



Minerals Case Studies in GeoERA & Mining Waste Case Study

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KNOWLEDGE SHARING ON RESOURCE CLASSIFICATION AND ESTIMATION

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UNECE

Introduction to European UNFC activities

EuroGeoSurveys



- <https://eurogeosurveys.org/>
- **Bridging Geoscience and Policy – EuroGeoSurveys** presents the experiences and achievements of more than 50 years of supporting Geoscience across Europe, and highlights the path towards a Geological Service for Europe.
- UNFC activities have started in 2014 within the Mineral Resource Expert Group (MREG) and UNFC activities by now are part of other Working Groups (Geoenergy, Groundwater)



European Geological Knowledge Base and Geological Service for Europe



www.eurogeosurveys.org

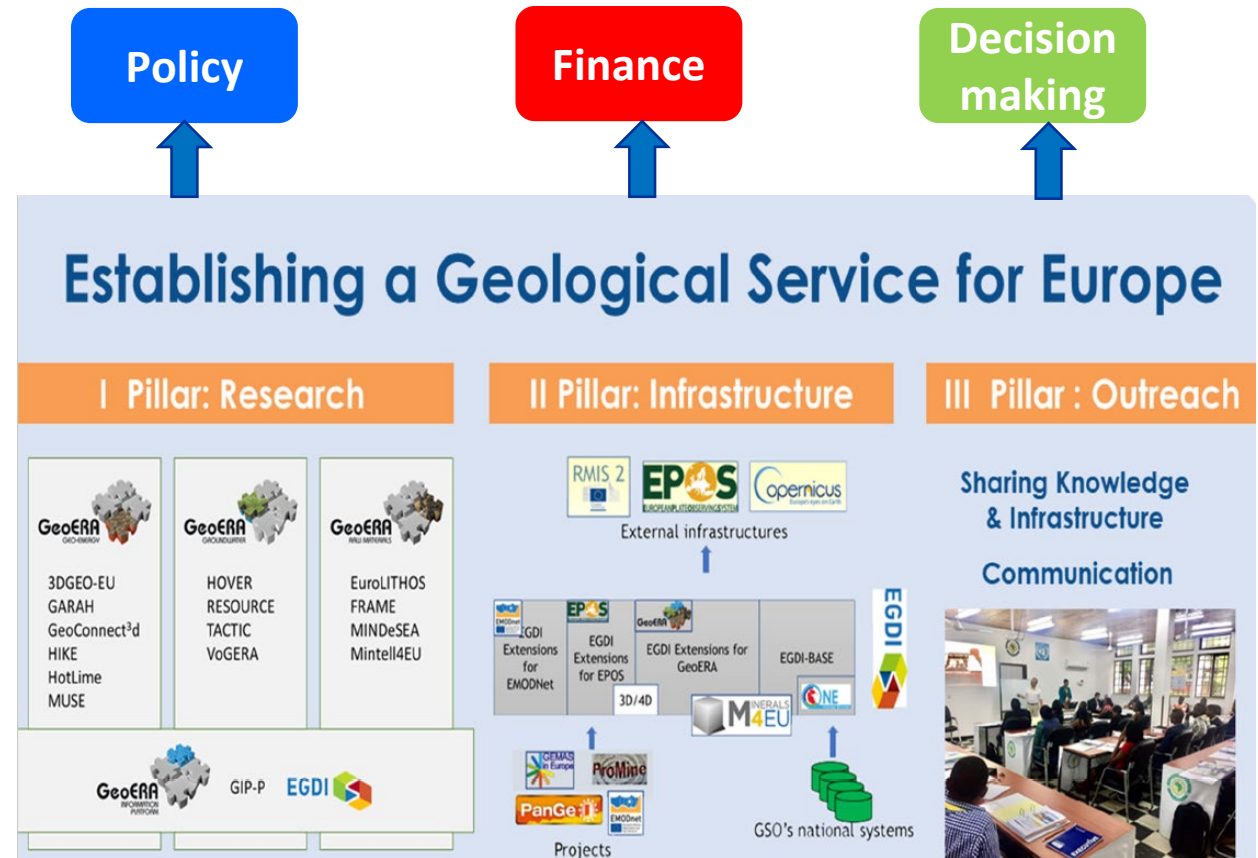


Introduction to European UNFC activities

EuroGeoSurveys

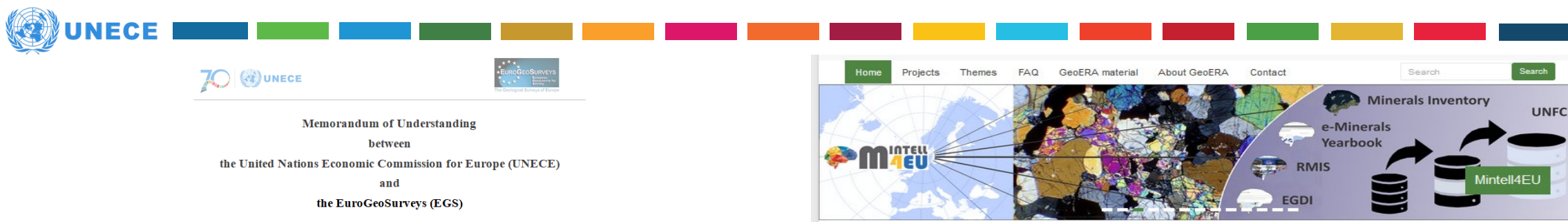


- Geological Survey Organizations (GSOs)**, together with the EUROGEOSURVEYS (EGS) provide data and information and studies on earth resources including mineral raw materials to the society, industry and decision-makers to support raw material supply on a sustainable way.
- All measures and legal actions to mineral exploration and exploitation where GSOs are involved directly or indirectly **contribute to the sustainable resource management.**
- Memorandum of Understanding between UNECE and EGS (2018) to support UNFC and UNRMS**



Introduction to European UNFC activities

EuroGeoSurveys



Memorandum of Understanding
between
the United Nations Economic Commission for Europe (UNECE)
and
the EuroGeoSurveys (EGS)



- **Support the adoption of UNFC for harmonization, sustainable management** and reporting of minerals resources (for both energy production and non-energy applications), petroleum resources, renewable energy resources, injection projects and anthropogenic resources among all stakeholders to strengthen European Union's competitiveness, social well-being, environmental management and international commitments;
- **Assist the continuous development of UNFC** as a tool to achieve balanced, transparent, equitable and sustainable development of all resources to achieve broad-based sustainable growth in alignment with European Union policies and directives and help to realize a European Geological Knowledge Base for all resources;
- **Promote the application of UNFC through National Geological Surveys and regional Surveys** as a sustainable resource management tool to support policy analyses, government resources management, industrial business processes, introduction of innovative technologies and financing;
- **Provide support to UNECE's Expert Group on Resource Classification** in the development and maintenance of UNFC and encourage mutual exchange of expertise in resource management.

Introduction to European UNFC activities

Data service framework:INSPIRE: Directive 2007/2/EC



- Responsible authorities including Geological Surveys have to provide data on mineral occurrences (resources, reserves) and mining activities, or endowments with the indication of the reporting codes, classification systems.
- This infrastructure enables the sharing of spatial information among public sector organisations, facilitate public access to information across Europe.
- Based on the infrastructures for spatial information established and operated by the Member States of the European Union.

Infrastructure data..	This Directive came into force on 15 May 2007. Has to implemented in by 2021.	
Environment data...		It addresses 34 spatial data themes needed for environmental applications.
Social data (population)		
Land Use Data..		
Mineral resources		

Introduction to European UNFC activities

Geological Service for Europe



UNECE



- **Aims:** To develop pan-European harmonised data and information services in Europe with a focus on:
 - Critical raw materials
 - Geothermal energy resources and subsurface storage capacities for sustainable energy carriers and CO₂ sequestration
 - Groundwater dynamics and quality, geological and climate change information for coastal vulnerability assessment and geological baseline information
- To establish the European Centre of Excellence on Sustainable Resource Management to promote the deployment of the United Nations Framework Classification for Resources (UNFC) and the United Nations Resource Management System (UNRMS);
- To develop the geological data infrastructure - building on the existing EGDI - to provide permanent access to and dissemination of the data and information services developed under the project and beyond, targeting a wide range of stakeholders, with the specific aim of enabling further innovation and strengthening the market uptake of innovative solutions;
- To provide a common European Geological Knowledge Base Platform as the single open access portal to the project results and to the underlying data and information collections and infrastructures of partners at national and regional level;
- To further strengthen the network of national and regional geological survey organisations to provide geological knowledge and services in a sustainable manner.
- <https://www.geologicalservice.eu/about-us>

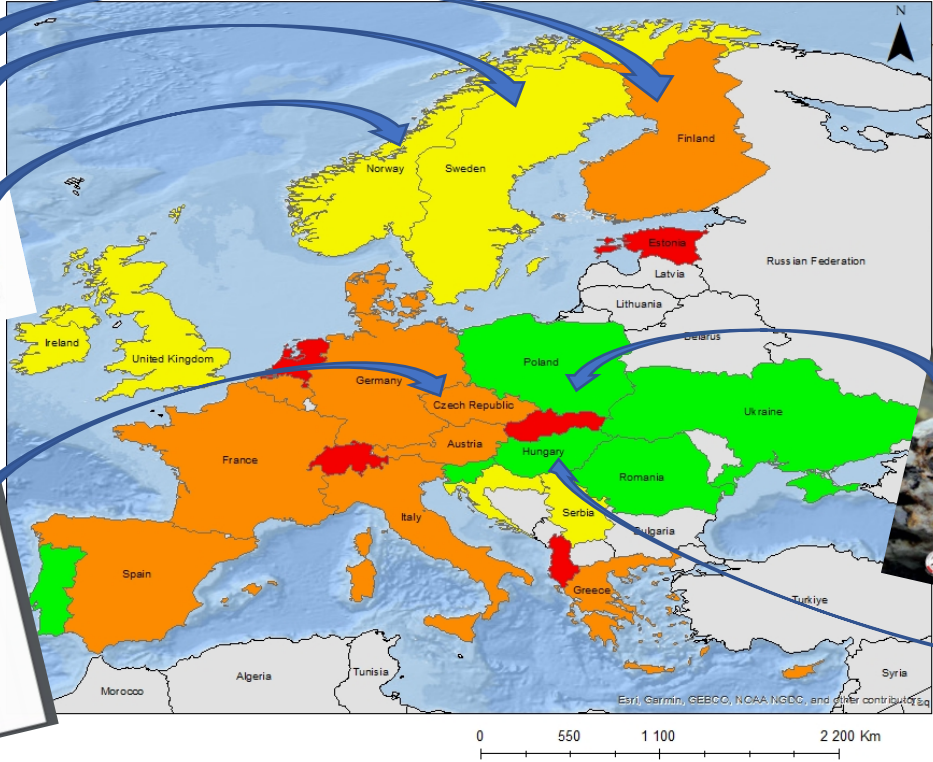
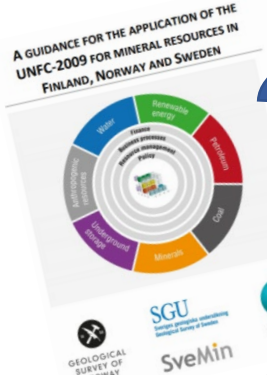
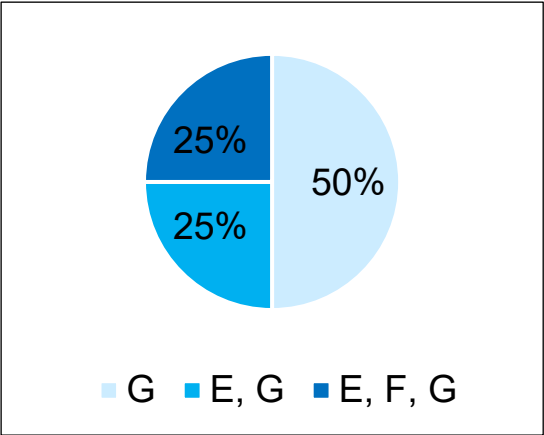


European experience

GSEU project



UNFC categories related data handled by GSEU partners (n=28)



Guidance and guidance-type documents: Czech Republic, Hungary, Poland, Slovenia, Finland, Norway, Sweden, and United Kingdom, significant developments: Portugal, France, Austria, Ukraine).

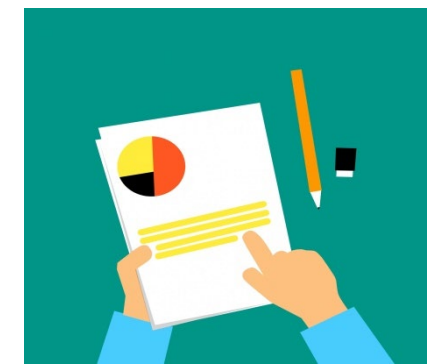
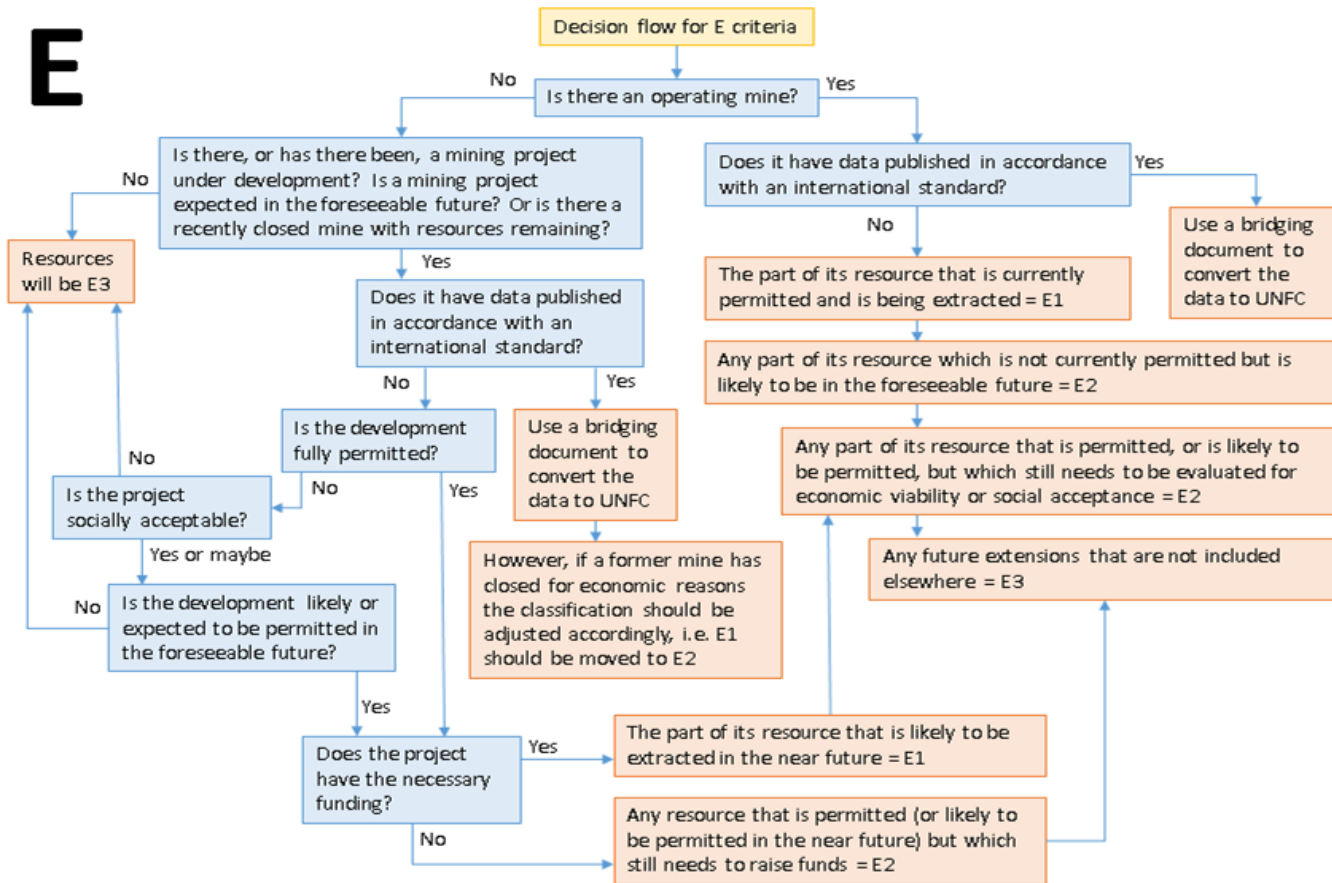
Map showing the years on practice with UNFC based on answers by project partners

Minerals case studies in GeoERA

Decision Tree (by BGS)



E

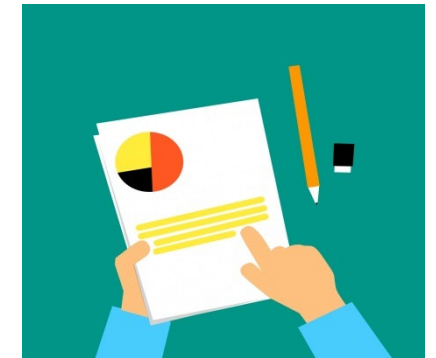
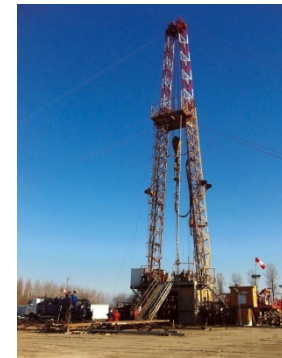
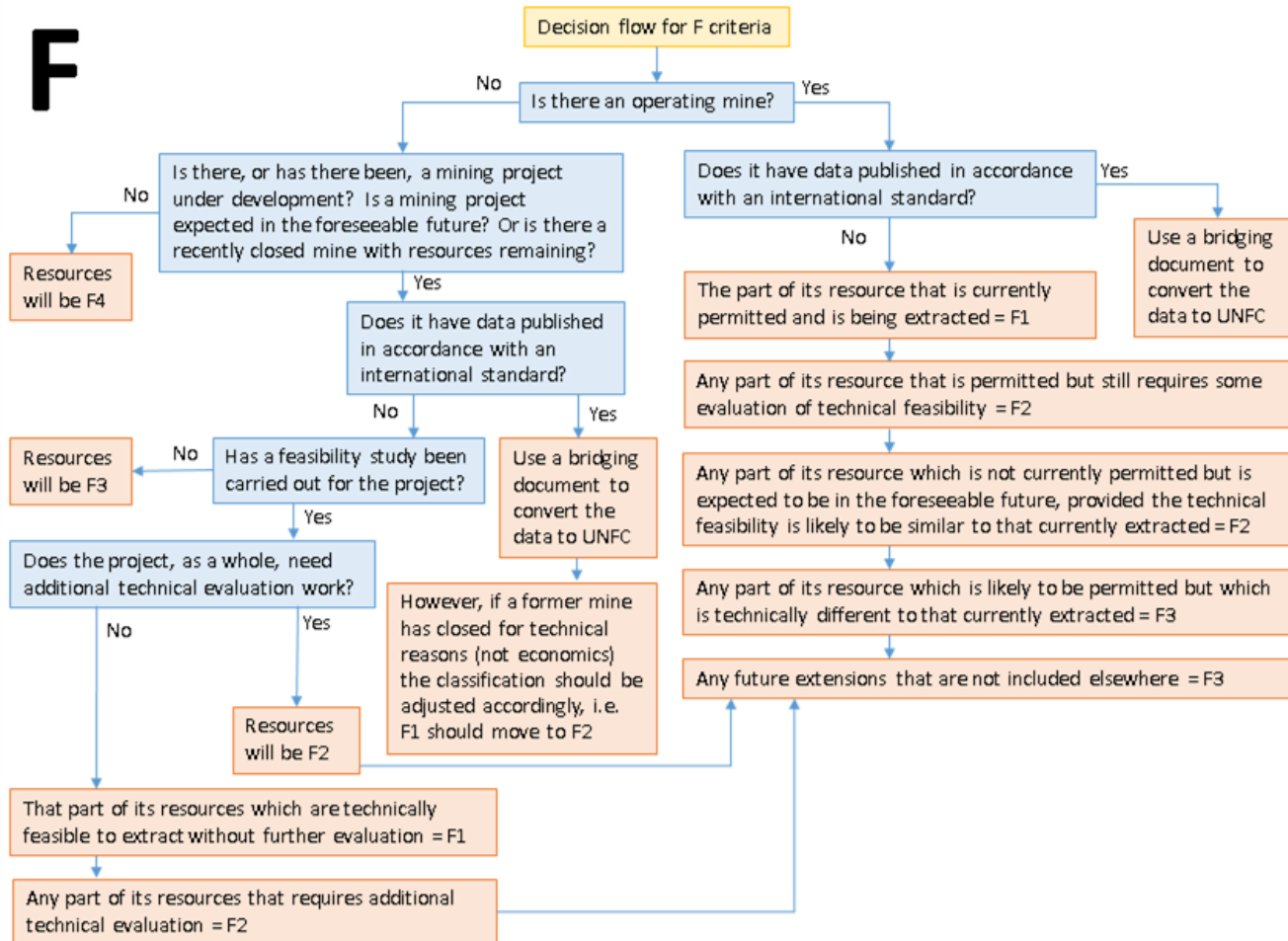


Minerals case studies in GeoERA

British Decision Flow (BGS)

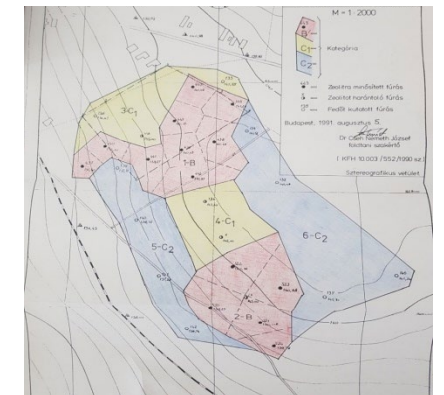
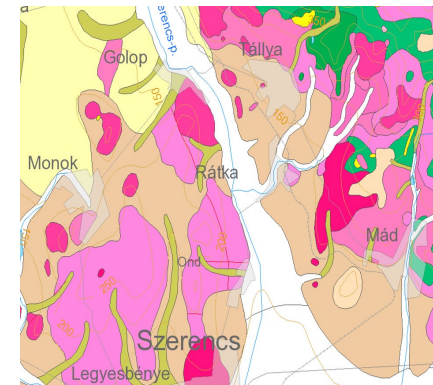
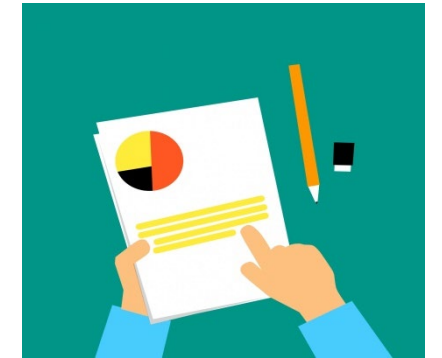
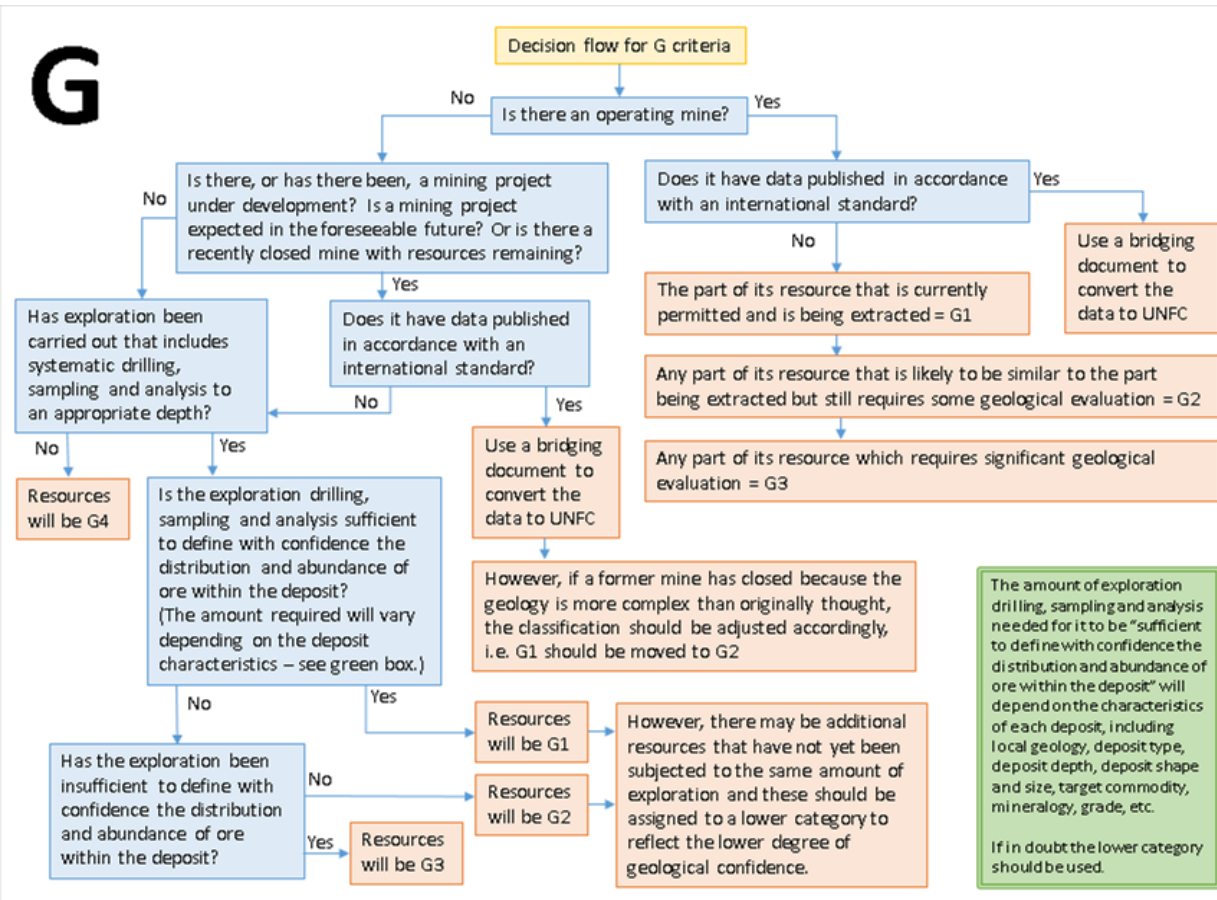


F



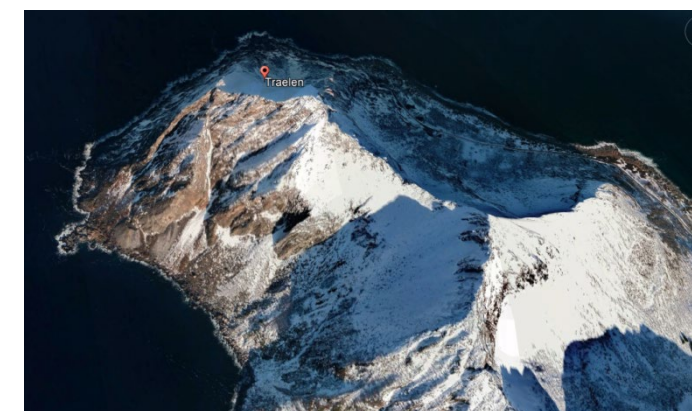
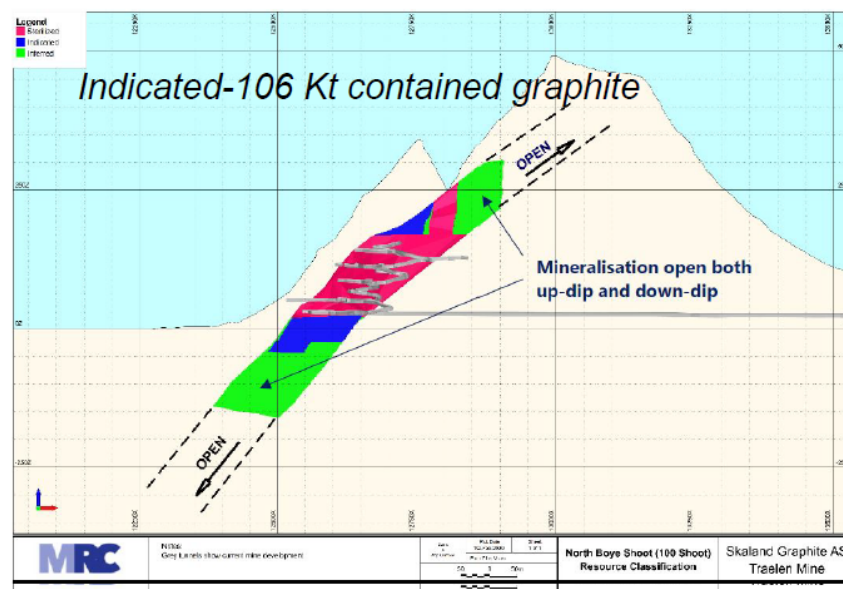
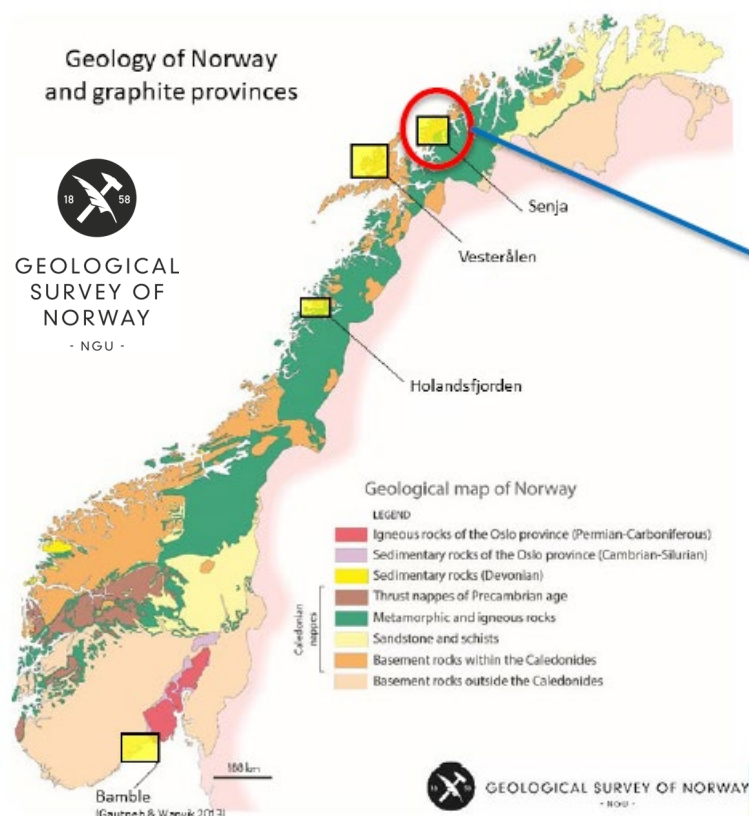
Minerals case studies in GeoERA

British Decision Flow (BGS)



Minerals case studies in GeoERA

Norway, Skaland graphite



Google Earth Pro

www.mineralcommodities.com/. Public ASX release

The resource database consists of 133 holes, representing 15,531m of drilling and 1,245 analysed drill samples.

G3->G2

<https://unece.org/sed/documents/2023/04/presentations/graphite-unfc-case-study-norway-janja-knezevic-solberg>

Minerals case studies in GeoERA

Norway, Skaland graphite



'All necessary environmental permits required to operate the mine and process plant are in place.' *'All licenses and permits are in good standing with no known impediments.'*

Classification	Tonnes Kt	Total Graphitic Carbon (TGC)	Tonnes Contained Graphite Kt
Indicated	409	26%	106
Inferred	1,376	21%	291
Total¹	1,785	22%	397

Total Mineral Resource for Traelen Graphite

Category	Tonnes (kt)	Total Graphitic Carbon (TGC) %	Contained Graphite (kt)
Measured	67	30.2	20
Indicated	719	25.2	181
Inferred	1,058	22.0	233
Total	1,844	23.6	434

Total Maiden Ore Reserves of Traelen Graphite

Category	Tonnes (kt)	Total Graphitic Carbon (%)	Contained Graphite (kt)
Proven	55	27.8	15
Probable	585	24.6	144
Total	640	24.8	159

¹ Ore Reserve was estimated using a 10% TGC cut-off grade

UNFC 2020

E	F	G		E	F	G
1	1	1+2+3	?	1	1	1

UNFC update 2022

E	F	G
1+2	1+2	1+2+3

- Publicly available company report with JORC data (resources) and consideration of permissions provides a proper opportunity to classify a project in UNFC

Tables, source: mineralcommodities.com/operations-projects/graphite/norway/

Other minerals case study

Hungary



General			UNFC codes
Name / ID	Jászapáti	Middle Hungary	
Raw material	sand		
Geology	Quaternary alluvial sand as the old Danube river sediment on the Great Hungarian Plain		
Available exploration reports and scientific publications	Many archive publications and few exploration reports without any pre-feasibility studies are available since 1950. Publications clarified sedimentological background and few drilling holes nearby provide preliminary data on the presence of sand. Final exploration is in progress (expected in June of 2023).		
Level of confidence			G
National category with CRIRSCO term (this is not in the State Mineral Resource Registry)	Internal use of bridging	volume (m3)	
	A+B	0	
	C1	0	
	C2	0	
	D (max. Inferred Resource)	10 000 000 (fictive data)	
Technical feasibility			F
Technical Operation Plan	Exploration TOP is valid to 01.01.2023. (Authority decisions are available). This is prognostic area where the final exploration report will clarify the volume and quality of mineral resource.		
Economic-social-environmental viability			G
Technical Operation Plan	Exploration TOP is valid to 01.01.2023. (Authority decisions are available). Prognostic area, final exploration report clarifies details of the resource.		
Environmental viability	There is not yet environmental license for mining operation		
Social acceptance	Local community is not yet aware about the potential mining activity in the future.		



Mining waste case study

Indirect use of UNFC: national, CRIRSCO to UNFC



Assessment criteria		Site I.	Site II.	Site III.
General	Purpose of Report	+	+	+
	Project Outline	+	+	+
	History	+	+	+
	Key Plan, Maps and Diagrams	+	+	+
	Project Location and Description	+	+	+
	Topography and Climate	partly	partly	partly
	Legal Aspects and Tenure	+	+	+
	Personal introduction into projects and verification of the data	+	+	+
Sampling Techniques and Data	Type(s) of sampling	+	+	+
	Drilling techniques	not relevant	not relevant	not relevant
	Drill sample recovery	not relevant	not relevant	not relevant
	Logging	+	-	-
	Other sampling techniques	+	-	-
	Sample preparation (instead of sub-sampling techniques and sample preparation)	+	+	+
	Assay data and laboratory investigation	+	+	+
	Verification of results	-	-	-
	Data location	+	+	+
	Data density and distribution	+	+	+
	Reporting Archives	+	+	+
	Audits or reviews	-	-	-

Aim: to use the international reporting standards (CRIRSCO family e.g. JORC and PERC) and UN classification framework (UNFC) for mining waste within three case studies.

Available documents:

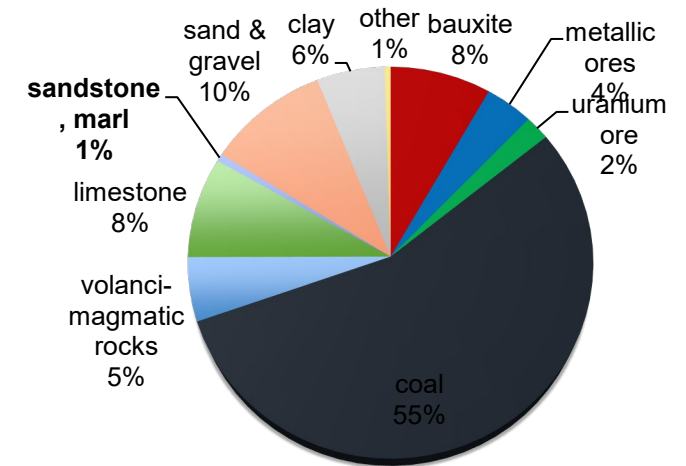
- register of mining waste facilities
- archive surveys of heaps and tailings ponds
- mining waste management plans
- surveys prepared for environmental purpose
- documents of remediation
- documents of scientific research

Mining waste case study

Indirect use of UNFC: national, CRIRSCO to UNFC



Assessment criteria		Site I.	Site II.	Site III.
Estimation and Reporting of Mineral Resources and Mineral Reserves	Database integrity	-	-	-
	Structure of the heap/tailing pond (instead of geological interpretation)	+	+	+
	Estimation and modelling techniques	-	-	-
	Metal equivalents or other combined representation of multiple components	partly	partly	partly
	Cut-off grades or parameters	-	-	-
	Tonnage Factor/In-situ Bulk Density	-	-	-
	Mining factors or assumptions	-	-	-
	Metallurgical factors or assumptions	-	-	-
	Mineral Resource estimate for conversion to Mineral Reserves	-	-	-
	Cost and revenue factors	-	-	-
	Market assessment	-	-	-
	Others			
	Classification	-	-	-
	Audits or reviews	-	-	-
Discussion of relative accuracy/confidence	-	-	-	



Inventory of closed mining waste facilities

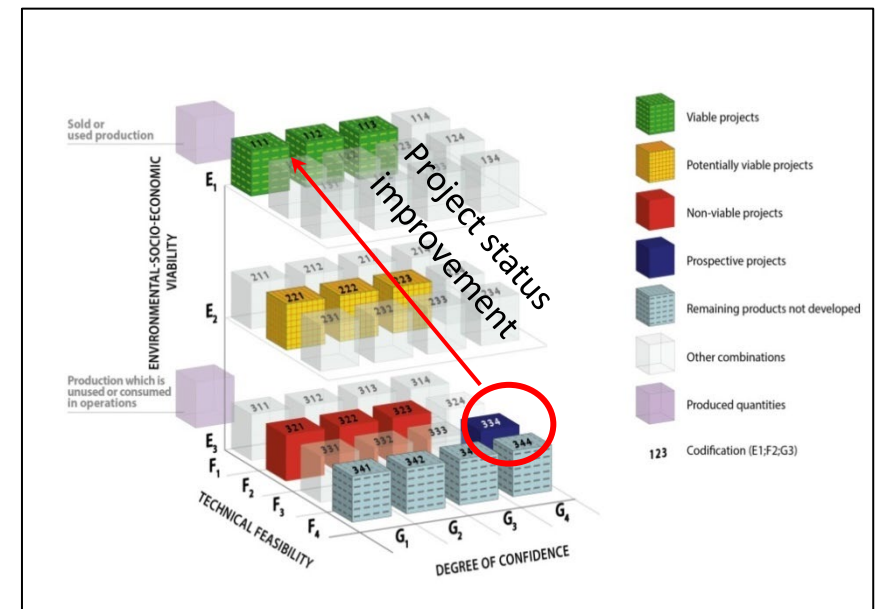
Mining waste case study

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UNFC		CRIRSCO	Hungarian (Russian type)
111	Commercial project	Proved Reserves	Exploitation Reserves in fully explored deposits (No reserves in the Hungarian system)
112		Probable Reserves	Exploitation Reserves in estimated deposits
221	Potentially commercial project	Measured Resources	Resources of category C1 in deposits of 1st, 2nd, and 3rd complexity groups and categories A and B
222		Indicated Resources	Resources of category C2 in deposits of all complexity groups and category C1 in deposits of the 4th complexity group
223		Inferred Resources	D1
334	Exploration project	Exploration Results	-

Sites	E	F	G
Site I. Copper	3	3	3
Site II. Copper	3	4	3
Site III. Polimetallic	3	4	3



Bridging between national inventory and international reporting system and the UNFC classification framework (Horváth et al. 2014)



Thank you!

Zoltán Horváth
Supervisory Authority of Regulatory Affairs
Mining Supervision Date 11-12 | 10 | 2023,
Tbilisi



**KNOWLEDGE SHARING ON RESOURCE
CLASSIFICATION AND ESTIMATION**

Tbilisi, Georgia 11-12 October 2023



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