed and rarely universal, this approach is the most likely to result in permitting mining projects in sensitive or protected areas.

4. Bibliography

Aileen A. Espiritu. The Northern Review 39 (2015): 53–65. Kautokeino and Kvalsund Compared: Rejecion and Acceptance of Mining in Communities in Northern Norway https://thenorthernreview.ca/nr/index.php/nr/article/download/389/419/959

Akvaplan Niva- Kommentarer fra Akvaplan-niva angående notat fra DNV og SINTEF på KU-arbeidet som er blitt utført for Repparfjorden, Finnmark. (2014) https://nettarkiv.miljodirektoratet.no/hoeringer/tema.miljodirektoratet.no/Documents/Nyhetsdokumenter/nussir-strommaling-tredjepartsvurdering-avkvaplanniva050914.pdf

Angell Elisabeth , Nygaard Vigdis & Selle Per (2020) Industrial development in the North – Sámi interests squeezed between globalization and tradition, Acta Borealia, 37:1-2, 43-62, DOI: 10.1080/08003831.2020.1751995

Areas of Outstanding Natural Beauty (AONB) Cornwall, see Aspects Holidays, Cornwall's Areas of Outstanding Natural Beauty (2020) https://www.aspects-holidays.co.uk/blog/places-to-visit/cornwall-s-areas-of-outstanding-natural-beauty

Ayntamento de Barruecopardo http://barruecopardo.es/explotacion-minera/

Barruecopardo Town Hall http://barruecopardo.es/explotacion-minera/

BBC News,2022, Hemerdon mine: proposal for more lorries to pass through. https://www.bbc.co.uk/news/uk-england-devon-60675529.

BBC News, 2011, Hemerdon mine link road could create 'HGV hell' MP says. https://www.bbc.co.uk/news/uk-england-devon-14807890.

BBC News,2022, Hemerdon mine could reopen in early 2023 - BBC News. https://www.bbc.co.uk/news/uk-england-devon-62230446.

BBC News, 2022, Hemerdon mine: Tungsten plans put on hold - BBC News. https://www.bbc.co.uk/news/uk-england-devon-61183804.

BBC, Hemerdon mine could reopen in early 2023 - BBC News. https://www.bbc.com/news/uk-england-devon-62230446.

BBC, Hemerdon mine: Tungsten plans put on hold - BBC News. https://www.bbc.co.uk/news/uk-england-devon-61183804.

BBC home, 2014, Devon - History features - Hemerdon Mine history. https://www.bbc.co.uk/devon/content/articles/2007/12/04/hemerdon_mine_history_feature.shtml

Beland-Lindahl, K., Suopajärvi, L., Poelzer, G., Tulilehto, M., Eerola, T. 2023. Factors affecting local attitudes to mineral exploration and mining: what's within the company's control? *Resources Policy*, *84*, 103715. https://doi.org/10.1016/j.resourpol.2023.103715

Birthe Ivars, Emine Isciel, (2012),Convention of biological diversity, 2012, CBC notification 2012 18-contribution from Norway. National initiatives, activities and action plans contributing to the implementation of the strategic plan for biodiversity 2011-2020 https://www.cbd.int/doc/world/no/no-nbsap-powpa-en.pdf

Boletín Oficial de Castilla y León, 6 de febrero de 2014 (2014) https://bocyl.jcyl.es/boletines/2014/02/06/pdf/BOCYL-D-06022014-3.pdf

Botnia Exploration Holding AB (2022), Årsredovisning Och Koncernredovisning Botnia Exploration - Koncernårsredovisning 2022 Master.xlsx

Browna Greg, Hausner Vera Helene, Grodzinska-Jurczak Małgorzata, Pietrzyk-Kaszynska Agata, Olszanska Agnieszka, Peek Barbara, Rechcinski Marcin, Lægreid Eiliv, (2015), Cross-cultural values and management

preferences in protected areas of Norway and Poland, Journal for Nature Conservation 28 (2015) 89–104 www.landscapevalues.org/publications/cross_cultural.pdf

Buchanan Myles, 15.2.2024, Irish Independent Wicklow County Council left in dark over lithium prospecting licence – 'drilling is going to go on for about 10 months' | Independent.ie

Canas Nathan, 2023, Euractiv Lithium mine project draws hope, anxiety in French region hit by deindustrialisation – Euractiv

CEREMA (2021), Favoriser l'implication du public – La concertation préalable du code de l'environnement, Fiche Outils Janvier 2021. Accessed in April 2023 :https://outil2amenagement.cerema.fr/IMG/pdf/fiche_ce_obsso_v1_cle23ba58.pdf

Cerfa (2021) Notice explicative destinée aux installations classées pour le protection de l'environnement (ICPE) relevant du régime de la déclaration. Accessed in April 2023 :https://www.formulaires.service-public.fr/gf/getNotice.do?cerfaNotice=51944&cerfaFormulaire=15275

Certu (2009) 30 fiches pour mieux intégrer les risques dans l'aménagement. Accessed in April 2023:https://outil2amenagement.cerema.fr/IMG/pdf/30_fiches_pour_mieux_integrer_les_risques_dans_l_amenagement_cle748df7.pdf

Constitution of Ireland (last amended January 2020), 1 July 1937 available at: https://www.irishstatutebook.ie/eli/cons/en/html

Construction near protected areas and wildlife - GOV.UK. https://www.gov.uk/guidance/construction-near-protected-areas-and-wildlife

Convention on Biological diversity, Austria - Main Details Biodiversity Facts Main Details (cbd.int)

Cornwall World Heritage Site Application https://www.cornwall-calling.co.uk/world-heritage-cornwall.htm

Dannevig & Brigt Dale, (2017) The Nussir case and the battle for legitimacy: Scientific assessments, defining power and political contestation, Halvor, Springer https://link.springer.com/chapter/10.1007/978-3-319-62610-9_8

Dartmoor National Park Authority (DNPA) (2021) Wildlife and Planning https://www.dartmoor.gov.uk/living-and-working/planning/wildlife-and-planning#:~:text=Dartmoor%20National%20Park%20Authority%20(DNPA,through%20national%20and%20local%2

Day Lauren and Worthington Anne, 2022, Lessons from the Arctic about an Indigenous Voice to Parliament - ABC News Lessons from the Arctic about an Indigenous Voice to Parliament - ABC News

Department of Communications, Climate Action, and Environment (2019), Good Environmental Practice in Mineral Exploration. V19.01

Department of Environment, Heritage, and Local Government (2009), Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities. Accessed in April 2023:https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf

Designated Protected Areas - GOV.UK. https://www.gov.uk/government/publications/designated-protected-areas.

Designating and Managing a Conservation Area | Historic England. https://historicengland.org.uk/advice/planning/conservation-areas/

Direction de l'eau et de la biodiverisite / Sous-Direction de la protection et de la restauration des ecosystemes terrestres (2019), Guide relatif a la gestion des sites Natura 2000 majoritairement terrestres – Mise en place des comites de pilotage, élaboration et mise en œuvre des documents d'objectifs, Juin 2019. Accessed in April 2019: https://www.pays-de-la-loire.developpement-durable.gouv.fr/IMG/pdf/2019_guide_gestion_sites_natura_2000_majoritairement_terrestres.pdf

Direction Régionale de l'Environnement, de l'Aménagement et du Logement Auvergne, (2013), Site Naura 2000 Foret des Colettes no. FR 82 01025 Document d'objectifs 2013-2019, October 2013

Directorate for Nature Management (2007), Emerald Network in Norway – Final Report from the Pilot Project https://rsis.ramsar.org/RISapp/files/56433228/documents/NO312_lit171201_4.pdf

Dowrick Molly, 2021, Villagers fear Hemerdon tungsten mine reopening will affect their health, homes and lives- Devon Live. https://www.devonlive.com/news/devon-news/villagers-fear-hemerdon-tungsten-mine-5415785.

Ecoticia.com, 2017, Animals Can Ingest Too Much Arsenic in Mining-Affected Pastures, Animals Can Ingest Too Much Arsenic in Mining-Affected Pastures (ecoticias.com)

Educational Register of Geological Sites A Guide to Geological Fieldwork in Devon https://web.archive.org/web/20121114190459/http://www.devon.gov.uk/geo-educational-register.pdf

Eerola T. (2021). New low impact mineral exploration technologies and the social license to *explore*: insights from corporate websites. Cleaner Environmental Systems, 3, 100059, https://doi.org/10.1016/j.cesys.2021.100059.

Eerola T. (2022b). Territories of contention: The importance of project location in mining-related disputes in Finland from the geosystem services perspectives. Resources 11, 109. https://doi.org/10.3390/resources11120109

Eerola, T. (2022). Corporate conduct, commodity, and place. Ongoing mining and mineral exploration disputes in Finland and their implications for the social license to operate. Resources Policy 76, 102568. https://doi.org/10.1016/j.resourpol.2022.102568

Eerola, T. 2024. The evolution and impacts of Finnish mining-sceptical movement from uranium debate to the green energy transition: an environmental protest wave? Extractive Industry and Society (in review).

Eira Anders Johansen, Granefjell Svein Ole, Eira Isak Henrik, Tuorda Elli-Ristin, 2020, Analyse Av Virkningen For Reindriften Ved Planlagt Gruvedrift I Nussir Og Ulveryggen I Kvalsund Kommune, Utredningen er utført på oppdrag fra Sametinget av Stiftelsen Protect Sápmi,

analyse-av-virkningen-for-reindriften-ved-planlagt-gruvedrift-i-nussir-og-ulveryggen-i-kvalsund-kommune.pdf (sametinget.no)

Eilu Pasi, (2012), Mineral deposits and metallogeny of Fennoscandia, Geological Survey of Finland, Special Paper 53 https://tupa.gtk.fi/julkaisu/specialpaper/sp_053.pdf

El Mundo, Diario de Valladolid, 2015, IU-Equo criticizes the Board's urgency in granting a "botched" license to reopen the Barruecopardo mine https://diariodevalladolid.elmundo.es/articulo/castillayleon/iu-equo-critica-urgencia-junta-conceder-licencia-chapucera-reabrir-mina-barruecopardo/20150729151100161925.html

Ente Parchi e biodiversitá, Parco Regionale della Vena del Gesso Romagnola Mappa | Ente Parchi e Biodiversità Romagna (parchiromagna.it)

Environmental Protection Agency (2006), Environmental Management Guidelines, Environmental Management in the Extractive Industry (Non-scheduled Minerals). Accessed in April 2023:https://www.epa.ie/publications/licensing--permitting/industrial/ied/EPA_management_extractive_industry.pdf

Environmental Protection Agency (2015), Guidance on Financial Provision for Environmental Liabilities. Accessed in April 2023: https://www.epa.ie/publications/compliance--enforcement/licensees/reporting/financial-provisions/financiaprovisionsreport.pdf

EPRM Secretariat, (2022), Company Case Study Wolfram Bergbau & Hütten AG (WBH) Company Case Study Wolfram Bergbau & Hütten AG (WBH) · The European Partnership for Responsible Minerals (europeanpartnership-responsibleminerals.eu)

ESA, (2021), Complaint against Norway in the area of management of waste from extractive industries, Letter (eftasurv.int)

ESPON / COMPASS, (2018), Comparative Analysis of Territorial Governance and Spatial Planning Systems in Europe / Final Report

Establishment of nature reserves, Metsähallitus. https://www.metsa.fi/luonto-ja-kulttuuriperinto/suojelualueverkosto/suojelualueiden-perustaminen/

Etxarri Iñaki, 2020,The tungsten that the Nazis longed for 'resurrects' a town in Salamanca The tungsten that the Nazis longed for 'resurrects' a town in Salamanca (lainformacion.com)

Europa press society, 2013, Rejection of a tungsten mine in Barruecopardo (Salamanca) https://www.europapress.es/sociedad/medio-ambiente-00647/noticia-rechazo-mina-wolframio-barruecopardo-salamanca-20130215190347.html

European commission, Digital observatory for protected areas (DOPA) Explorer, Arribes del Duero, ZEPA.Arribes del Duero - ZEPA | DOPA Explorer (europa.eu)

Eurofins, (2019), Viiankiaavan natura alueen malmietsinnän natura-arviointi 2019. (Natura report within permitting process) AASakattiMining_kairausten_Natura-arviointi_2019_julkinen.pdf (tukes.fi)

European Commission, (1992), Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. No L 206/7. Accessed in April 2023: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043

European Commission, (1996), Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control. No. L 257/26. Accessed in April 2023: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31996L0061

European Commission, (2015), Natura 2000 and Forests, Pat I-II, ISBN 978-92-79-49396-6, Accessed in April 2023:https://ec.europa.eu/environment/nature/natura2000/management/docs/Final%20Guide%20N2000%20%20Forests%20Part%20I-II-Annexes.pdf

European Commission, (2019), Guidance document on non-energy mineral extraction and Natura 2000 Guidance document on non-energy mineral extraction and Natura 2000 - Publications Office of the EU (europa.eu)

European Commission, (2017), Study – Legal framework for mineral extraction and permitting procedures for exploration and exploitation in the EU, MINLEX, funded by the European Commission under Contract no. SI 2.717317

Fallon Aoibhin, 19.1.2022 Beat Early Breakfast Residents protest against lithium mine on Carlow border | Beat102103.com

Fédération des SCOT, (2022), Le SCOT modernisé, Edition 2022 - Ficha Resumen de los Formularios Oficiales de la Red Natura 2000. http://rednatura.jcyl.es/natura2000/zepa/formularios%20oficiales/pdf%20zepa%20resumen/es0000118.pdf

FNE, 2023, EMILI project – lithium mine in Allier https://www.fne-aura.org/actualites/allier/projet-emili-mine-de-lithium-dans-lallier/

Galin R., Moras J.-F, Guillon D., Liger A., (2017), Législation et réglementation miniere. Collection « La mine en France ». Tome 2, 19p, 1 tabl. Accessed May 2023 :https://www.mineralinfo.fr/sites/default/files/documents/2021-01/tome_02_legislation_et_reglementation_miniere_final24032017.pdf

Galin R., Urien P., Charles N., Bailly L. (2017) – Projet minier et parties-prenantes. Collection « La mine en France ». Tome 3, 24 p., 4 fig. Accessed April 2023:https://www.mineralinfo.fr/sites/default/files/documents/2021-01/tome_03_projet_minier_et_parties-prenantes_final24032017.pdf

Gallego Bernad, M.S,(2017). Application in Spain of the Natura 2000 Legal Protection Regime. General Questions and Case Law. SEO/BirdLife, Madrid Dialnet-ApplicationInSpainOfTheNatura2000LegalProtectionRe-701057 (1).pdf

Geitzenauer Maria, Hogl Karl, Weiss Gerhard, (2016), The implementation of Natura 2000 in Austria—A European policy in a federal system. Land Use Policy Volume 52, Pages 120-135 The implementation of Natura 2000 in Austria—A European policy in a federal system - ScienceDirect

Geoscience Regulation Office, (2022), GSRO Review of Submissions Received in Relation to the Renewal of Eight Blackstairs Lithium Prospecting Licence Areas in Counties Carlow and Wicklow, October 2022

Gleeson Daniel, 2021, International Mining. Tungsten West set to bring Hemerdon tungsten-tin mine back into .... https://im-mining.com/2021/10/12/tungsten-west-set-to-bring-hemerdon-tungsten-tin-mine-back-into-production/.

Golder Associates, (2017). Bearbetningskoncession för Stekenjokk K nr 1 och Levi K nr 1, 23 pp.

Golder associates, map bilaga_1_oversiktskarta_med_brytomrade_121126.pdf (heidelbergmaterials.se)

Golder, (2021). Stekenjokk Knr 1 och Levi Knr 1, Miljökonsekvensbeskrivning för Natura 2000 tillstånd för Natura 2000 området Vardo-, Laster-, och Fjällfjällen (SE0810394), 72 pp.

Gómez-Baggethun Erik and Benjaminsen Tor Arve, NMBU Mining or traditional use? Conflicts in the Northern Norwegian copper frontier Faculty of Landscape and Society,

Rør, Anders MIES 2018.pdf (unit.no)

Google map, Tungsten West Tungsten West mine road access route, B3417, https://www.google.com/maps/@50.4151039,-4.032669,15z?entry=ttu

Google maps Redmoor https://www.google.com/maps/@50.5175174,-4.3202488,1007m/data=!3m1!1e3?entry=ttu

Gordon, P., Lavery S, (2018), The Potential for Economic Reprocessing of Mine Waste in Ireland. Published by the Environmental Protection Agency under the STRIVE Programme. Accessed here in April 2023: https://www.epa.ie/publications/research/small--scale-studies/The_Potential_for_Economic_Reprocessing_of_Mine_Waste_in_Ireland.pdf

Gov. UK, Policy paper Changes to the Habitats Regulations 2017, (2021), https://www.gov.uk/government/publications/changes-to-the-habitats-regulations-2017/changes-to-the-habitats-regulations-2017

Government of Ireland, (1930), National Monuments Act 1930. Number 2 of 1930. Accessed in April 2023: https://www.irishstatutebook.ie/eli/1930/act/2/enacted/en/print.html

Government of Ireland, (1940), Minerals Development Act 1940. Number 31 of 1940. Accessed in April 2023: https://www.irishstatutebook.ie/eli/1940/act/31/enacted/en/html

Government of Ireland, (1979), S.I.No.340/1979 - Minerals Development Regulations 1979. Accessed in April 2023: https://www.irishstatutebook.ie/eli/1979/si/340/made/en/print

Government of Ireland, (1992), Environmental Protection Agency Act 1992. No. 7 of 1997. Accessed in April 2023: https://www.irishstatutebook.ie/eli/1992/act/7/enacted/en/html

Government of Ireland, (1994), S.I.No. 319/1994 - Minerals Development (Amendment) Regulations 1994. Accessed in April 2023: https://www.irishstatutebook.ie/eli/1994/si/319/made/en/print

Government of Ireland, (1995), Minerals Development Act 1995. Number 15 of 1995. Accessed in April 2023: https://www.irishstatutebook.ie/eli/1995/act/15/enacted/en/html

Government of Ireland, (1996), S.I. No. 259/1996 - Minerals Development (Application Fees for certain state mining facilities) Regulations 1996. Accessed in April 2023:https://www.irishstatutebook.ie/eli/1996/si/259/made/en/print

Government of Ireland, (1999), Minerals Development 1999. Number 21 of 1999. Accessed in April 2023: https://www.irishstatutebook.ie/eli/1999/act/21/enacted/en/html

Government of Ireland, (2000), Planning and Development Act 2000. No. 30 of 2000. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2000/act/30/enacted/en/html,

Government of Ireland, (2000), Wildlife (Amendment) Act 2000, No. 38 of 2000. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2000/act/38/enacted/en/print

Government of Ireland, (2004), S.I. No. 436/2004 – Planning and Development (Strategic environmental Assessment) Regulations 2004. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2004/si/436/made/en/print

Government of Ireland, (2009), S.I No. 566/2009 – Waste Management (Management of Waste from the Extractive Industries) Regulations 2009. Accessed in April 2023:https://www.irishstatutebook.ie/eli/2009/si/566

Government of Ireland, (2011), S.I No. 477 of 2011 – European Communities (Bird and Natural Habitats Regulations 2011. Accessed in 2011:https://www.irishstatutebook.ie/eli/2011/si/477/made/en/print

Government of Ireland, (2012), S.I. 249/2012, European Union (Environmental Impact Assessment of Proposed Demolition of National Monuments) Regulation 2012. Accessed in April 2023:https://www.irishstatutebook.ie/eli/2012/si/249/made/en/print

Government of Ireland, (2013), S.I. 138 of 2013 - European Union (Industrial Emissions) Regulations 2013. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2013/si/138/made/en/print

Government of Ireland, (2013), S.I. No. 283 of 2013 - EPA (Integrated Pollution Control) (Licensing) Regulations, 2013. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2013/si/283/made/en/print

Government of Ireland, (2013), S.I. No.137 of 2013 - EPA (Industrial Emissions) (Licensing) Regulations, 2013. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2013/si/137/made/en/print

Government of Ireland, (2018), Heritage Act 2018. No. 15 of 2018. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2018/act/15/enacted/en/html

Government of Ireland, (2018), Project Ireland 2040 - National Planning Framework. Accessed in April 2023: https://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf

Government of Ireland, (2019), S.I. No. 30/2019 – Radiological Protection Act 1991 (Ionising Radiation) Regulations 2019. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2019/si/30/

Government of Ireland, (2020), S.I. No. 189 of 2020 - EPA (Integrated Pollution Control) (Licensing)(Amendment) Regulations 2020. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2020/si/189/made/en/print

Government of Ireland, (2020), S.I. No. 190 of 2020 - EPA (Industrial Emissions) (Licensing)(Amendment) Regulations 2020. Accessed in April 2023: https://www.irishstatutebook.ie/eli/2020/si/190/made/en/print

Government of Ireland,(1979), Minerals Development Act 1979. Number 12 of 1979. Accessed in April 2023: https://www.irishstatutebook.ie/eli/1979/act/12/enacted/en/html

Government UK, National Planning Policy Framework, (2012): https://www.gov.uk/government/publications/national-planning-policy-framework--2

Government UK, (2014), Guidance Minerals, Minerals - GOV.UK (www.gov.uk)

Guidelines for processing applications for low-flying in protected areas in connection with geophysical mapping under the auspices of the Geological Survey of Norway. https://www.miljodirektoratet.no/globalassets/alle-tema/verneomrader/lavtflyging-verneomrader130814.pdf

Habitats Management and Restoration at Metsähallitus (Finland) https://www.metsa.fi/en/nature-and-heritage/habitats/

Hallituksen esitys Eduskunnalle laiksi Talaskankaan luonnonsuojelualueesta 1993 vp - HE 298 https://www.edilex.fi/he/fi19930298.pdf ,

Harrop J., (2015), Preliminary Report on Avalonia Block Exploration 2013-2015 – Prospecting licences 1476, 3407, 3411, 3864, 3893, 3894, 4031, 4032. Counties Wicklow and Carlow. Prepared for Blackstairs Lithium Ltd, July 2015

Heinämäki Leena, Markkula Inkeri & Saijets Jan, 2023, Saamelaisten alkuperäiskansaoikeudet ja saamelaiskulttuuria koskevien vaikutusten arviointi YVA-lain mukaisessa menettelyssä http://urn.fi/URN:ISBN:978-952-361-219-8

HM government, 2022, Resilience for the Future: The United Kingdom's Critical Minerals Strategy (2022) p.11 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1097298/resilience_for_the_future_the_uks_critical_minerals_strategy.pdf

Holmbush Mine https://www.cornwall-calling.co.uk/mines/callington/holmbush.htm

IMERYS et RTE, 2023, Projet EMILI , Synthèse du dossier de saisine de la Commission nationale du débat Public https://www.debatpublic.fr/sites/default/files/2023-10/IMERYS-EMILI_Synth%C3%A8se-dossier-saisine.pdf

Instrucción Técnica Complementaria 08.02.01 del capítulo XII del Reglamento General de Normas Básicas de Seguridad Minera "Depósitos de lodos en procesos de tratamiento de industrias extractivas". (2001) https://www.boe.es/eli/es/o/2000/04/26/(3)

Inventaire National du Patrimoine Naturel, (2022), FR8301025 – Foret des Colettes. Accessed in April 2023: https://inpn.mnhn.fr/site/natura2000/FR8301025

Journal Officiel de la République, (2021), Arrêté du 11 mai 2021 prologeant le permis exclusif de recherches de mines de lithium, étain, tantale, niobum, tungstène, béryllium et substances connexes, dit "Permis de Beauvoir" au profit de la société Imerys Ceramics France, Texte 46 sur 173. Accessed April 2023: https://www.puy-de-dome.gouv.fr/IMG/pdf/per_beauvoir_arrete_jo.pdf

Journal Officiel de la République, (2023), Décret no. 2023-13 du janvier 2023 relatif a l'autorisation environnementale des travaux miniers. 12 janvier 2023, texte 16 sur 142.

Junta de Castilla y Leon Régimen De Protección Régimen de Protección | Medio Ambiente | Junta de Castilla y León (jcyl.es)

Kangas, K., Brown, G., Kivinen, M., Tolvanen, A., Tuulentie, S., Karhu, J., Markovaara-Koivisto, M., Eilu, P., Tarvainen, O., Similä, J., Juutinen, A., (2022). Land-use synergies and conflicts identification in the framework of compatibility analyses and spatial assessment of ecological, socio-cultural and economic values. Journal of Environmental Management 316, 115174

Keskitalo Ilkka, (2021), Mining law and exploration permitting in Finland, Tukes. https://www.gtk.fi/wp-content/uploads/2021/02/Mining-law-and-exploration-permitting-in-Finland-PDAC-2021.pdf

Kivinen, S., Kotilainen, J. & Kumpula, T. (2020). Mining conflicts in the European Union: environmental and political perspectives. Fennia 198(1–2) 163–179. https://doi.org/10.11143/fennia.87223

Kleine Zeitung, 2023, https://www.kleinezeitung.at/steiermark/suedsuedwest/17872715/betroffene-wir-wollen-nicht-streiken-wir-wollen-arbeiten

Konttinen, E., 2012. The civil society and coordinates of collective action – observations on the environmental movement. In: Nikula, J. and Granberg, L. (Eds.), Looking after peasants and post-socialism: investigations on reality together with Ilkka Alanen (in Finnish). Jyväskylän yliopisto, SopHi 118, 161–176. https://jyx.jyu.fi/bitstream/handle/123456789/47900/SoPhi33_978-951-39-6484-9.pdf

Kotilainen, J.M., Peltonen, L., Reinikainen, K. (2022). Community benefit agreements in the Nordic mining context: Local opportunities for collaboration in Sodankylä, Finland. Resources Policy, 79, 102973. https://doi.org/10.1016/j.resourpol.2022.102973

Kronen Zeitung, 2023, Also in Styria - Warning strikes: "The people's wallets are burning" | krone.at

Land use planning, Ministry of environment (Finland) https://ym.fi/en/land-use-planning

Lassila, M. M. (2020). The Arctic mineral resource rush and the ontological struggle for the Viiankiaapa peatland in Sodankylä, Finland. Globalizations, 18, p. 635-649. https://doi.org/10.1080/14747731.2020.1831818

Légifrance, Code de l'Environnement, dernière mise a jour 26 avril 2023

Légifrance, Code du Patrimoine, dernière mise 12 mars 2023. Accessed May 2023: https://www.legifrance.gouv.fr/codes/texte_lc/LEGITEXT000006074236/

Ley 21/2013, de 9 de diciembre, de evaluación ambiental. https://www.boe.es/eli/es/l/2013/12/09/21

Ley 22/1973, de 21 de julio, de Minas. Boletín Oficial del Estado https://www.boe.es/buscar/act.php?id=BOE-A-1973-1018

Ley de 16 de diciembre de 1954 sobre expropiación forzosa. Boletín Oficial del Estado https://www.boe.es/buscar/act.php?id=BOE-A-1954-15431

Les Ecologistes, 2022, Lithium mine project in Allier: Environmental requirements must be as high as possible Lithium mine project in Allier: Environmental requirements must be as high as possible - Les Écologistes - Auvergne-Rhône-Alpes (ecologieaura.fr)

Margutti Roberto, (2009), The gypsum mining area in the "Vena del Gesso" biodiversity landscapes (Monte Tondo quarry, Emilia-Romagna Region): quarrying and old mine tunnels environment impact on natural karsts systems and groundwater quality. Scientifica Acta 3, No 2, pages 31-37 Margutti.pdf (unipv.it)

Méndez Álvarez Irene, 2017, Proyectos mineros en Castilla y León https://www.ehu.eus/ehusfera/derecho-administrativo/files/2013/06/Proyectos-mineros-en-CyL.pdf

Metsänhoidon suositukset, Demarcation of a natural site (Finland) https://metsanhoidonsuositukset.fi/fi/toimenpiteet/luontokohteiden-huomioon-ottaminen/toteutus#section-592

Mikkonen Minttu, (2001), Pro gradu tutkielma. https://trepo.tuni.fi/bitstream/handle/10024/88749/gradu00064.pdf?sequence=1&isAllowed=y

Ministry of Climate and Environment, Department for Nature Management https://www.regjeringen.no/en/dep/kld/organisation/departments/department-nature-management/id1212/

Ministry of employment and economy (FI), Guide environmental impacts assessment procedure for mining project in Finland, (2015), MEE guidelines and other publications, Finland 11/2015 https://tem.fi/documents/1410877/2851374/Environmental+Impact+Assessment+Procedure+for+Mining+Projects+in+Finland

Ministry of the Environment (FI), (2021), PRIORITISED ACTION FRAMEWORK (PAF) FOR NATURA 2000 in FINLAND including the Province of Åland, https://ym.fi/documents/1410903/0/PAF+2021-2027_fi.pdf/055f8a55-1055-b131-755f-644eb2ec95ad/PAF+2021-2027_fi.pdf?t=1616585728349

Ministry of Trade, Industry and Fisheries (NO), (2019), Decision on operating license for the Nussir and Ulveryggen copper deposit. Initiative holder: Nussir AS https://www.regjeringen.no/globalassets/departementene/nfd/dokumenter/nussir-asa---driftskonsesjon-for-repparfjord-kobberforekomst.pdf

Ministry of Trade, Industry and Fisheries (NO), (2019), The decision by the permitting authorities took those into consideration and they are part of their final documentation Nussir, Mining plan, https://dirmin.no/sites/default/files/dybdedokument_for_gruvedrift.pdf

Minland, The Governance of Land Use Country fact sheet Finland, (2017), Minland https://www.oecd.org/regional/regional-policy/land-use-Finland.pdf

Mireu project repport (r Grant Agreement No 776811), SLO Good Practices and Recent Disputes - Illustrative Examples Across Europe, 2021, https://mireu.eu/sites/default/files/2021-06/Illustrative%20Examples%20Report.pdf

Mononen Tuija, Kivinen Sonja, Kotilainen Juha M., Leino Johanna, 2022, Social and environmental impacts of mining activities in the EU (europa.eu)

Myplan.ie: www.myplan.ie

National Parks and Wildlife, (2005), NPWS Conservation Plan for 2006-2011 - Blackstairs Mountains cSAC – Site Code 770 Cos. Carlow and Wexford. Accessed in April 2023:https://www.npws.ie/protected-sites/sac/000770

National Parks and Wildlife, (2011), Conservation Objectives Series, Slaney River SAC 000781. Accessed in April 2023: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000781.pdf

Natura 2000m standard data form, Viiankiaapa https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=FI1301706

Norwegian environmental agency. (2016) Norwegian Environment Agency's licensing procedures. https://www.ltu.se/cms_fs/1.151946!/file/2.1%20Glenn%20Kristian%20Storbr%2BÑten.pdf

Norwegian Environmental Agency. Report. (2019). Mining industry and tailings disposal. Status, environmental challenges and gaps of knowledge https://www.miljodirektoratet.no/globalassets/publikasjoner/m1335/m1335.pdf

Nuutinen-Kallio, T. 2024. Activists of the Extinction Rebellion attached to drill rigs accuse a mining company to put them in danger – CEO answers (in Finnish). YLE Uutiset, 22 February 2024. Availabe at https://yle.fi/a/74-20076041 (Accessed on 23 February 2024.

Nykos project. New knowledge on sea disposal. https://www.sintef.no/projectweb/nykos/

O'Sullivan Kevin,2024, The Irish Times Concern lithium exploration in Co Wicklow may threaten 'one of Ireland most beautiful places' – The Irish Times

OECD, (2017), The Governance of Land Use Country fact sheet Italy land-use-Italy.pdf (oecd.org)

OECD, (2017) Land-Use Planning Systems In The Oecd: Country Fact Sheets, The Governance of Land Use Country fact sheet Austria land-use-Austria.pdf (oecd.org)

Office Français de la Biodiversité, (2011), No.78 Outils Juridiques pour la protection des espaces naturels. Mise a jour 23/09/2011.

OPALS viewer: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=da2d9d49c3364f84a0f46ad0da0eeee8

Parliamentary White Paper 14 (2015-2016) Nature for life — Norway's national biodiversity action plan. 2016. FAOLEX database. https://www.fao.org/faolex/results/details/en/c/LEX-FAOC199319/

Pelli, P. 2023. Environmental authority: Mine of the nature conservation ares is illegal – a company still proceeds (in Finnish). Helsingin Sanomat 18 August 2023. Available at https://www.hs.fi/talous/art-2000009793466.html (Accessed on 23 February 2024.

Pettersson Sanna, Viken Arvid, Suopajärv Leenai & Svensson Gaute, (2018), Local acceptance of industrial operations within mining, forestry, fish farming and tourism in Lapland and Troms/Finnmark https://projects.luke.fi/busk/wp-content/uploads/sites/15/2020/02/Busk_report_FI-NO_May_2018_WP4.pdf

Plymouth & S W Devon Joint Plan, (2017), DRAFT, Habitat Regulations Assessment

Plymouth Chronicle, 2022, Flood of objections lodged over proposed increase in lorry movements at mine https://www.plymouthchronicle.co.uk/flood-of-objections-lodged-over-proposed-increase-in-lorry-movements-at-mine/.

Protect Moylisha group facebook pages https://www.facebook.com/protectmoylishahill/

R. M. Serra-Llinares, P. A. Bjørn, B. Finstad, R. Nilsen, A. Harbitz, M. Berg, L. Asplin, (2014), Salmon lice infection on wild salmonids in marine protected areas: an evaluation of the Norwegian 'National Salmon

Fjords'. AQUACULTURE ENVIRONMENT INTERACTIONS Aquacult Environ Interact Vol. 5: 1–16 doi: 10.3354/aei00090 https://www.int-res.com/articles/feature/q005p001.pdf

R.W.Kruk, G.De Blust, R.C. Van Apeldoorn, I.M. Bouwma and R.J. Sier. Natura 2000 Information and communication on the designation and management of Natura 2000 sites. management_n2000_tcm30-197177.pdf (miteco.gob.es)

Ramboll, (2018), Vindelgransele permit application http://www.botniaexploration.com/wordpress/wp-content/uploads/2018/11/Bilaga-C.1_Samra%CC%8Ad.pdf

Ramirez-Llodra Eva, Cecilie Trannum Hilde, Andersen Guri S., Baeten Nicole J., Brooks Steven J., Escudero-Oñate Carlos, Gundersen Hege, Kleiv Rolf Arne, Ibragimova Olga, Lepland Aivo, Nepstad Raymond, Sandøy Roar, Schaanning Morten Thorne, Shimmield Tracy, Yakushev Evgeniy, Ferrando-Climent Laura, Høgaas Per Helge. (2022), New insights into submarine tailing disposal for a reduced environmental footprint: Lessons learnt from Norwegian fjords, Marine Pollution Bulletin, Volume 174, ISSN 0025-326X, https://doi.org/10.1016/j.marpolbul.2021.113150. https://www.sciencedirect.com/science/article/pii/S0025326X2101184X

Real Decreto 1029/2022, de 20 de diciembre, por el que se aprueba el Reglamento sobre protección de la salud contra los riesgos derivados de la exposición a las radiaciones ionizantes. https://www.boe.es/eli/es/rd/2022/12/20/1029

Real Decreto 975/2009, de 12 de junio, sobre gestión de los residuos de las industrias extractivas y de protección y rehabilitación del espacio afectado por actividades mineras. https://www.boe.es/eli/es/rd/2009/06/12/975

République Francaise, (2012), Circulaire du 27 avril 2012 relative a la gestion contractuelle des sites Natura 2000 majoritairement terrestres en application des articles R414-8 a 18 du Code l'Environnement. Accessed in April 2023 :https://www.natura2000.fr/sites/default/files/circulaire_gestion_2012.pdf

Royal Decree 29 November 2019 – Nussir 5. Human Rights Protection against Interference – Administrative Practice - NIM (nhri.no) https://www.regjeringen.no/globalassets/departementene/nfd/dokumenter/liste-over-avbotende-tiltak.pdf

Rojas-Briales e., 2000, Socio-economics of nature protection policies in the perspective of the implementation of Natura 2000 Network: the Spanish case Socio-economics of nature protection policies in the perspective of the implementation of Natura 2000 Network: The Spanish case (researchgate.net)

Royal Norwegian Ministry of Climate and Environment, (2019), Response to follow up letter- complaint against Norway concerning Directive 2006/EC on the management of waste exctractive industries. https://www.stortinget.no/globalassets/pdf/eu_open/esa_mineralavfallsdirektivet.pdf

Royal Norwegian Ministry of Climate and Environment, (2021), Reply to letter regarding management of waste from extractive industries svar_til_esa_mineralavfall_des2021.pdf (stortinget.no)

Salonen Onni, Hilli Anu, (2019) Yksityinen luonnonsuojelualue yleiseen virkistys- ja matkailukäyttöön, (Private nature reserve for public recreation and tourism use) ePooki 24/2019 https://www.oamk.fi/epooki/2019/yksityinen-luonnonsuojelualue-yleiseen-virkistys-ja-matkailukayttoon/

Samediggi (Sami parliament) Information from the Sámi Parliament on the effects of mining waste on Norwegian fjords and water bodies https://www.google.fi/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjdwu65_ciEAxWuGBAIHYM5BCoQFnoECCQQAQ&url=https%3A%2F%2Fwww.vannportalen.no%2Fsharepoint%2Fdownloaditem%3Fid%3D01FM3LD2XOOBAJUFQQN5GJ22FHXMPH54F5&usg=AOvVaw287SrMkn-YuOsrPCFEw0Cl&opi=89978449

Sciences Environnement, Imerys Ceramics, (2013), Demande de Permis Exclusif de Recherches de Mines, Dit « Permis de Beauvoir » pour lithium, étain tantalle, nobium, tungstene, beryllium et connexes, Communes d'Echassieres (03), Coutansouze (03), Lalizolle (03), Nades (03), Servant (63). Acccessed in April 2023: https://www.economie.gouv.fr/files/files/PDF/per-beauvoir_information-du-public.pdf

SEO Birdlife, 2013, The reopening of a tungsten mine in Salamanca endangers endangered species The reopening of a tungsten mine in Salamanca endangers threatened species - SEO/BirdLife

S.G.S Canada (2011), An Investigation into recovery of copper from the Kvalsund deposit – Final report https://www.eftasurv.int/cms/sites/default/files/documents/gopro/4209-Nussir%2002%20An%20investigation%20into%20recovery%20of%20copper_small1.pdf

SGU-Geological Survey of Sweden, (2020) Mineral deposits of national interest https://www.sgu.se/en/mineral-resources/legislation/mineral-deposits-of-national-interest/

Sheard E., (2013). Review Report PL4032, County Wicklow, Republic of Ireland, August 2011-August 2013. Report AEX13-62.

Sistema de Información Urbanística de Castilla y León https://idecyl.jcyl.es/siur/

Suhonen Kari (2008) Progradu tutkielma. Luonnon (tilan) ennallistamisen dilemma- mitä käytännöt voivat opettaa https://trepo.tuni.fi/bitstream/handle/10024/80088/gradu03166.pdf?sequence=1&isAllowed=y

TEM- Ministry of Employment and Economy, (2014), Opas-Malminetsintä suojelualueilla sekä saamelaisten kotiseutualueella ja poronhoitoalueella, 2014 https://tem.fi/documents/1410877/2851374/Malminetsint%C3%A4+suojelualueilla+sek%C3%A4+saamelaisten+kotiseutualueella+ja+poronhoitoalueella.pdf/f113c499-0de1-43fa-9ce0-9a131a491bd4/Malminetsint%C3%A4+suojelualueilla+sek%C3%A4+saamelaisten+kotiseutualueella+ja+poronhoitoalueella.pdf

The Journal, (2022), Local residents' campaign against lithium exploration along Wicklow-Carlow border. Published online on the 17th of January 2022. Accessed on the 12th of April 2023:https://www.thejournal.ie/lithium-mining-wicklow-carlow-protests-5657257-Jan2022/

The Nationalist, (2022), Expert says only a slim chance of lithium mine opening in Carlow, published online on the 16th of February 2022. Accessed on the 12th of April 2023: https://carlow-nationalist.ie/2022/02/16/expert-says-only-a-slim-chance-of-lithium-mine-opening-in-carlow/

The Principles of Protected Area Management in Finland-Guidelines on the Aims, Function and Management of State-owned Protected Areas, 2000, Metsähallituksen luonnonsuojelujulkaisuja. Nature Protection Publications of the Finnish Forest and Park Service. Series B No. 54, Natural Heritage Serviceshttps://julkaisut.metsa.fi/assets/pdf/lp/Bsarja/b054.pdf

The Royal Ministry of Agriculture and Fisheries -Vedtak om driftskonsesjon for Nussir og Ulveryggen kobberforekomst. Tiltakshaver: Nussir ASA (Decision on operating license for the Nussir and Ulveryggen copper deposits. Initiative holder: Nussir ASA) https://www.regjeringen.no/globalassets/departementene/nfd/dokumenter/nussir-asa---driftskonsesjon-for-repparfjord-kobberforekomst.pdf

TUKES Exploration https://tukes.fi/en/industry/mining-ore-prospecting-and-gold-panning/exploration

Tungsten West. https://www.tungstenwest.com/

Tuulentie, S., Halseth, G., Kietäväinen, A., Ryser, L., Similä, J. (2019). Local community participation in mining in Finnish Lapland and northern British Columbia, Canada – practical applications of CSR and SLO. Resources Policy, 61, 99–107. https://doi.org/10.1016/j.resourpol.2019.01.015

Tyrens AB (2018),Cleaning analysis for Fäbodtjärn (http://www.botniaexploration.com/wordpress/wp-content/uploads/2018/11/Bilaga-C.5-Renna%CC%88ringsanalyser.pdf).

UEPG Case studies- database Case studies - Aggregates Europe (aggregates-europe.eu)

UEPG, 2022, UEPG_SDA_2022_Booklet1.pdf (aggregates-europe.eu)

UK Protected Areas | JNCC - Adviser to Government on Nature Conservation. https://jncc.gov.uk/our-work/uk-protected-areas/

Vincent Christophe, 2022, Franceinfo Lithium mining: "We mustn't miss out", say residents living near a future mine in Allier (francetvinfo.fr)

Wärneryd Erika and Johansson Gomér Johan (2009). Natura 2000 - implementation and application in Sweden. FULLTEXT01.pdf (diva-portal.org)

Wardell-Armstrong International, Competent Persons Report On The Hemerdon Deposit, UK, (2019), https://consult.environment-agency.gov.uk/psc/pl7-5bw-tungsten-west-limited/supporting_documents/Ref_Additional%20documents%20CPR_Site%20Condition%20Report_V1%2011573473.pdf

Wikipedia Drakelands Mine - Wikipedia.

Wolfram, (2021), In tune with nature. In tune with nature | wolfram

Annex 1 – Structure for collection of information on the case studies

The compilation of the cases was performed by the project partner to whom a case was assigned. When the compilation of information required interview with authorities or companies it is reported as "direct interview" and the name of the person. Other information is referred to a bibliography that was listed at the end of the report.

Identification of the case study

This section provides a brief overview of key aspects of the case.

Name
Country
Region
Type of mineral resources? (primary raw materials, particularly critical raw materials, commodities, and associated commodities)
Open pit or underground mine
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)
Period of activity
Companies involved:
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National Park (e.g. biodiversity areas, nature reserves)

PICTURE

General description of the case

General description of the case along its life cycle (the permits applied, changes in legislation that affected the case, new fundings or technological uptakes,….)

Country regulatory regime

The goal of this section is to understand which frame was in place at the time when extraction activity was permitted, what was feasible and why was feasible. This is then compared with today's frame. It is relevant to understand the development of the project according to the evolution of legislative requirements along the time. Sometimes protected areas were established after the extraction activity was permitted, sometimes at closure stage. Environmental, land use and mining legislation in act during permitting process / operation / closure are into the focus. When compiling this section, answer for the past and present situation and, when possible, add links. If some questions are not relevant for the case that developed in the past, focus on the present.

1. Ownership/Mineral Rights

1.1 Ownership of mineral resources. (e.g. private, central state owned, other). Cite legislation

1.2 If necessary, differentiate between surface and deep resources. Cite legislation.

1.3 What are the rights of the holder of an exploration or mining right to use the surface necessary or incidental to an exploration or mining operation? Cite legislation

2. Relevant authorities and level within State

2.1 Which are the plan/regulation/protected area designation making bodies? Specify if they are at national, regional, or local levels within the governance framework

2.2 Which are the permitting authorities? (for all consents, mineral rights, exploration, development, waste management, closure/rehabilitation)

2.3 Which is the monitoring authority?

2.4 What are the instruments and means for monitoring regulatory compliance of mining and exploration operations?

3. Plan/Regulation/Designation Process

3.1 Protected Area Designation

3.1.1 What was the process to set up the protected area and which authority undertakes it?

3.1.2 How were the boundaries of the protected area defined?

3.1.3 What is the statutory consultation required

3.2 Regulations and Policy Making

3.2.1 Describe the land use planning policy preparation process

3.2.2 How is competition between (prospective) users of groundwater and surface waters resolved to ensure fair use (wetland protection, irrigation rights, clean drinking water for humans and animals, processing waters, etc.)?

3.2.3 Are there restrictions in place on the use of specific equipment or heavy machinery for ecological or habitat protection reasons? (explain)

3.2.4 Are there any land-use restrictions with respect to the type of extraction method (e.g., open-pit, underground mining, in situ leaching, heap leaching)? (explain)

3.2.5 Are there any specific regulations that prevent or limit exploration or mining near to or in protected areas (ecological sensitive areas, nature reserves, Natura 2000 sites, cultural heritage sites, etc.)? (explain)

3.2.6 How is compliance with EU nature legislation (Birds and Habitats Directives) and the goals of the EU Biodiversity Plan ensured?

3.2.7 Are there any regulations related to the recycling of water in mining sites? (explain)

3.2.8 Which are the regulations related to wastewater disposal?

3.2.9 Are there laws, regulations, or standards of practice for what to do should any archaeological or fossil remains be encountered during mining activities? (explain)

3.2.10 What statutory public consultations are required?

3.2.11 How is integrated into national legislation the Strategic Environmental Assessment (SEA) directive in relation to extractive activities.

4. Exploration Permitting Processes

4.1 How are exploration licences granted, what mechanisms are applied?

4.2 What are the rights of the holder of an exploration licence to use the surface necessary or incidental to an exploration?

4.3 Are there specific processes for granting exploration licences in protected areas?

4.4 What are the instruments and means for monitoring regulatory compliance of exploration operations?

4.5 How are the requirements of the EIA and Habitats Directives applied?

4.6 Are there public consultation requirements/rights?

5. Development & Other Permits Operational Phase

5.1 How are mining licence granted, what mechanisms are applied? Specify the licence types.

5.2 Which are the rules about the licence duration?

5.3 What are the rights of the holder of a mining licence to use the surface necessary or incidental to the operation?

5.4 Is there a formalised mandatory or voluntary public involvement or consultation process during permitting?

5.5 Are there any regulatory provisions for complaints and arbitration?

5.6 Are there any mandatory/voluntary compensation measures foreseen in the framework legislation procedures? If so, what kind of compensation?

5.7 How are the requirements of the EIA and Habitats Directives applied?

5.8 Are there rights of legal administrative appeals for developers/mining operators?

5.9 What are the rights of the public (including NGOs) to appeal and take further legal action?

6. Waste Management Processing

6.1 Are there any laws or regulations in place specifically on the management of extractive waste?

6.2 Are there laws, regulations, or rules in place on the type of tailings storage or disposal (e.g., dewatered tailings piles, construction of tailings dams)?

7. Closure and Rehabilitation Permitting

7.1 What are the laws, policies, requirements for provisions pertaining to mine closure and remediation, including the provisions of bonds?

7.2 What are the law and policies pertaining to mine care and maintenance (for inactive mines)?

8. Naturally Occurring Radioactive Materials (NORM)

8.1 Are there any regulations on wastes and residues containing Naturally Occurring Radioactive Materials (NORM), for instance uranium, thorium, or radium?

8.2 Which organisation is responsible for monitoring regulatory compliance for NORM?

Practice based upon the case

In this section is described the case, and the practices connected to the case.

Description of the project and of the land use, pointing out if there have been other land uses interacting with the area (conflicting or parallel activities)

Land-use and Protected Area Map

What were the natural background conditions before mineral extraction (if available)?

What kind of studies have been performed for permitting and before mineral extraction?

Have any natural system-based boundaries been used to define protected areas?

What kind of impact assessment strategies and methodologies were used?

Which were the tools to assess the impacts on human health and biodiversity

Was a source-pathway-receptor model used to identify potential risks from extractive activities in or near the protected area?

What was the knowledge of mineral deposits before the designation of the protected area?

Are there any extractive operations that may affect habitats and biodiversity outside of the protected areas?

Which were the measures for nature protection shown in permitting application/ operation/ closure

What use of the mine-site itself is foreseen after it has been closed?

Which are/were rehabilitation measures foreseen in permitting application/operation/closure

Which present low-impact, low-visibility methods were used in the case study?

a. For exploration:

b. For extraction (extraction method, haulage, waste management-dump):

c. For treatment (plant, physical and chemical separations):

d. For rejects (ponds and tailings):

e. Storage and expedition:

f. Rehabilitation (new land use):

In the case study what type methods and technologies were applied (please detail for each mine stage mentioned above)?

Reason for the choice of the methods or technology adopted

What environmental mitigation and compensation measures are foreseen?

Describe stakeholder consultation process performed when establishing the protected area and how were the results of this process used in decision-making?

Describe statutory stakeholder consultation process performed when permitting the extractive operation in the protected area and how were the results of this process used in decision-making?

Describe informal stakeholder engagement strategies performed by the mining company during the relevant stage of the project?

How were benefits and costs to the communities regarding the extractive operation evaluated?

Did local communities, NGOs object outside the statutory processes?

How were benefits and costs to the communities regarding the extractive operation evaluated?

Bibliography and list of relevant guidelines