

# UNFC GUIDANCE EUROPE

## Guidance for the Application of the United Nations Framework Classification for Resources (UNFC) for Mineral and Anthropogenic Resources in Europe





UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

**UNFC GUIDANCE EUROPE**

**Guidance for the Application of  
the United Nations Framework Classification for Resources  
(UNFC) for Mineral and Anthropogenic Resources in Europe**



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## Acknowledgements

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The first draft of UNFC Guidance Europe was prepared by Rodrigo Chanes from DG GROW in 2019. In the following years, it was reviewed by several EGRM experts and interest groups. Furthermore, the draft UNFC Guidance Europe was issued for public comments on the UNECE website for a period of three months from 9 March 2022 to 6 June 2022. All the public comments and responses are available on the UNECE website<sup>1</sup>.

After the public consultation, the Review Team was established to respond to the public comments and adjust the draft document. The members of the Review Team are:

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### Disclaimer

The publication does not necessarily reflect the position of the reviewers and partners listed above who helped to develop this publication.

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<sup>1</sup> See <https://unece.org/draft-guidance-application-unfc-mineral-and-anthropogenic-resources-europe>

## Abbreviations and Acronyms

<b>Acronym</b>	<b>Expansion</b>
<b>CF</b>	Controlling Factors
<b>CRIRSCO</b>	Committee for Mineral Reserves International Reporting Standards
<b>CRMs</b>	Critical Raw Materials
<b>DG GROW</b>	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
<b>EC</b>	European Commission
<b>EGDI</b>	European Geological Data Infrastructure
<b>EGRM</b>	UNECE Expert Group on Resource Management
<b>EIA</b>	Environmental Impact Assessment
<b>ESG</b>	Environmental, Social, and Governance
<b>EWMP</b>	Environmental Water Management Plans
<b>INSPIRE</b>	Infrastructure for Spatial Information in the European Community
<b>ISL</b>	In-situ Leaching
<b>ISR</b>	In-situ Recovery
<b>Mintell4EU</b>	Mineral Intelligence for Europe
<b>Mt</b>	Million tonnes
<b>QA</b>	Quality Assurance
<b>QC</b>	Quality Control
<b>REE</b>	Rare Earth Element
<b>RPEEE</b>	Reasonable Prospects for Eventual Economic Extraction
<b>SDGs</b>	Sustainable Development Goals
<b>TRL</b>	Technology Readiness Levels
<b>UN</b>	United Nations
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>UNFC</b>	United Nations Framework Classification for Resources
<b>UNRMS</b>	United Nations Resource Management System
<b>WEEE</b>	Waste from Electrical and Electronic Equipment
<b>WFD</b>	Water Framework Directive

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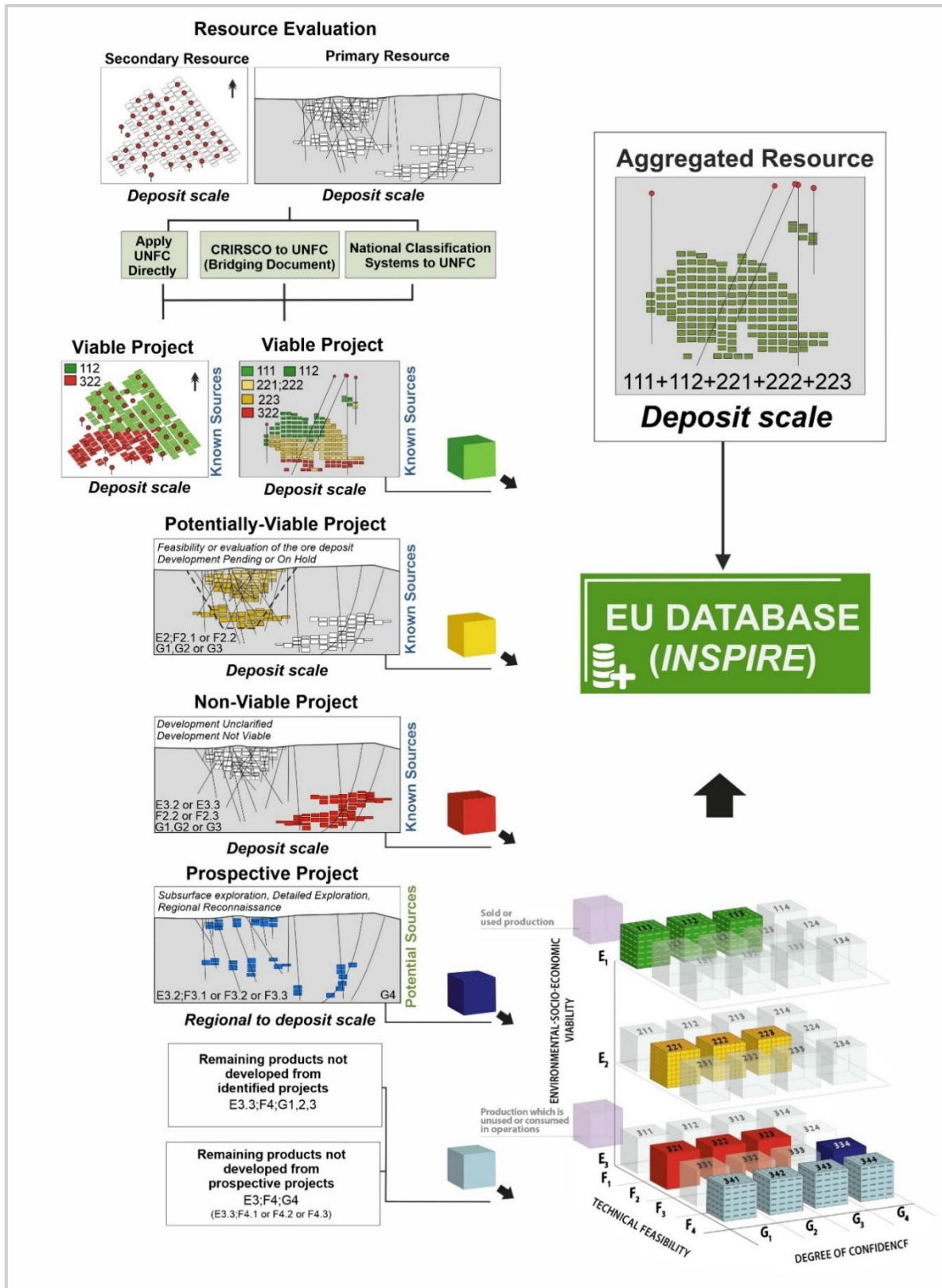
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# Graphical Abstract



## Executive Summary

This document "Guidance for the Application of the United Nations Framework Classification (UNFC) for Mineral and Anthropogenic Resources in Europe" will assist regional and national authorities to establish and maintain a Project inventory of primary and secondary raw materials Projects in Europe. The inventory will be based on the United Nations Framework Classification for Resources. The inventory will cover Projects that aim at the recovering of mineral raw materials from geological occurrences in the earth crust (geogenic resources) and from extractive industry residues such as tailings, stockpiles, and waste rocks (anthropogenic resources).

A UNFC-based inventory will facilitate decision-making by stakeholders related to raw material stocks and flows in Europe. Reliable and relevant information on Sources and Products is important for:

- **Public-sector decision-making** ranging from onsite, municipality, regional, country, European and the UN level on aspects of the resource life cycle
- **Economic management** for planning, organization, and leading activities of management of all corporate levels
- **Finance investment decision making** considering economic, environmental, and social aspects of raw material Projects
- In **expertise**, knowledge, and education

The United Nations and all levels of government must set framework conditions to achieve climate goals and the United Nations 2030 Agenda for Sustainable Development. The framework conditions must enable industry and capital markets to deploy expertise and finance.

Stakeholders must work together where the constraints and obligations of each party are respected. Secondary stakeholders, including academia, media, and the public at large, must be well- and correctly informed to create and introduce change while maintaining necessary consensus through reliable factual and science-based information.

This document facilitates the development of UNFC-based inventories across Europe and provides alignment with Infrastructure for Spatial Information in Europe (INSPIRE) for Mineral Resources. The implementation should be conducted by skilled, qualified experts and/or teams from the relevant country, regional network, and International Centre of Excellence on Sustainable Resource Management, assuring quality and comparability.

This document is one of the first steps on the path to full implementation of UNFC in Europe. Proposed next steps that should be taken in parallel are:

- Increase publicizing, implementation, and utilization of UNFC in societal and economic structures
- Development and strengthening of the expert community of UNFC practitioners
- Inclusion of relevant Project information into the international, national, corporate, and financial accounts and statistics
- Adaptation of quality assurance and quality control structures to the decision support provided by UNFC
- Integration with the Glasgow Financial Alliance for Net Zero (GFANZ), the International Financial Reporting Foundation's International Sustainability Standards Board (ISSB) and the EU Taxonomy.
- Strengthened relations with investors and lenders supporting the Paris Agreement and the Sustainability Development Goals

This document provides guidance on the use of the United Nations Framework Classification for Resources (UNFC) Update 2019 (UNFC (2019))<sup>2</sup> and the Supplementary Specifications for the Application of the United Nations Framework Classification for Resources to Minerals (2021)<sup>3</sup> and Specifications for the Application of the United Nations Framework Classification for Resources to Anthropogenic Resources (2018)<sup>4</sup>. In case of a conflict between the documents and this Guidance, the texts in UNFC (2019) and its Specifications shall prevail.

The common terms and definitions of UNFC are provided in the Glossary of Terms in Annex V. The reader is also advised to examine the source-specific terms explained in Minerals and Anthropogenic Specifications when seeking additional information. The INSPIRE Glossary defines all the terms and definitions to assist in understanding the INSPIRE documentation including terminology of other components e.g., metadata, network services, data sharing, and monitoring.

The use of the UNFC Guidance Europe document is non-mandatory. It aims to assist in classifying Projects and Sources according to UNFC (2019).

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<sup>2</sup> UNFC (Update 2019) (current version)

[https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf)

<sup>3</sup> Supplementary Specifications for the Application of UNFC to Minerals <https://unece.org/sites/default/files/2022-01/UNFC%20Mineral%20Specifications%202021.pdf>

<sup>4</sup> Specifications for the Application of UNFC to Anthropogenic Resources [https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic\\_Resources/UNFC\\_Antropogenic\\_Resource\\_Specifications.pdf](https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic_Resources/UNFC_Antropogenic_Resource_Specifications.pdf)

## Overview of UNFC Implementation for European Regional and National Authorities

### Introduction

The Guidance for the Application of the **United Nations Framework Classification for Resources (UNFC)** for Mineral and Anthropogenic Resources in Europe provides guidance on the use of UNFC (2019) for mineral and anthropogenic resources in Europe.

The purpose of the UNFC Guidance Europe is to **provide a uniform raw materials dataset that would be suitable for aggregated data** across Europe for both primary and secondary raw materials. This dataset will **facilitate European resource management** to ensure and support coherent and consistent national / regional raw materials Project classification and resource management policies at the European level including:

- National raw materials Projects and resource management assisting the development and implementation of national sustainable resource management policies and regulations.
- Company internal business process innovation enabling companies in Europe to develop and adopt business processes that are sustainable, profitable, socially inclusive, environmentally responsible, and resilient.
- Financial reporting that enables capital allocators and investor to correctly assess the opportunities and risks arising from the physical and regulatory uncertainties that climate change and policy reforms represent for investors and lenders.

To fulfil the above purpose, this document is to provide guidance for:

- **Users, including regional and national authorities** in Europe to **facilitate decision-making and maintain databases** for primary and secondary raw materials Projects based on UNFC which is outlined in the Section "Overview of UNFC Implementation for European Regional and National Authorities".
- **Qualified Experts and estimate preparers** in Europe to **classify primary and secondary raw materials Projects** using UNFC as outlined in the Section "Practical Guidance in Applying UNFC for Primary and Secondary Raw Materials in Europe" and Annexes.

The document focuses on the classification of mineral Sources, both primary and secondary Sources, especially, extractive industry residues with a special focus on Critical Raw Materials (CRMs) but also including metal ores, technical minerals, evaporates, aggregates and solid energy minerals such as coal to achieve alignment with the Sustainable Development Goals (SDGs).

The UNFC Guidance Europe is non-mandatory and aims to assist in classifying Projects, Products and Sources based on UNFC (2019). UNFC provides a neutral and uniform classification system for advanced governmental resource management at a variety of scales from local operative environments to national governance levels pursuing common goals for sustainability and innovative technologies in Europe.

Alignment between different reporting systems is ensured through bridging documents to UNFC and linking to INSPIRE. UNFC provides a uniform classification system for Sources, Products and Projects, in contrast, EU-databases, such as INSPIRE, enhance the knowledge base of raw materials, and provide a tool for more effective resource accounting in Europe.



Figure 1. Schematic Diagram showing the Scale and Relationships between Resource Management Concepts and the Achievement of Sustainable Development Goals

## UNFC Application

UNFC is a tool to communicate the availability of resources and the maturity level of Projects. The objective is achieved by providing generic principles and harmonized terminology for classifying these Projects and potential Projects and their associated resources. UNFC is a resource classification system. It is currently not a legally mandated standard for financial reporting.

Deriving its vision from the global requirements, UNFC is designed as a system to facilitate the supply of energy and raw materials required for sustainable development. The emerging challenges in these sectors are the sustainable, socially conscious, environmentally friendly, carbon neutral and efficient development and production of raw materials that are required for a growing population coming out of poverty on the planet.

UNFC is an internationally applicable scheme for the classification of energy and raw material resource Projects at all stages of development and is currently the only classification in the world to do so for the purpose of international, national, and regional level assessments. UNFC reflects conditions in the economic, environmental, and social domain, including markets and government framework conditions, social and environmental considerations, technological and industrial maturity of the Projects and the ever-present uncertainties. The classification system is aligned to the requirements of the 2030 Agenda for Sustainable Development (2030 Agenda). It provides a single framework on which to build international energy and raw material studies and policies, support government resource management policies, plan industrial processes innovation and allocate capital efficiently.

UNFC is a generic principle-based system in which quantities are classified by the three fundamental Criteria:

- Social, environmental, and economic viability (E),
- Technical feasibility (with status of commitment of capital funds) (F), and
- Degree of confidence in the estimates (G).

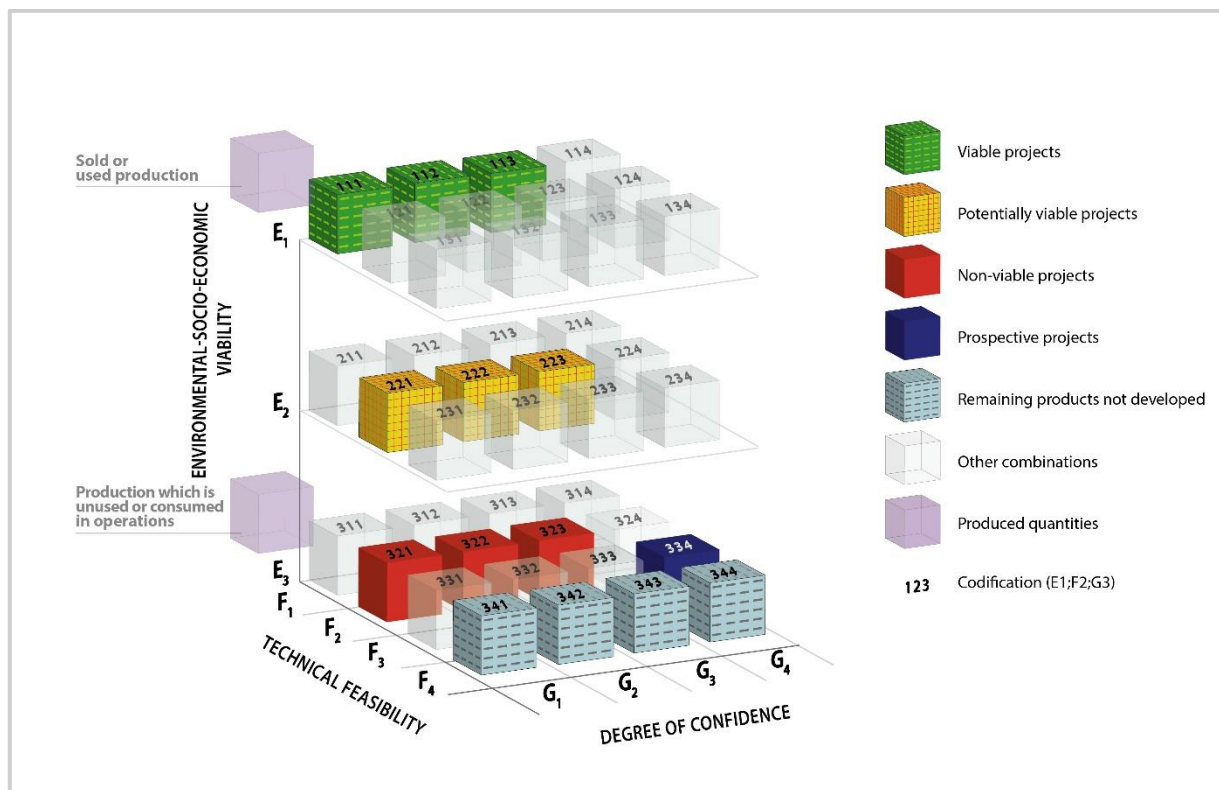


Figure 2. UNFC Categories and Example of Classes<sup>5</sup>

European raw material inventories, both primary and secondary resources, can be reported in UNFC using the definitions and Guidelines provided in this document. The definitions follow the UNFC (2019) definitions and Generic Specifications and are aligned to relevant EU directives, tools, and Guidelines. This document clarifies how UNFC Categories and Classes can be linked to EU instruments, such as INSPIRE, EIA, Aarhus Convention, etc. In addition, other information of relevance to resource management decisions may be included in the inventory. This may include scalar quantities such as total costs, emissions, employment etc. or vectors such as a time series of the same, as well as of production of materials that are both for sale and not for sale.

UNFC inventories may be constructed at a national level, considering 100% shares of the Projects included, and at the entities level based on the metrics that their assets hold according to the legal rights. This can be based on a proportionate share of the Project metrics or other more complex metrics that define the sharing of Products, cash flows, obligations, rights etc.

The UNFC Generic Specifications 2019 is applicable to all resources for inventories of Sources and Products.

Governance of UNFC and its Specifications is the responsibility of the UNECE Expert Group on Resource Management. The development and revision of Specifications are prepared by Technical Advisory Groups in sub-groups. Specifications can evolve over time with revisions published as updates of UNFC, lessons learned from new studies that estimate and classify mineral and anthropogenic resources, and results from expert discussions during workshops and conferences.

<sup>5</sup> See definitions of Categories and Sub-categories in Annex I UNFC Classes and Sub-classes and INSPIRE Code List.

## Minerals Specifications

The Minerals Specifications (2021) provide supplementary Specifications for UNFC to classify mineral Projects, including metal ores, technical minerals, evaporates, aggregates and solid energy minerals such as coal and others in alignment with the Sustainable Development Goals (SDGs). This document specifies functional requirements to classify mineral Projects including Project plans and definitions, Project evaluations, Project classifications, and Project reporting. See Minerals Resources Specifications (2021) for terms and definition.

## Anthropogenic Specifications

The Anthropogenic Specifications (2018) provides supplementary Specifications for UNFC to classify secondary resource Projects in line with the Sustainable Development Goal (SDG) 12, notably objective 12.5. Anthropogenic Sources are material quantities from anthropogenic materials Sources, such as mining tailings, buildings, infrastructure, consumer durable goods, and all material life cycle stages, including recovery, production, use and end-of-life. See Anthropogenic Resources Specifications (2018) for terms and definition.

## Relevant Bridging Documents

UNFC is aligned with other classification systems via Bridging Documents. A Bridging Document<sup>6</sup> explains the relationship between UNFC and another classification system, including instructions on how to classify estimates generated by application of that system using the UNFC Numerical Codes (UNECE 2015) and vice versa.

The Committee for Mineral Reserves International Reporting Standards (CRIRSCO) is an international advisory body relying on its constituent members to ensure national level regulatory and disciplinary oversight at a national level for standard for the reporting of Exploration results, Mineral Resources and Mineral Reserves. The CRIRSCO International Reporting Template ('CRIRSCO Template') assemble the practices and definitions and Guidelines for public reporting for solid minerals<sup>7</sup>. It encourages compatible and consistent public reporting for public companies and includes maintenance of Competent Person standards.

Corporate estimates reported or published in accordance with CRIRSCO Template can be coded into UNFC categories by making simplifying assumptions following the mapping presented in Table 1.

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<sup>6</sup> Bridging Document between the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) Template and the United Nations Framework Classification for Resources (UNFC) [https://unece.org/DAM/energy/se/pdfs/UNFC/UNFC\\_specs/Revised\\_CRIRSCO\\_Template\\_UNFC\\_Bridging\\_Document.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/UNFC_specs/Revised_CRIRSCO_Template_UNFC_Bridging_Document.pdf)

<sup>7</sup> Source: <https://www.criirSCO.com>



Table 1. Simplified Mapping of CRIRSCO Template to UNFC-2009<sup>8</sup> Classes and Categories

CRIRSCO Template		UNFC-2009 "minimum" Categories			UNFC-2009 Class
Mineral Reserve	Proved	E1	F1	G1	Commercial Projects
	Probable			G2	
Mineral Resource	Measured	E2	F2	G1	Potentially Commercial Projects
	Indicated			G2	
	Inferred			G3	
Exploration Results		E3	F3	G4	Exploration Projects

In situations where national classification system is used, harmonization to UNFC should be ensured before producing national aggregation of primary and secondary raw materials data into EU-databases. It is important to identify all the significant differences between systems and, if necessary, adjust definitions and/or Specifications of the systems aligned to UNFC so that they lead to comparable results. A system that is harmonized with UNFC can become an Aligned System through the development and endorsement (by the Expert Group on Resource Management) of a Bridging Document.

## Infrastructure for Spatial Information in Europe (INSPIRE) for Mineral Resources

The Infrastructure for Spatial Information in Europe (INSPIRE) Knowledge base is to provide the basis for the interoperability of spatial information that are created and maintained by the EU Member States. The INSPIRE Mineral resources data theme<sup>9</sup> is European data model for mineral resources. The initial INSPIRE data model has been improved and extended through use in many Projects (Minerals4EU, EURARE, ProSUM, ORAMA and Mintell4EU) to solve the goals, tasks, and challenges regarding data delivery on mineral resources and raw materials in Europe. Currently, the EU level implementation of the INSPIRE Mineral Resource theme is M4EU DB database, which integrates the national datasets into single entity.

M4EU DB is fully based on INSPIRE schemas, but the data model and code lists have extensions that are not yet included in the actual INSPIRE data specification documentation. INSPIRE-compliant M4EU DB database enables EU geological surveys and other partners to share mineral resource information, and stakeholders to find, view and acquire standardized and harmonized data through a single EGDI portal<sup>10</sup>. The INSPIRE data model and code lists have not been developed based on the definitions of UNFC. Therefore, definitions of categories and Sub-categories and all available codifications are currently not specified within INSPIRE. The INSPIRE data model is intended to continue to evolve, and the data delivery platforms will be supported and developed.

<sup>8</sup> Bridging document between UNFC and CRIRSCO was created before the update of UNFC 2019.

<sup>9</sup> See <https://inspire.ec.europa.eu/Themes/135/2892>.

<sup>10</sup> See <https://www.europe-geology.eu/>.

## Quality Control

Reliable and consistent data (estimates of quantities, classification, and aggregation) are required for robust decision making. It is therefore essential that an appropriate quality control processes are in place.

The Qualified Experts must be accountable for the quality of their work and guidance is provided in the Section "Practical Guidance in Applying UNFC for Primary and Secondary Raw Materials in Europe," below. The regional or national bodies which receive the data and may choose to regulate the requirements should assure themselves that these processes are applicable and have been applied<sup>11</sup>.

A review process can be extremely helpful in establishing and maintaining consistency, while identifying and resolving issues. This can readily be implemented within a preparer's organization. Whilst more difficult to implement, it can also be extremely helpful to introduce reviews across organizations (e.g., at the national and regional level where data is received) and to bring in external reviewers, to share experience and achieve a greater consistency.

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<sup>11</sup> See "Guidance Note to support the United Nations Framework Classification for Resources Specification for Evaluator Qualifications" especially paragraph 11) and section VI of the document "The United Nations Framework Classification for Resources applied to Commercial Assessments – Introductory Guidance (ECE/Energy/GE.3/2018/8)

## Practical Guidance in Applying UNFC for Primary and Secondary Raw Materials in Europe

The Generic Specifications defined in UNFC (2019) and Supplemental Specifications for Mineral (2021) and Anthropogenic Resources (2018) specifies functional requirements to classify mineral Projects and sets the minimum Criteria for reporting under UNFC. These Specifications shall be used e.g., when applying UNFC directly or mapping between classification systems.

The use of UNFC to Projects is done according to the user's needs:

- Assigning estimated quantities to specific Class or Sub-class of UNFC by reference to the definitions of Categories or Sub-categories for each of the three Criteria and considering Generic Specifications and source-specific Specifications, Guidelines and Bridging Documents or
- Classifying Projects in UNFC (Figure 2). It should be noted that the Category and Sub-category definitions together with Generic Specifications and relevant source-specific Specifications necessary for classification into Viable Projects, Potentially Viable Projects, and Non-Viable Projects, shall be met before consideration is given to assignment to the appropriate Sub-class.

The structure of the UNFC Guidance Europe consists of the main text for users and series of annexes which are aimed to assist the practitioners (Qualified Experts). UNFC Classes, Sub-classes and INSPIRE Code List is provided in Annex I, Supplemental Guidance for the National Resource Reporting is provided in Annex II, Mineral and Anthropogenic Resources Sectoral Guidelines for Europe is provided in Annex III, Glossary of Terms in Annex IV, and Additional literature in Annex V.

The annexes are intended to provide practical guidance for those responsible for governmental resource management. This provides supplemental instructions and sectoral Guidelines for evaluators mapping raw materials Sources (primary and secondary) using UNFC as well as how classification and subsequent quantities can be linked to European databases.

In addition, the Technology Readiness Levels (TRL) measurement system is used to assess the maturity level of a particular technology. A Project may be evaluated against the parameters for each technology level and is then assigned a TRL rating based on the Projects progress assessment. There are nine technology readiness levels with TRL 1 as the lowest and TRL 9 the highest level.

This practical guidance is to assist in classifying Projects using UNFC in relation to primary and secondary mineral Sources. The aim of UNFC classification is not to re-assess, re-evaluate existing resources, and not, to forecast changes in exploration and mining permitting or the demand for mineral resources. It is intended only to harmonize the existing information and to give resource coding to cases where the current industrial standards cannot be applied. Estimated quantities need to reflect the "true" current situation related to Project maturity which, e.g., indicate realistic timeframes of saleable Product inputs to the market or the total amount of potential Viable quantities of Critical Raw Materials in Europe.

Specifications provide additional mineral-specific terms as well as terms related to anthropogenic resources, which are useful to readers seeking additional information on mineral and anthropogenic Sources.

The importance of quality control was emphasized in Section "Overview of UNFC Implementation for European Regional and National Authorities." The responsibility for these checks lies with the preparers of the data (estimates of quantities, classification, and aggregation), whereas the receivers of the data should verify that appropriate quality control processes are in place.

Quality control is potentially complex for data to populate regional and national databases since this data may come from multiple providers, and even from a chain of providers. For example, a

national agency may receive classifications of Projects, and estimates of quantities which will be produced by several different companies. These may be classified using different systems. UNFC Classes are then to be assigned to INSPIRE. Furthermore, the quantities may be aggregated for e.g., national reporting. Quality control of each step in the process is necessary if the data are to be reliable and consistent.

Section VI of ECE/ENERGY/GE.3/2021/8 "The United Nations Framework Classification for Resources applied to Commercial Assessments - Introductory Guidance" provides helpful guidance on quality assurance and control. Whilst this was written for commercial applications, the principles, and approaches which it sets out can provide the basis for quality control of other types of data for regional and national databases.

In general, quality control should cover the following elements:

- Those undertaking the work have the necessary technical expertise and experience<sup>12</sup>.
- Appropriate methods have been properly applied in estimating quantities and the level of confidence in these estimates<sup>13</sup>
- Projects and associated estimated quantities have been appropriately classified
- Quantities have been correctly aggregated, including accounting for levels of confidence and levels of maturity<sup>14</sup>.
- There is documentation of the estimation, classification, and aggregation together with supporting evidence. This should be sufficient to allow an audit of the work done.

A review process can be helpful to establish and maintain consistency, and to identify and resolve issues. This can readily be implemented within a preparer's organization. Whilst more difficult to implement, it can also be helpful to introduce reviews across organizations (e.g., at the national and regional level where data is received) and to bring in outside reviewers, to share experience and achieve greater consistency.

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<sup>12</sup> See ECE/ENERGY/GE.3/2022/4 Guidance Note on Competency Requirements for the Estimation, Classification and Management of Resources

<sup>13</sup> See UNFC 2019 [Part II, section II]

<sup>14</sup> See UNFC 2019 [Part II, section II and section IV J]

## Conclusions

This Guidance builds on the latest UNECE documents United Nations Framework Classification for Resources (UNFC (2019)), Specifications for the Application of UNFC to Minerals (2021) and Specifications for the Application of UNFC to Anthropogenic Resources (2018). It provides information regarding the classification of Projects that aim at the production of raw materials (primary and secondary) in the mining sector tailored for Europe and shows the interconnections with Infrastructure for Spatial Information in Europe (INSPIRE). The main document is prepared for a broad audience dealing with UNFC (government officials, industry, finance sector, academia etc.) while the annexes (Specifications, Guidelines, extended glossary) have been prepared for Qualified Experts. An approach to use the classification for resource management may be:

- Identify the key resource management decisions to be supported in government, industry, and finance.
- List the key information required to inform these decisions and that Projects carry.
- Identify the metrics to be included in the Project inventories to allow the information to be generated
- Develop high security and quality shared data management facilitating the work of both preparers and users making sure both have strong professional and economic interests in the results.

The purpose of the UNFC Guidance Europe is to classify Projects correctly in accordance with the Category definitions, primarily at the national and Member State level. If regional or local standards were used to classify Projects, these Projects should also be classified with UNFC to ensure complete and correct aggregation into national levels and to create a standard for all of Europe.

The UNFC Guidance Europe at national level would include several steps:

- Prepare a Bridging Document(s) to the national system(s) (if needed)
- Establish a national UNFC-based database
- Dissemination and communication of the UNFC-based database
- Extended use of the UNFC-based database information for decision support to UN and governments, industry, and capital allocators
- Further development of UNFC practices together with the UNECE Expert Group on Resource Management.





# **UNFC GUIDANCE EUROPE**

## **ANNEX I**

### **UNFC Classes and Sub-classes and**

### **INSPIRE Code List**

## ANNEX I: UNFC Classes and Sub-classes and INSPIRE Code List

The minerals Project plan may be detailed or conceptual (in the case of long-term national resource planning). Feasibility and design studies fall within three major categories of (i) order of magnitude (scoping), (ii) preliminary studies, and (iii) detailed studies. The minerals Project plan should be sufficiently detailed to allow an appropriate assessment for the stakeholder needs at the defined level of maturity. The estimation of quantities shall be done in accordance with professional quality assured methods.

INSPIRE data model structure and harmonized vocabularies are the cornerstones of data interoperability. Commonly agreed terms of INSPIRE registry code lists **Mine Status**<sup>15</sup> and **Exploration Activity Type**<sup>16</sup> are selected for this guidance. When applicable, they provide common terminology that all EU countries can use as a basis for UNFC classification. Full compatibility of UNFC definitions and INSPIRE data model structure is not attained, therefore, Qualified Experts should use terms soundly according to their expertise and areas of work. Note, the INSPIRE sub-codes (labels) listed in the following table are to provide additional information of related topics and relevant data confidences in particular INSPIRE parent code. Individual INSPIRE labels alone do not define any UNFC Category or Sub-category.

### Mining Projects

A mining Project produces mineral Products from a mineral source with defined frame conditions, which provide the basis for environmental-socio-economic evaluation and in decision-making. The Project is comprised of a defined activity or set of activities, which provide the basis for estimating technical viability on the one hand (F-axis issues) and environmental-socio-economic viability, on the other (E-axis issues).

In UNFC, a Project may have quantities in several Classes (i.e., reflecting Products that will be sold or used, Products that will be consumed by the Project or not used (e.g., fuel and mine tailings) and quantities that will not be associated with any Project (e.g., unrecoverable quantities remaining in situ). In addition, a Project may produce multiple Products, defined as the quantities crossing the reference points through sub-Projects that may or may not have the same categories.

### Viable Projects

Viable Projects are current or future recovery by actual mining operations. Viable Projects have been confirmed to be technically, social, environmentally, and economically acceptable to society with a likelihood under current conditions for success.

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<sup>15</sup> See <https://inspire.ec.europa.eu/codelist/MineStatusValue>.

<sup>16</sup> See <https://inspire.ec.europa.eu/codelist/ExplorationActivityTypeValue>.



- **In production** is used where the Project is producing, and supplying one or more mineral Products to market, at the Effective Date of the evaluation (E1F1.1)

Table 2. Interconnections between UNFC Categories and INSPIRE Codes (Viable Projects - in Production)

Minimum UNFC Categories	INSPIRE Code Name (Mine Status)	INSPIRE Code (Mine Status)	INSPIRE Code List Description
E1 F1.1 G1,2,(3) <sup>17</sup>	operating	operating	A mine is operating.
E1.1 or E1.2	operating continuously	operatingContinuously	A mine is operating continuously.
E1.1 or E1.2	operating intermittently	operatingIntermittently	A mine is operating intermittently.

High level of confidence. All necessary conditions are met regards the Project viability in Foreseeable Future or Reasonable Expectation can be estimated with high level of confidence.

- **Approved for Development** requires that all approvals/permits/contracts be in place, and capital funds have been committed (E1F1.2)

Table 3. Interconnections between UNFC Categories and INSPIRE Codes (Viable Projects - Approved for Development)

Minimum UNFC Categories	INSPIRE Code Name (Mine Status)	INSPIRE Code (Mine Status)	INSPIRE Code List Description
E1 F1.2 G1,2,3	under development	underDevelopment	Under development.
	under construction	construction	Under construction.

- **Justified for development** requires that the Project has been demonstrated to be technically feasible and Viable, and there shall be a reasonable expectation that all necessary approvals/contracts for the Project to proceed to development will be forthcoming (E1F1.3).

Table 4. Interconnections between UNFC Categories and INSPIRE Codes (Viable Projects – Justified for Development)

Minimum UNFC Categories	INSPIRE Code Name (Mine Status)	INSPIRE Code (Mine Status)	INSPIRE Code List Description
E1 F1.3 G1,2,3	pending approval	pendingApproval	A mine waiting for the exploitation authorization, generally given by a State Mining Engineering Department.

All necessary conditions are met regards the Project viability with Reasonable Expectation (F1.3)

<sup>17</sup> In most cases, G3 is not to be stand-alone and it should link with G1 or G2.

## Potentially Viable Projects

Potentially Viable Projects are potential future recovery by mining operations, where development is pending or on- hold.

- **Development pending** is limited to Projects that are actively subject to technical activities, such as the acquisition of additional data (e.g., appraisal drilling) or the completion of feasibility studies and associated social, environmental, and economic analyses designed to confirm the viability including the determination of optimum development scenarios or mine plans. Also, the status may include Projects that have non-technical contingencies, provided these contingencies are being actively pursued by the developers and are expected to be resolved positively within a reasonable period.

Table 5. Interconnections between UNFC Categories and INSPIRE Codes (Potentially Viable Projects - Development Pending)

Minimum UNFC Categories	INSPIRE Code Name (Mine Status)	INSPIRE Code (Mine Status)	INSPIRE Code List Description
E2 F2.1 G1,2,3	feasibility	feasibility	Technical economic study aimed at assessing the possibility to launching a mine venture.
E1 F2	feasibility	feasibility	
E2 F1	feasibility	feasibility	

Minimum UNFC Categories	INSPIRE Code Name (Exploration Activity)	INSPIRE Code (Exploration Activity)	INSPIRE Code List Description
E2 F2.1 G1,2,3	evaluation of the ore deposit	evaluationOfOreDeposit	This is the final phase of evaluation leading to the final yes/no mining decision.
	mining Pilot	miningPilot	Intermediate phase between laboratory tests and actual plant.
	core drilling systematic	coreDrillingSystematic	The evaluation of the ore deposit with the aim of getting detailed information on the whole deposit and best quality samples. This is the final phase of evaluation leading to the yes/no mining decision.
	mine workings reconnaissance	mineWorkingsReconnaissance	Reconnaissance workings aimed at getting a better understanding of the deposit and allowing one to get large ore samples for detailed beneficiation tests.
	geostatistical estimates	geostatisticalEstimates	Technique based on probability theory that is used to compute regionalized variables, the values of which depend on their position in space, such as the metal content or grade in a deposit.
	feasibility study and report	feasibilityStudyReport	Technical economic study aimed at assessing the possibility of launching a mine venture.

- **Development on hold** is used where a Project is considered to have at least a reasonable chance of achieving viability (i.e., there are Reasonable Prospects for eventual social, environmental, and economically Viable production), but where there are currently major non-technical contingencies (e.g., environmental, or social issues) that need to be resolved before the Project can move towards development.

Table 6. Interconnections between UNFC Categories and INSPIRE Codes (Potentially Viable Projects - Development on Hold)

Minimum UNFC Categories	INSPIRE Code Name (Mine Status)	INSPIRE Code (Mine Status)	INSPIRE Code List Description
E2 F2.2 G1,2,3	not operating	notOperating	A mine is not operating.
E1 F2.2 or E2 F1	care and maintenance	careAndMaintenance	A mine is under care and maintenance.
E2 F1 or E2 F2.2	retention	retention	A mine can be kept unexploited until the price of contained commodity(ies) makes it economical.

Quantities associated with a mine which are unexploited until CFs e.g., the price of contained commodity(ies), change to allow commercial viability in Foreseeable future.

## Non-Viable Projects

Non-Viable Projects are potential future recovery by mining operations, but where development is uncertain, or development is currently assessed as not Viable.

- **Development unclarified** is appropriate for Projects that are in the initial stages of technical and economic evaluation (e.g., a recent new discovery), and/or where significant further data acquisition is required, to make a meaningful assessment of the potential for an economic development (i.e., there is currently insufficient basis for concluding that there are Reasonable Prospects for eventual social, environmental, and economically Viable production).

Table 7. Interconnections between UNFC Categories and INSPIRE Codes (Non-Viable Projects - Development Unclarified)

Minimum UNFC Categories	INSPIRE Code Name (Exploration Activity)	INSPIRE Code (Exploration Activity)	INSPIRE Code List Description
E3.2 F2.2 G1,2,3	resource assessment	resourceAssessment	The aim of this phase is the delineation of the envelope of an orebody. Logging of cores, sampling of mineralized sections to better understand the distinctive features of the deposit, the physical properties of the ore, and finally to lead to a first (still approximate) calculation of the resource.
	percussion drilling assessment	percussionDrillingAssessment	The assessment of the resource using percussion drilling, sometimes on a grid with a wide mesh. The aim of this phase is the (still rough) delineation of the envelope of an orebody. Drill logging, sampling of mineralized sections to better understand the distinctive features of the deposit, the physical properties of the ore, and finally to lead to a first (still approximate) calculation of the resource.
	core drilling assessment	coreDrillingAssessment	Drilling of a cylindrical hole with an ad hoc tool to collect a rock sample, or to conduct a physical measurement or a geological observation. By extension, designates also the drill hole, whatever the latter's purpose. Boreholes are drilled by coring. This technique is used to collect undisturbed rock cylinders and allows to confirm/to precise results from percussion drilling.
	geological interpretation	geologicalInterpretation	Compilation and synthesis of all the available geological information to get as precise as possible model of the mineral resource.
	ore beneficiation tests	oreBeneficiationTest	Technique designed to treat run-of-mine material.
	approximate calculation of the resource	approximateResourceCalculation	Rough evaluation of the tonnage and grade essentially based on drill holes information, by correlation and interpolation of intersected mineralized sections.

This should not be confused with INSPIRE Code "evaluation of the ore deposit" which is used for 221, 222, 223 Classes and aligned with CRIRSCO-compliant Mineral Resources.

The "resource assessment" is applicable when development is unclarified. For example, Project activities that may be subject to significant delay due to e.g., technical data acquisition required to make a meaningful assessment of potential for a development or other contingency related to non-technical issue where development or operation activities are suspended.

- **Development not Viable** is used where a technically feasible Project can be identified, but it has been assessed as having insufficient potential to warrant any further data acquisition activities or any direct efforts to progress the Project.

Table 8. Interconnections between UNFC Categories and INSPIRE Codes (Non-Viable Projects - Development Not Viable)

<b>Minimum UNFC Categories</b>	<b>INSPIRE Code Name (Mine Status)</b>	<b>INSPIRE Code (Mine Status)</b>	<b>INSPIRE Code List Description</b>
<b>E3.3 F2.3 G1,2,3</b>	<b>not operating</b>	<b>notOperating</b>	<b>A mine is not operating.</b>
	closed	closed	A mine can be closed for technical, economical, or techno-economic reasons.
	abandoned	abandoned	A mine is abandoned.
	historic	historic	An 'old' mine which has been exploited before 1900.

Note: quantities in place without plans for recovery should be classified as E3.3; F4; G1,2,3

## Prospective Projects

Prospective Projects are potential future recovery by successful exploration activities. An Exploration Project is associated with one or more major occurrences, i.e., a deposit that has not yet been demonstrated to exist by direct evidence (e.g., drilling and/or sampling), but has been assessed primarily on indirect evidence (e.g., surface, or airborne geophysical measurements).

Table 9. Interconnections between UNFC Categories and INSPIRE Codes (Prospective Projects)

<b>Minimum UNFC Categories</b>	<b>INSPIRE Code Name (Exploration Activity)</b>	<b>INSPIRE Code (Exploration Activity)</b>	<b>INSPIRE Code List Description</b>
<b>E3.2 F3 G4</b>	<b>not operating</b>	<b>notOperating</b>	<b>A mine is not operating.</b>
<b>F3.1</b>	<b>subsurface exploration</b>	<b>subsurfaceExploration</b>	<b>Subsurface exploration using the low costs techniques (trenching, destructive drilling, etc.), of resources appraisal.</b>
	excavation	excavation	Detailed geological mapping of the area(s) of interest.
	auger drilling	augerDrilling	Detailed surveys (often on a grid) with the most appropriate method, to confirm delineate and characterize geochemical anomalies identified during the previous phase.
	percussion drilling	percussionDrilling	Detailed surveys (often on a grid) with the most appropriate method, to confirm and better delineate and characterize geophysical anomalies identified during the previous phase.
	core drilling	coreDrilling	Detail prospecting in a local scale with a hand-held washing tool, usually shaped like a plate or a flat cone, at the bottom of which the densest fractions of a soil, a stream sediment is collected.

<b>F3.2</b>	<b>detailed surface exploration</b>	<b>detailedSurfaceExploration</b>	<b>Detailed surface exploration to delineate anomalies and describe occurrences in their refined geological context.</b>
	detailed geology	detailedGeology	Detailed geological mapping of the area(s) of interest.
	detailed geochemistry	detailedGeochemistry	Detailed surveys (often on a grid) with the most appropriate method, to confirm and better delineate and characterize geochemical anomalies identified during the previous phase.
	detailed geophysics	detailedGeophysics	Detailed surveys (often on a grid) with the most appropriate method, to confirm and better delineate and characterize geophysical anomalies identified during the previous phase.
	detailed heavy mineral sampling	detailedHeavyMineralSampling	Detail prospecting in a local scale with a hand-held washing tool, usually shaped like a plate or a flat cone, at the bottom of which the densest fractions of a soil, a stream sediment is collected.
<b>F3.3</b>	<b>regional reconnaissance</b>	<b>regionalReconnaissance</b>	<b>Regional investigation to identify anomalies (geochemical, geophysical, mineralogical) and discover occurrences.</b>
	regional geology	regionalGeology	Drafting of a very preliminary geological map with the main formations and the main structures, including the location of discovered mineral showings.
	regional geochemistry	regionalGeochemistry	The detection of abnormal concentrations of chemical elements in superficial water, soils, or organisms, usually accomplished by instrumental, spot-test, or rapid techniques which are applicable in the field.
	regional geophysics	regionalGeophysics	Exploration technique based on the detection of anomalous physical characteristics of a ground.
	regional heavy mineral sampling	regionalHeavyMineralSampling	Prospecting with a hand-held washing tool, usually shaped like a plate or a flat cone, at the bottom of which the densest fractions of a soil, a stream sediment is collected.

*Note: quantities in place without plans for recovery should be classified as E3.3 F4 G1,2,3*

## Remaining Products not developed from identified Projects, or from Prospective Projects

They are associated with known Sources that will not be recovered by any currently defined mining operation. Quantities should only be classified as additional quantities in place where no technically feasible Projects have been identified that could lead to the production of any of these quantities.

Table 10. UNFC Classes defined by Categories and Sub-categories with Mapping of INSPIRE Codes

UNFC Classes Defined by Categories and Sub-categories						INSPIRE Code List
Produced	Sold or used production					
	Production which is unused or consumed in operations <i>Future production that is either unused or consumed in the Project operations is categorized as E3.1. These can exist for all Classes of recoverable quantities <sup>c</sup></i>					
Total Products	Class	Sub-class	Categories			
			E	F	G <sup>a</sup>	
Known Sources	<b>Viable Projects</b> <i>Estimates associated with Viable Projects are defined in many classification systems as Reserves, but there are some material differences between the specific definitions that are applied within different industries and hence the term is not used here. <sup>c</sup></i>	On Production	1	1.1	1, 2, (3)	operating continuously operating intermittently
		Approved for Development	1	1.2	1, 2, 3	under development
		Justified for Development	1	1.3	1, 2, 3	pending approval
	<b>Potentially Viable Projects</b> <i>Not all Potentially Viable Projects will be developed</i>	Development Pending	2 <sup>b</sup>	2.1	1, 2, 3	feasibility evaluation of the ore deposit
		Development On Hold	2	2.2	1, 2, 3	care and maintenance retention
	<b>Non-Viable Projects</b> <i>Non-Viable Projects include those that are at an early stage of evaluation in addition to those that are considered unlikely to become Viable developments within the Foreseeable Future. <sup>c</sup></i>	Development Unclassified	3.2	2.2	1, 2, 3	resource assessment (geological interpretation, approximate calculation of the resource)
		Development Not Viable	3.3	2.3	1, 2, 3	closed abandoned historic
	<b>Remaining Products not developed from identified Projects</b> <i>Remaining Products not developed from identified Projects or Prospective Projects may become developable in the future as technological or environmental-socio-economic conditions change. Some or all these estimates may never be developed due to physical and/or environmental-socio-economic constraints. <sup>c</sup></i>		3.3	4	1, 2, 3	
	Potential Sources	<b>Prospective Projects</b>	3.2	3.1	4	subsurface exploration
			3.2	3.2	4	detailed surface exploration
3.2			3.3	4	regional reconnaissance	
<b>Remaining Products not developed from Prospective Projects</b>		3.3	4.1	4		
		3.3	4.2	4		
		3.3	4.3	4		

a - G Categories may be used discreetly, or in cumulative scenario form (e.g., G1+G2).

b - Potentially Viable Projects may satisfy the requirements for E1.

c - Commentaries in *Italics* are essential for further clarifications of related terms.

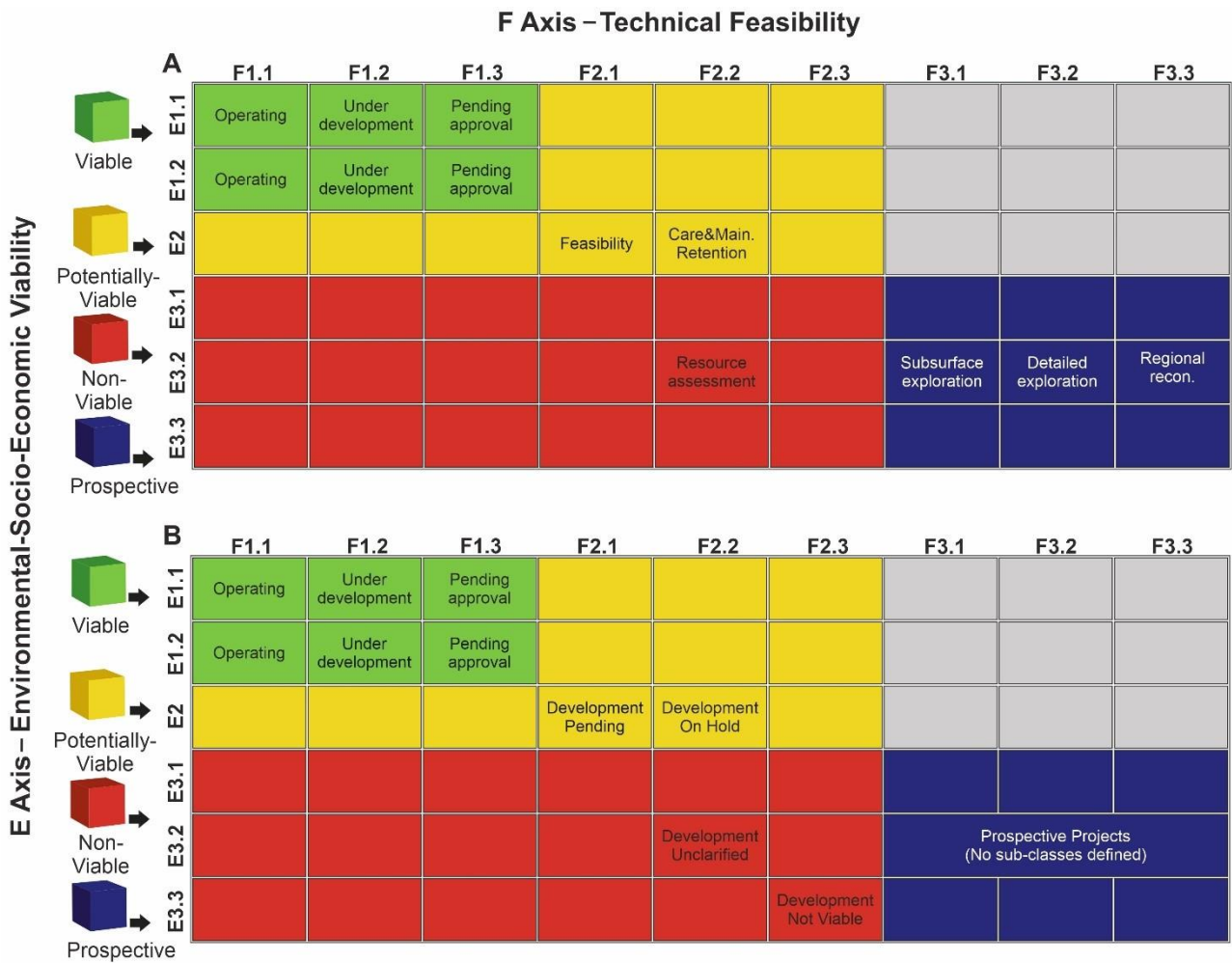


Figure 3. Mapping of the E-F Matrix to (A) INSPIRE Codes and Comparison to (B) UNFC Sub-classes<sup>18</sup>

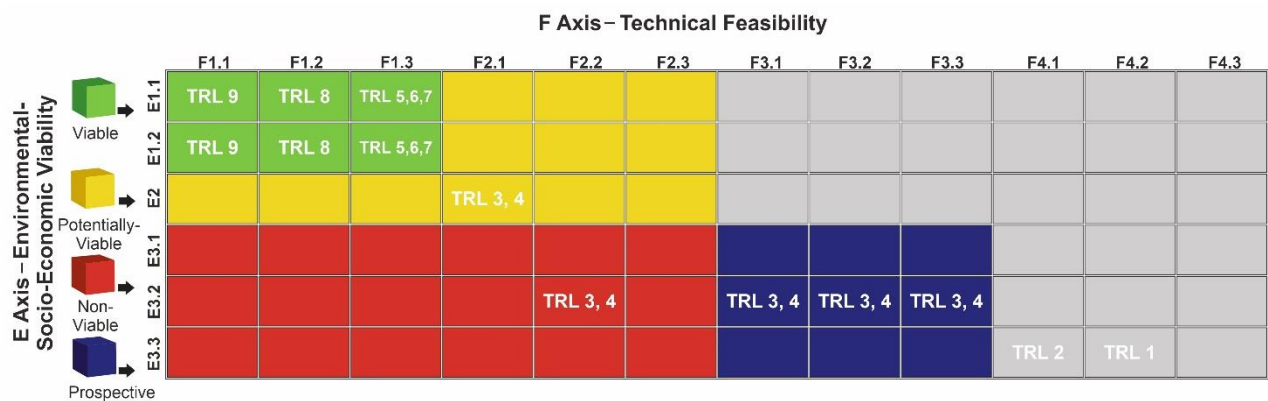


Figure 4. Technology Readiness Levels (TRLs) in E-F Matrix

<sup>18</sup> Only the minimum codes and categories are shown. The colors represent codification which can be used to communicate EF categories under UNFC. Care&Main. = Care and Maintenance, Regional recon. = Regional Reconnaissance





# **UNFC GUIDANCE EUROPE**

## **ANNEX II**

# **Supplemental Guidance for the National Resource Reporting**

## ANNEX II: Supplemental Guidance for the National Resource Reporting

### Introduction

The following guidance is to ensure clarity and comparability in national resource reporting, especially, how resource quantities are classified in accordance with UNFC and linked to various EU instruments, such as INSPIRE.

In the *supplemental specifications*, the following words have specific meanings:

- “*Shall*” is used where a provision is mandatory
- “*Should*” is used where provision is preferred; and,
- “*May*” is used where alternatives are equally acceptable<sup>19</sup>.

Care must be exercised to distinguish between Projects and assets. Projects are the most relevant object for reporting at the national and international level. Assets, defined by the legal rights that a party has to participate in the Project will be in focus for entities.

The following referenced documents shall be used as principal guidance in respect to Project plan and definition, Project lifetime, Project evaluation, Project classification, Project reporting and used in conjunction with this document. It provides further guidance for national resource reporting under UNFC in Europe. Where text is quoted verbatim, it is shown *in italics* and reference accordingly.

The latest edition of the referenced document applies:

United Nation Framework Classification for Resources – Update 2019.<sup>20</sup>

Supplementary Specifications for the Application of the United Nations Framework Classification for Resources to Minerals.<sup>21</sup>

Specifications for the Application of the United Nations Framework Classification for the Anthropogenic Resources.<sup>22</sup>

UNECE 2015. Bridging Document between the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) Template and the United Nations Framework Classification for Resource (UNFC).<sup>23</sup>

The relevant Numerical Codes in Annex II are given either in form 111, 111+112, E1.1F1.2 or 1.1;1.2;1.

### Guidance for National Resource Reporting

#### National Reporting

*At a government level, national Product estimates may be based on an aggregation of reported or published corporate estimates for individual Projects. Further, where government organizations have a responsibility for developing estimates at a regional or national level, the estimates may be different from corporate estimates on an individual Project basis, regardless of the classification*

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<sup>19</sup> Source: Specifications for the Application of UNFC to Anthropogenic Resources, [https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic\\_Resources/UNFC\\_Antropogenic\\_Resource\\_Specifications.pdf](https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic_Resources/UNFC_Antropogenic_Resource_Specifications.pdf), page 17

<sup>20</sup> See footnote n1

<sup>21</sup> See footnote n2

<sup>22</sup> See footnote n3

<sup>23</sup> See footnote n5

*system being used. In such cases, regional or national estimates using UNFC shall be derived using an appropriate methodology based on the nature and extent of available data.*<sup>24</sup>

*For reporting of corporate or national quantities, the estimated quantities of the 'single' Projects may need to be aggregated.*<sup>25</sup>

*The creation of a Project at a territorial level may allow an estimate and classification of all the territories quantities based on a system approach, including quantities not yet linked to Projects as defined under UNFC. These territorial quantities could be adequately classified as, e.g., E3, F3.3, and G1 to G3 or G4 (depending on the data availability with direct and indirect evidence).*<sup>26</sup>

Regional scenario-based estimates may become applicable when no reported resource quantities are publicly available, e.g., privately-owned commercial operators, government organizations have a responsibility for developing estimates at a regional or national level.

If territorial quantities are estimated or postulated primary on indirect evidence, G-axis Category should be classified as G4. Otherwise, estimates quantities based on primary direct evidence may be classified using a the range from G1 to G3 or G4 (either as G4.1+G4.2 named just G4 or the full range depending on whether information on uncertainty is available). Projects categorized as F3 or F4 will automatically have a low level of confidence for being realized. For example, aggregate Project (e.g., sand and gravel) should be considered case-specifically and decision should be derived using an appropriate methodology based on the nature and extent of available data.

*Anthropogenic Material Stocks cover Anthropogenic Material quantities and qualities, which can change over time. Estimates on future quantities are based primarily on indirect evidence. In UNFC, a deposit with quantities based on indirect evidence is defined as a "Potential deposit," which is a "Potential Anthropogenic Material Source" in this document. These quantities must be added to Category G4. It might be helpful to introduce Sub-categories (G4.1, G4.2, and G4.3), based on the level of confidence, as it is defined for G1, G2 and G3 (see section II.B.3).*<sup>27</sup>

See UNFC (2019) [PART II, IV.K], Anthropogenic Specifications [II.G.] and Mineral Specifications for further guidance.

## The Use of Relevant Bridging Documents

The relevant and the most current Bridging Documents shall be used, when applicable, e.g., when mapping resource quantities from another classification system into UNFC or vice versa. In addition, *the Bridging Document that was used as the basis for the evaluation shall be disclosed in conjunction with the reported quantities*<sup>28</sup>.

This applies mainly to Viable or Potentially Viable Projects that are considered as commercial or potentially commercial where "Reasonable Prospects for environmentally, socially, and economically Viable production in the Foreseeable Future" can be demonstrated (e.g., reported or published corporate estimates in accordance with CRIRSCO family of standards and codes). Care must be exercised to distinguish between Project and asset values if they are not the same.

When UNFC details are not available and a Bridging Document is used to provide an inventory, the mapping of resource quantities must be fully aligned with Bridging Documents used in evaluation and published. Reported quantities must not be modified from the original source. Note, that UNFC codifications from 111 to 223 are mainly for Products with direct evidence of ownership, plans for

<sup>24</sup> Source: UNFC 2019, [https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf), page12

<sup>25</sup> Source: Specifications for the Application of UNFC to Anthropogenic Resources, [https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic\\_Resources/UNFC\\_Antropogenic\\_Resource\\_Specifications.pdf](https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic_Resources/UNFC_Antropogenic_Resource_Specifications.pdf), page21

<sup>26</sup> *ibid.*

<sup>27</sup> Source: Specifications for the Application of UNFC to Anthropogenic Resources, [https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic\\_Resources/UNFC\\_Antropogenic\\_Resource\\_Specifications.pdf](https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic_Resources/UNFC_Antropogenic_Resource_Specifications.pdf), page19

<sup>28</sup> Source: UNFC 2019, [https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf), page13

technical feasibility of development and/or planned activities related to minerals Projects. These are not, for example, for historic or abandoned Projects regardless of availability of technical and geological information.

*Note, where government organizations have a responsibility for developing estimates at a regional or national level, the estimates may be different from corporate estimates on an individual Project basis, regardless of the classification system being used. In such cases, regional or national estimates using UNFC shall be derived using an appropriate methodology based on the nature and extent of available data.*<sup>29</sup>

This means that when the resources additional to what entities report using current industrial standards (e.g., CRIRSCO requirements) and the additional resources are of lower confidence, they normally go into UNFC categories E3; F3–F4; G3–G4. If territorial quantities are estimated or postulated primarily on indirect evidence, the G-axis Category should be classified as G4. For example, Potential Source or Potential Anthropogenic Material Source may be based on primary indirect evidence. This classification would be similar to “undiscovered resources” from undiscovered mineral deposits whose existence is postulated based on only indirect geological evidence. Consequently, in UNFC, all such quantities must be added to Category G4. Sub-categories, E3.2 and E3.3, F4.1, F4.2, and F4.3, G4.1, G4.2 and G4.3 may be included into an undiscovered resource. As the evidence is indirect and an extensive range of uncertainties is included, there may be no reason to use the Sub-categories for undiscovered resources, unless this is required to signal that early exploration activities have changed, e.g., from regional geologic studies to detailed geophysical observations. Estimated quantities based on primary direct evidence may be classified using G1 to G3. For example, an aggregate Project (e.g., sand and gravel) should be considered case-specifically and decision should be derived using an appropriate methodology based on the nature and extent of available data.

### Reported Resource Quantities and Quality

The Product quantities are defined in quality and quantity by Products, for example, mined or produced ores, ore concentrates or by-products that will cross the Project reference points. Mineral Sources are potentially economically recoverable accumulation of a specific or group of minerals. A mineral Project produces mineral Products from a mineral source with defined frame conditions. The Project provides estimates on resource quantities with different levels of confidence. The Sources are resource quantities, regardless of Project maturity which may be tonnage, volumes, grade, or quality. When reporting quantities, tonnage and grade or quality information is preferred.

It is important to note that without both tonnage or volume and grade or quality a Product cannot be defined, and the Project cannot be classified in the in the same UNFC Class. For example, if an iron deposit has an Indicated Resource of 100 Mt of ore at 40 % Fe, the Bridging Document indicates that the iron resource is categorized as UNFC Category 222. If the same 100 Mt is known to also contain potential by-product vanadium, but the vanadium grade is not estimated for this volume of ore, this possible vanadium resource cannot be classified beyond Category F4, without necessary additional information about the Source.

It is also possible that the same quantity may go into different UNFC categories for different commodities. If the above-mentioned iron deposit has a rare earth element (REE) concentration known for the entire deposit, but the extraction of the REE has not been investigated, then, most probably, the processing permitting does not include REE extraction and the economy of REE extraction is not known. This results in the REE resource going into the UNFC Category 332, 333 or 343 depending on what is the level of uncertainty for the REE concentration data for the resource. If the REE mineralogy (minerals hosting the REE) is extensively known at this stage, the F-axis value is 3, but if such information is meagre the F-axis value is 4. Presumably, E and F categories E3.3F4.1, E3.3F4.2 or E3.3F4.3 are the most probable and follows the UNFC (2019) definition:

<sup>29</sup> Source: UNFC 2019, [https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf), page12

*Remaining Products not developed from identified Projects or Prospective Projects may become developable in the future as technological or environmental-socio-economic conditions change. Some or all these estimates may never be developed due to physical and/or environmental-socio-economic constraints.*<sup>30</sup>

It follows from the above that a Project may have several sub-Projects with different maturity and Class. When reporting aggregation of quantities see UNFC (2019) [PART II, IV.J] for further guidance.

### Product Type

Each product type that will be sold, used, transferred, or disposed of separately should have quantities estimated separately at the Project reference point. This means that if a tailings storage facility Project delivers the sand to a refinery, the delivery point could be the reference point and the quantities and qualities would be that of the sand. The refinery could then be an anthropogenic Project with reference point both at the inlet (corresponding to reference points of sand mining Projects feeding it) and at the outlet. Its Products could be, for example, REE and further tailings. When the refinery is operated as a separate Project or receives sands from different tailing mining or other Projects this is a convenient way to handle the system. If on the other hand, the refinery is integrated with the tailings mining Project, then the Products of that Project would be REE and further tailing (given that REE is the only Product extracted for sale).

Product types could include metallic minerals, non-metallic minerals, industrial minerals including aggregates, coal, diamond etc. Where estimates of different Product types have been aggregated for classification purposes, and separate estimates are not provided, the aggregated estimates shall be accompanied by a statement clarifying which Product types have been aggregated and the conversion factor(s) used to render them equivalent for the purposes of aggregation. The products are recovered from geological occurrences in the earth crust (geogenic resources) and from extractive industry residues such as tailings, stockpiles, and waste rocks (anthropogenic resources).

See UNFC (2019) [PART II, IV.J] for further guidance.

### Historic Estimates

Historic resource quantities often possess high uncertainty in respect to geological knowledge regarding quantities and qualities (G-axis), technical feasibility (F-axis), and the environmental-socio-economic axis categories (E-axis). The estimates may be based on an Identified Project but until a commercial operator is engaged and has verified or updated the estimates of the quantities, it should probably be mapped under the Non-Viable Project Class.

The distinction between recently closed or abandoned mines and historic mines in respect to quantities and qualities in G-axis should be taken into consideration.

Classification of Non-Viable Projects coded as historic, closed, or abandoned may need to be considered case-specifically and decision should be derived using an appropriate methodology based on the nature and extent of available data. For example, Non-Viable Projects are not compliant with CRIRSCO requirements, and therefore the Bridging Document cannot be used. Estimates may also lack the minimum practice of reporting to allow a full assessment of data accuracy and precision. For example, no competency ("Competent Person") has been defined and there is missing description of Quality Assurance and Quality Control (QA/QC). Also, chemical assay data, feasibility, and beneficiation studies, permitting, and references to non-technical issues or Controlling Factors (CF) may often be fully or for the most part outdated, and more so the older the data and information is. Valid permitting may only be partial or not in place any more for all aspects of what a fully permitted mine requires. All such quantities go into E-axis Category 3. For

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<sup>30</sup> Source: UNFC 2019, [https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf), page 3

the F-axis, the Category is either 3 or 4 depending on the extent and quality of existing information. G-axis values may vary from 1 to 4, most commonly being 4. Examples of different cases of historic estimates are described immediately below.

### **C.1 A mine closed with no obvious prospects to be reopened**

This is a non-Viable, non-active, Project, be the mine closed recently or decades ago. There is no permitting to mine in place, nor information on what would be the currently profitable extraction method. The confidence of geological information is variable, but mostly low, but a range may be estimated. If there is a remaining resource, it is classified as E3.3; F4; G1–G4. The value for the G-axis depends on quality of the available data – the older the data, the more probably the range of uncertainty is large. Note that for many historic mines, the information for remaining resources is circumstantial only and not based on any direct evidence; this means that assumed resources should not be classified, at all. On the other hand, such information is used in evaluating a regional resource potential, e.g., in the assessment of undiscovered resources (UNFC Class 3,4,4). But note that such a regional resource (UNFC Class 3,4,4) cannot be connected to any individual deposit.

### **C.2 Prospective Projects that never had standard-based resource assessments made and have never been mined.**

Projects can be either active or non-active. Typically, these are 'historic' estimates that were completed before international reporting standards were developed and are not, for example, in accordance with CRIRSCO requirements. Common deficiencies in reporting for historic, non-active Projects would be, but not restricted to, lack of competency requirements and lack of QA/QC information. Chemical analyses, feasibility, beneficiation studies (if any at all), permitting, and references to commodity prices are outdated fully or for most parts. Practically always, also the ownership of the Project asset has been changed, often more than once. This means that for E-axis, the value is 3, and for F-axis the value may range between 2.3 to 4. The G-axis value is to be considered based on the confidence in estimates and reflect the confidence in geology and quality of data. The range in quantities is defined as low, medium, and high levels where the high will have the least confidence. Note, the same may also be applicable to more recent Projects when change of ownership occur regardless of the amount of technical work completed and level of reporting done.

For F-axis, value 3 can be used in a number of cases, as that value is defined "*Very preliminary studies of a Project, indicate the need for further data acquisition or study in order to evaluate the potential feasibility of development*"<sup>31</sup>. Preliminary studies may include mineralogical investigations and primary metallurgical test work (e.g., bench-scale testing for beneficiation). Also, rough pit optimization may be included. Such preliminary studies can be found in even decades old reporting. If Sub-categories are used, F3.2 or F3.3 are possible. In some cases, even F3.1 might be used. However, historical data should always be treated with a high level of uncertainty. and, therefore, the classification should be realistic reflecting the degree to which the historical data can be validated.

For the G-axis, the Category depends on data density and quality, and follows this general rule:

- *Good data density + high geological confidence => Narrower uncertainty range from G1 to G3 and higher G1 numbers (Product quantity associated with a Project that can be estimated with a high level of confidence).*
- *Poor data density + low geological confidence => G4 (Product quantity associated with a Prospective Project, estimated primarily on indirect evidence)*

See further guidance in Annex III "Mineral and Anthropogenic Resources Sectoral Guidelines for Europe" in this report.

<sup>31</sup> Source: UNFC 2019, [https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf), page 6

## Viable Projects Turn Non-Viable

When *"Reasonable Prospects for environmentally, socially, and economically Viable production in the Foreseeable Future"*<sup>32</sup> get suspended, terminated, or cannot be demonstrated due to non-technical issues that directly impact the viability of the Project, the Project is reclassified from E1 to E2 or from E1 to E3, respectively.

This means that a Project becomes Non-Viable and Classes 111,112, 221, 222 and 223 may have to be downgraded to reflect the current situation regardless of classification system used. For example, if a company is reporting in accordance with the CRIRSCO-family Standards and Codes and conditions change, then it shall be re-estimated to reflect the CRIRSCO Template Reasonable Prospects for Eventual Economic Extraction (RPEEE) aspects. In CRIRSCO Template it is stated as follows: *"If re-evaluation indicates that any part of the Mineral Reserves is no longer Viable, such Mineral Reserves must be re-classified as Mineral Resources and be removed from the Mineral Reserve statements"*<sup>33</sup>. In addition, the UNFC Categories 221, 222 and 223 would be only used for active Projects that fulfil the *"Reasonable Prospects for environmental-socio-economic Viable development in the Foreseeable Future"* Criteria.

There may be several reasons to close a mine, abandon a mine Project or an exploration Project, such as issues in permitting, remaining ore being difficult to extract, process or having lower commodity grades, changes in permitting regulation, changes in company strategy, the company been taken over by another company or just went bankrupt. This immediately means that there are currently no *"Reasonable Prospects for environmental-socio-economic Viable development in the Foreseeable Future"* and, therefore, re-classification of quantities may become relevant. For example, if the operator is following the CRIRSCO requirements in reporting and Resources or Reserves are downgraded this needs to be aligned with UNFC accordingly. When there is a change of ownership during the Project development, the new owner is required to consider aspects regarding environmental-socio-economic viability, technical feasibility, and confidence in estimation. Until the new holder of the Project confirms existing reports or reports on update to the technical study and/or resource estimate, it may be reasonable to consider the Project as "non-active" and downgrade the previously reported UNFC quantities from E2F2.1 to E3.2F2.2. Whereas, if an entity has announced to withdraw or it can be indicated from e.g., expired exploration license, the Potentially Viable Project may have to be downgraded to Non-Viable Project as E3.3; F2.3; G1,2,3.

The changes in the E and F Categories, from 1 and 2 to 3, relate to the Project status which means that assessments related to the environmental-socio-economic viability (E-axis) and technical feasibility (F-axis) can no longer be regarded as valid. Often the new entity needs to make a full reassessment of the factors relating to the E and F axes, not just confidence of the estimate. This is not only because another company may have other strategic interests, but also because, with time, new technologies come available, and metal prices, environmental regulations, and the values of society change. Contrary to the E and F axes, the degree of confidence (G-axis), that is, the degree of uncertainty related to geology, is not essentially changed. This is unless the work done on acquiring geological information becomes outdated, too.

See UNFC (2019) [PART II, IV.H] for further guidance.

## Terminology

The Glossary of Terms in Annex V in this document, UNFC (2019) and relevant specifications which are referred in the text should be used when classified under UNFC. The glossary supports the use of consistent language in different documents when referring to the terms. For example, the terms

<sup>32</sup> Source: UNFC 2019, [https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf), page 14

<sup>33</sup> Source: CRIRSCO Template 2019, [Microsoft Word - CRIRSCO International Reporting Template 2019 Final.docx](#), page 29

"reserve" and "resources" are not defined in UNFC, because both terms have specific, but different, definitions across different sectors.

See Glossary of Terms in UNFC (2019) and relevant Specifications.

### Documentation

*Estimates (of mineral and Anthropogenic Resource quantities) shall be documented in sufficient detail that would allow an independent evaluator or auditor to clearly understand the basis for estimate (of the classified quantities) and their classification<sup>34</sup>.*

When classifications of resource quantities are mapped to the national level within mineral resource database, the governmental organization (e.g., geological survey organization) may produce a country-specific classification report.

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<sup>34</sup> Source: UNFC 2019, [https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://unece.org/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf), page 15





# **UNFC GUIDANCE EUROPE**

## **ANNEX III**

### **Mineral and Anthropogenic Resources**

#### **Sectoral Guidelines for Europe**

## ANNEX III: Supplemental Guidance for Project Classification

Qualified Experts need to classify Projects by their categories, following the Category definitions.

The applicable categories for minerals are defined in the Minerals Specifications and repeated below. Where they differ from the definitions provided by UNFC (2019), the UNFC (2019) definitions will prevail.

### Definitions of Categories and Sub-categories

Tables 11 to 15 provide the definitions of Categories and Sub-categories.

*Table 11. Definitions of E-Axis Categories (UNFC (2019) text in italics)*

<b>Category</b>	<b>Definition</b>	<b>Supporting explanation for minerals</b>
E1	<i>Development and operation are confirmed to be environmentally-socially- economically Viable.</i>	<i>Development and operation (prospecting, exploration, mine production, processing, sales-access to market, rehabilitation) are environmentally-socially-economically Viable based on current conditions and realistic assumptions of future conditions. All necessary conditions have been met (including relevant permitting and contracts) or there are Reasonable Expectations that all necessary conditions will be met within a reasonable timeframe and there are no impediments to the delivery of the Product to the user or market. Environmental-socio-economic viability is not affected by short-term adverse conditions provided that longer-term forecasts remain positive.</i>
E2	<i>Development and operation are expected to become environmentally-socially-economically Viable in the Foreseeable Future.</i>	<i>Development and operation (prospecting, exploration, mine production, processing, sales-access to market, rehabilitation) are not yet confirmed to be environmentally-socially-economically Viable but, based on realistic assumptions of future conditions, there are Reasonable Prospects for environmental-socio- economic viability in the Foreseeable Future.</i>
E3	<i>Development and operation are not expected to become environmentally-socially- economically Viable in the Foreseeable Future or evaluation is at too early a stage to determine environmental-socio-economic viability.</i>	<i>Based on realistic assumptions of future conditions, it is currently considered that there are not Reasonable Prospects for environmental-socio-economic viability of mining in the Foreseeable Future; or, environmental- socio-economic viability cannot yet be determined due to insufficient information (e.g., during prospecting and exploration). Also included are estimates associated with Projects that are forecast to be developed, but which will be unused or consumed in operations (sub-economic ore, waste).</i>

*Table 12. Definitions of E-Axis Sub-categories (UNFC (2019) text in italics)*

<b>Category</b>	<b>Sub-category</b>	<b>Sub-category definition</b>
E1	E1.1	<i>Development and operation are environmentally-socially-economically Viable based on current conditions and realistic assumptions of future conditions.</i>
	E1.2	<i>Development and operation are not environmentally-socially-economically Viable based on current conditions and realistic assumptions of future conditions but is made Viable through government subsidies and/or other considerations.</i>
E2	No Sub-categories defined	
E3	E3.1	<i>Estimate of mineral Product that is forecast to be developed, but which will be unused or consumed in operations.</i>
	E3.2	<i>Environmental-socio-economic viability cannot yet be determined due to insufficient information.</i>
	E3.3	<i>Based on realistic assumptions of future conditions, it is currently considered that there are not Reasonable Prospects for environmental-socio-economic viability in the Foreseeable Future.</i>

*Table 13. Definitions of F-Axis Categories (UNFC (2019) text in italics)*

<b>Category</b>	<b>Definition</b>	<b>Supporting explanation for minerals</b>
F1	<i>Technical feasibility of a development Project has been confirmed.</i>	<i>Development or operation is currently taking place or sufficiently detailed studies have been completed to demonstrate the technical feasibility of development and operation. A commitment to develop should have been or will be forthcoming from all parties associated with the Project, including governments.</i>
F2	<i>Technical feasibility of a development Project is subject to further evaluation.</i>	<i>Preliminary studies of a defined Project provide sufficient evidence of the potential for the development and that further study is warranted. Further data acquisition and/or studies maybe required to confirm the feasibility of development.</i>
F3	<i>Technical feasibility of a development Project cannot be evaluated due to limited data.</i>	<i>Very preliminary studies of a Project indicate the need for further data acquisition or study to evaluate the potential feasibility or development. Additional exploration and investigation are required to confirm or to assess the technical feasibility of the Project.</i>
F4	<i>No development Project or mining operation has been identified.</i>	<i>Remaining quantities of Product not developed by any Project (not recoverable ore, at least not with available technology, too deep, groundwater issues etc.).</i>

Table 14. Definitions of F-Axis Sub-categories (UNFC (2019) text in italics)

<b>Category</b>	<b>Sub-category</b>	<b>Sub-category definition</b>
F1	F1.1	<i>Production or operation is currently taking place.</i>
	F1.2	<i>Capital funds have been committed and implementation of the development is underway.</i>
	F1.3	<i>Studies have been completed to demonstrate the technical feasibility of development and operation. There shall be a reasonable expectation that all necessary approvals/contracts for the Project to proceed to development will be forthcoming</i>
F2	F2.1	<i>Project activities are ongoing to justify development in the Foreseeable Future.</i>
	F2.2	<i>Project activities are on hold and/or where justification as a development may be subject to significant delay.</i>
	F2.3	<i>There are no plans to develop or to acquire additional data at the current time due to limited potential.</i>
F3	F3.1	<i>Site-specific studies have identified a potential development with sufficient confidence to warrant further testing.</i>
	F3.2	<i>Local studies indicate the potential for development in a specific area but requires more data acquisition and/or evaluation to have sufficient confidence to warrant further testing.</i>
	F3.3	<i>At the earliest stage of studies, where favorable conditions for the potential development in an area may be inferred from regional studies.</i>
F4	F4.1	<i>The technology necessary is under active development, following successful pilot studies, but has yet to be demonstrated to be technically feasible for this Project.</i>
	F4.2	<i>The technology necessary is being researched, but no successful pilot studies have yet been completed.</i>
	F4.3	<i>The technology is not currently under research or development.</i>

Table 15. Definitions of G-Axis Categories (UNFC (2019) text in italics)

Category	Definition	Supporting explanation for minerals
G1	<i>Product quantity associated with a Project that can be estimated with a high level of confidence.</i>	<i>Product quantity estimates may be categorized discreetly as G1, G2 and/or G3 (along with the appropriate E and F Categories), based on the degree of confidence in the estimates (high, moderate, and low confidence, respectively) based on direct evidence.</i>  <i>Alternatively, Product quantity estimates may be categorized as a range of uncertainty as reflected by either (i) three specific deterministic scenarios (low, best, and high cases) or (ii) a probabilistic analysis from which three outcomes (P90, P50 and P10) are selected. In both methodologies (the "scenario" and "probabilistic" approaches), estimates are then classified on the G Axis as G1, G1+G2 and G1+G2+G3, respectively. In all cases, the Product quantity estimates are those associated with a Project.</i>
G2	<i>Product quantity associated with a Project that can be estimated with a moderate level of confidence.</i>	<i>The G-axis Categories are intended to reflect all significant uncertainties (e.g., source uncertainty, geologic uncertainty, facility efficiency uncertainty, etc.) impacting the estimate forecast for the Project. Uncertainties include variability, intermittency and the efficiency of the development and operation (where relevant).</i>  <i>Typically, the various uncertainties will combine to provide a full range of outcomes. In such cases, categorization should reflect three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.</i>
G3	<i>Product quantity associated with a project that can be estimated with a low level of confidence.</i>	<b>Additional Comments:</b>  <i>The G axis in minerals and mining conditions primarily reflect geologic uncertainty impacting the estimate forecast for the Project. Uncertainties include availability and resolution of direct data such as drill hole density in relation to the mineralization and/or deposit type.</i>  <i>In addition, indirect data such as geophysical data might be included, which should be measured against redundancy of methods (e.g., geophysical measurements calibrated against drill core evaluation, drill hole logs. Calibrated methods provide higher certainty than uncalibrated methods.)</i>  <i>The accuracy of measurements controls the level of the Category (lab assay, rock mechanics, mineralogical phase assessment).</i>
G4	<i>Product quantity associated with a Prospective Project, estimated, or postulated primarily on indirect evidence.</i>	<i>A Prospective Project is one where the existence of a developable Product is based primarily on indirect evidence and has not yet been confirmed. Further data acquisition and evaluation would be required for confirmation.</i>  <i>Where a single estimate is provided, it should be the expected outcome but, where possible, a full range of uncertainty should be calculated for the Prospective Project. Based on the lack of direct evidence, an estimation of qualities and quantities is not suitable and/or potentially misleading in mineral exploration.</i>  <i>In addition, it is recommended that the chance of success (probability) that the Prospective Project will progress to a Viable Project is assessed and documented.</i>

Note: Further sub-categorization of Class G4 is not applicable for minerals Projects.<sup>35</sup>

<sup>35</sup> G4 subdivisions may still be applied as the UNFC definitions take precedence over the mineral specifications. They are applied in this document.

When classifying Projects, it is helpful to consider the actions that have been taken and the decisions made when reading these definitions. To illustrate, if a Project is in production, its categories will be E1F1 regardless of whether reports have been published or not.

Preparers should produce balanced judgements on which categories to apply and always check that the definition of the chosen Category is honored. The report should describe the reasons for the choices made. There must be an audit trail so that the assumptions and evaluations made can be followed.

The text below identifies optional controlling factors (CFs)<sup>36</sup> that evaluators may consult to satisfy themselves that their considerations have been relevant. This should not be taken as instructions to use them, but a list that may or may not be helpful. They will not override the balanced judgement of the evaluator.

This guidance is a living document. It is expected that over time, certain controlling factors will recur, and that it then may be appropriate to provide more prescriptive advice on how they should be examined and used.

While the F and the G-categories are reasonably well defined in the UNFC definitions copied above from the mineral Specifications, the E axis categories are much more complex.

For factors that affect the choice of E-categories and E2 (*Development and operation are expected to become environmentally- socially-economically Viable in the Foreseeable Future*), Four groups of controlling factors may be considered:

- Economic
- Environmental
- Social
- Legal

The full set of Controlling Factors (CF) are all social, environmental, economic, technological, and geological factors that may be considered when changing a mineral Project from one Class to another. In the early stages of the Project, many of the CFs will be vague or unclarified. With the availability of more data, the CFs will acquire more clarity. Not all controlling factors are equally important in all cases. It is therefore recommended that the lists below be reviewed and that the final categorization to be applied be chosen based on a balanced judgement of the likelihood that the Project may be impaired if one or more of the controlling factors are not met, or if other conditions apply in a specific case that must be taken into account.

The following should not be used as direct classification of E-categories but as a listing of pivotal factors to give the Qualified Expert assistance when making a balanced judgement in respect to categorization and may have a direct impact to the viability of a Project. It is recommended to prepare necessary checklists and practical workflows to assist the classification under UNFC.

Due to the number of Project contingencies related to the CFs differ between European countries, therefore, the relevance must be based on evaluators balanced judgement.

CFs that may be considered are:

## E Axis – Environmental-Socio-Economic Viability

### Policy

Note, some elements can be extracted from STRADE H2020 Project<sup>37</sup>.

<sup>36</sup> Similar to Modifying Factors according to the CRIRSCO Template.

<sup>37</sup> See [https://www.stradeProject.eu/fileadmin/user\\_upload/pdf/STRADE\\_Rpt\\_D2-01\\_EU-MiningIndustry-Competitiveness\\_Apr2017\\_FINAL.pdf](https://www.stradeProject.eu/fileadmin/user_upload/pdf/STRADE_Rpt_D2-01_EU-MiningIndustry-Competitiveness_Apr2017_FINAL.pdf).

Table 16. Potential E Categories for Policy <sup>38</sup>

Issue / potential CF	Level of support	Probability of approval	Potential E Category	Comments
EU policy on non-energy raw materials	Minerals included in the Critical Raw Materials (CRM) list, minerals for energy transition	Yes, No		CRM can be different for MS
Raw Materials Policy at EU MS/Regional/local level	Policy is favorable, neutral, unknown, or not favorable	High, medium, low	E1, E2 (favorable) E2 (neutral) E3.2 (unknown) E3.3 (not favorable)	
National interest	Mineral may be of national, regional, local interest	Yes (high, medium) No (medium, low)	E2 (Yes) E2, E3.2, E3.3 (No)	
Regulatory approval process	Efficient permitting process <sup>39</sup>		E1, E2 (efficient) E2 (neutral) E3.2 (unknown) E3.3 (inefficient)	

Aligning with UN policies (2030 Agenda, SDGs, etc.) is also a prerequisite.

## Legal Framework

Related contingencies may include the right to produce and sell (or benefit) from a resource.

- E1 if the legal right to produce and sell is established and not in dispute.
- E2 if the legal right to produce and sell is being negotiated but not finalized or is in dispute.
- E3 if there is no legal right to produce and sell<sup>40</sup>, as is the case for many exploration activities and no negotiation or application in process.<sup>41</sup>

## Exploration Rights

Table 17. Potential E Categories for Exploration Rights (Early Exploration)

Issue / potential CF	Level of support	Probability of approval	Potential E Category	Comments
<b>Exploration rights (Early exploration)</b>				
Exploration exclusivity	The exploration rights are exclusive to the holder, including undiscovered minerals	Yes/No/unknown	E3.2 (Yes) E3.3 (No, unknown)	Should be E3 because it's exploration
Exploration duration	Right to keep exploration rights by performing work	Yes/No/unknown	E3.2 (Yes) E3.3 (No, unknown)	Should be E3 because it's exploration

Table 18. Potential E Categories for Exploration Rights (Advanced Exploration)

Issue / potential CF	Level of engagement	Probability of approval	Potential E Category	Comments
<b>Exploration rights (Early exploration)</b>				
Exploration exclusivity	The exploration rights are exclusive to the holder, including undiscovered minerals	Yes/No/unknown	E3.2 (Yes) E3.3 (No, unknown)	Should be E3 because it's exploration
Exploration duration	Right to keep exploration rights by performing work	Yes/No/unknown	E3.2 (Yes) E3.3 (No, unknown)	Should be E3 because it's exploration

<sup>38</sup> Since UNFC (2019) does not subdivide E2, an explanation is provided in the brackets.

<sup>39</sup> Fraser Institute, Investment Attractiveness Index may be a source.

<sup>40</sup> Except for non-sales production, (E3.1).

<sup>41</sup> Source: Guidance for Social and Environmental Considerations for UNFC, [https://unece.org/sites/default/files/2022-01/ECE\\_ENERGY\\_GE.3\\_2021\\_6e.pdf](https://unece.org/sites/default/files/2022-01/ECE_ENERGY_GE.3_2021_6e.pdf), page 7

## Mining Rights

Table 19. Potential E Categories for Mining Rights

Issue / potential CF	Level of support	Probability of approval	Potential E Category	Comments
<b>Mining rights</b>				
Right to Mine	Explorationist has priority to acquire mining rights	Yes/No	E1, E2 (Yes) E3.2 (unknown) E3.3 (No)	In the case Yes, E2 will depend on how effective the transmission of rights is
Tenure certainty, duration	Priority for renewal	Yes/No	E1, E2 (Yes) E3.2 (unknown) E3.3 (No)	

## Regulatory Approval

It is important for efficient resource management to take the decisions in the right order. Here it is an advantage to have a proactive government engagement rather than a reactive one. This may lead to an early exploration phase carried out by the government to move Projects from F4G4 to F3E3. For the Projects that look promising, Governments may also consider performing an early strategic impact assessments to ascertain whether Projects can or cannot be carried out. Where there is potential and the impact assessment is favorable, industry can be invited to compete for licenses setting out any restrictions that may apply. Many of the roadblocks on the E-axis can then be removed before investments start, protecting the economic interests of industry, government (through avoiding tax losses if not directly through equity) and capital allocators. In this mode, development can be accelerated relative to a process where a government is reactive.

Regulatory approval is required for many aspects of extraction operations, ranging from major environmental approval to routine minor issues such as individual abandonment approvals of minor parts of the operations, or minor operational safety and labor issues. Not all will be controlling factors all the time.

- E1 if approved or located in areas and jurisdictions where there is an established history of approval indicates that approval can be expected with the appropriate level of assurance
- E2 if applied and awaiting approval.
- E3 if required but not applied for or applied for and not approved.<sup>42</sup>

<sup>42</sup> *ibid*



## Exploration Permits

*Table 20. Potential E Categories for Exploration Permits (Early Exploration)*

<b>Issue / potential CF</b>	<b>Level of support</b>	<b>Probability of approval</b>	<b>Potential E Category</b>	<b>Comments</b>
<b>Exploration permit (Early exploration)</b>	Not been initiated	Unknown	E3.3	
Exploration permit	Been approved	high	E3.2	Should be E3 because it's exploration
	Not been approved	low	E3.3	
Application, submission to public enquiry	Being initiated and in the process of being considered	high, medium, low	E3.2 (high, medium probability) E3.3 (low probability)	Should be E3 because it's exploration
<b>Exploration permit (Advanced exploration)</b>	Not being initiated	-	E3.3	
Exploration permit	Been approved	high	E2 (feasibility) E2 (evaluation of the ore deposit) E3.2 (resource assessment)	
	Not been approved	low	E3.2	E3.2 should be assigned since early exploration can be considered granted
Application, submission to public enquiry	Being initiated and in the process of being considered	high, medium, low	E3.2 (resource assessment & medium probability) E3.2 (resource assessment & high/medium probability) E3.3 (low probability)	<i>Estimation</i>

## Extraction Permit

*Table 21. Potential E Categories for Extraction Permits*

<b>Issue / potential CF</b>	<b>Level of support</b>	<b>Probability of approval</b>	<b>Potential E Category</b>	<b>Comments</b>
<b>Extraction license</b>	Not been initiated		E3.2, E3.3	
Extraction	Been approved	high	E1, E2	The risk of appeals should be assessed and could lower E beyond E2 Construction risks are to be assessed under F-axis.
	Approved subject to modifications	high, medium	E2	
	Not been approved	low	E3.3	There could be a contradiction with the first row "extraction license not been initiated" that could be E3.2 or E3.3
Extraction license application, submission to public enquiry	Being initiated and in the process of being considered	high, medium, low	E2, E3.2	<i>Estimation</i>
Timing	<5 year		<5 year: E2	
	>5 year		>5 year: E3.2, E3.3	

The **Environmental Impact Assessment (EIA)** Directive (2011/92/EU) requires Member States to conduct environmental impact assessments of certain public and private Projects, before they are authorized, where it is believed that the Projects are likely to have a significant impact on the environment. The objective is to identify the environmental impacts and assess whether prevention or mitigation is appropriate. The public must be consulted, and its comments considered when a decision is taken on whether to authorize the Project. Account must be taken of specific factors such as whether the location is important for nature conservation.

The Directive on the Management of Waste from Extractive Industries sets up measures, procedures, and guidance to prevent or reduce the possible adverse effects of the management of mining wastes (wastes from the extractive industry) on the environment, fauna, and flora, as well as water, air and soil and human health.

The **Water Framework Directive (WFD)** is the main regulatory tool of the EU water policy. It has a double target: to get the polluted water to reach the clean water status and on the other hand ensure that the clean status of the waters is kept clean.

The key objective of the WFD is to achieve good status for all water bodies by 2015. This comprises the objectives of good ecological and chemical status for surface waters and good quantitative and chemical status for groundwater.

Regarding **land use**, Spatial planning is an effective regulatory tool which has the potential to find common ground between different interests and facilitate permitting procedures. Access to land for exploration and extraction of mineral raw materials is a key requirement.

There are a number of Project contingencies related to the use and protection of land. These differ between Member States of EU.

Land use types are designated according to their nature and location, their contribution to fulfilling existing societal needs, and general long-term sustainable development objectives. Close coordination between land use planning and mineral planning, zones designated as "raw material priority areas", raw materials designated of national interest are some of the instruments used by MS for land use planning.

If co-existence of the conflicting interests is impossible, one of the interests must be given precedence. It is important for all parties that this is resolved before substantial investments are made. The Project information in the UNFC classification can be applied in land use planning to avoid unreasonable decisions which might hinder justified, effective, and sustainable exploration of mineral resources. It can avoid large expenditures not only by Project participants but also by governments through the fiscal system on Projects that cannot be realized.

Guidance for the Application of United Nations Framework Classification for Resources (UNFC)  
for Mineral and Anthropogenic Resources in Europe

Table 22. Potential E Categories for Regulatory Approval<sup>43</sup>

<b>Issue / potential CF</b>	<b>Level of support</b>	<b>Probability of approval</b>	<b>Potential E Category</b>	<b>Comments</b>
<b>Environmental Impact Assessment (exploitation)</b>	Not been initiated		E2 (high), E3.3 (medium)	When not initiated should have a lower ranking since can be considered there is not active engagement
EIA permits	Been approved		E1, E2	
	Not been approved		E3.2, E3.3	
Application/Submission to public enquiry	Being initiated and in the process of being considered	high, medium, low	E1, E2 (not affected) E2 (affected but compatible) E3.2 (unknown; further studies required) E.3.3 (affected incompatible)	Potential affections: population, human health, biodiversity, land, water, air, climate, human health, landscape, material assets, cultural heritage <sup>44</sup>
<b>Mining waste (External emergency plans, financial guarantee, EWMP)</b>	Not been initiated	-	E2 (high), E3.3 (medium)	When not initiated should have a lower ranking since can be considered there is not active engagement
Mining waste permits	Been approved	high	E1, E2	
	Not been approved	low	E3.2, E3.3	
Application/Submission to public enquiry	Being initiated and in the process of being considered		E2, E3.2	
<b>Land use planning</b>	Not been initiated	-	E2 (high), E3.3 (medium)	When not initiated should have a lower ranking since can be considered there is not active engagement
Land use planning considers the area as "minerals area"	Been approved (including landowners agreement)		E1, E2	
Change of land uses for non-minerals areas	Not been approved		E3.2, E3.3	
		Feasible (high), not feasible (low)	E2 (feasible) E3.2; E3.3 (not feasible)	
Landowner agreement	A process to resolve differences and align interests with a good chance of success	high	E1, E2	
	Landowner issues are complex or there is a strong misalignment	low	E3.2, E3.3	
<b>Construction</b>	Not been initiated	-	E2 (high), E3.3 (medium)	
Construction licenses	Been approved	high	E1, E2	
	Been denied	low	E3.2, E3.3	
Application submitted	Being initiated and in the process of being considered	high, medium, low	E1, E2	
Timing	<5 year		<5 year: E2	
	>5 year		>5 year: E3.2, E3.3	
<b>Others</b>				

<sup>43</sup> Topics included in this table include too many criteria. The more Criteria that are included, the less is the probability that a Project will proceed. Furthermore, they are connected. Potential CF could be simplified to: "land use planning"; "environmental permits" (including mining waste permits); "construction"; "others"

<sup>44</sup> EIA Directive, annex IV

## Fiscal Framework/Contractual Conditions

Fiscal framework includes corporate, cash flow taxes/ direct government financial participation in all or selected Projects and various forms of production or profit-sharing arrangements, royalties, or other fiscal provisions under which extraction operations are conducted.

- E1 if established, not in dispute or uncertain, and allows a decision to implement a Project to be made.
- E2 if it is being negotiated but not finalized, is in dispute, or there is uncertainty due to the possibility of a change that could affect the viability of a Project.
- E3 if not determined.

There may be Projects that are economic in themselves, but not for one or more critical asset holders due to fiscal patterns, tariff structures etc. This could inform parties about changes that may cause or prevent impairment of Projects.

Contractual conditions are specific to an asset or Project but may contain terms beyond those of the legal or fiscal framework (e.g., a requirement to use local labor, private sector contracts, lease expiry after a specific time, abandonment, and Reclamation obligations, etc.). A contract may not always be required, but if it is:

- E1 if established, not in dispute or uncertain in any manner, and is expected to be concluded with a high degree of certainty
- E2 if they are being negotiated but not finalized, are in dispute, or there is uncertainty due to the possibility of a change that could affect the commercial viability of a Project.
- E3 if it does yet not exist<sup>45</sup>.

Table 23. Potential E Categories for Fiscal Framework

Issue / potential CF	Level of support	Probability of approval	Potential E Category	Comments
<b>Fiscal framework</b>				
Taxes	Have been established and allows the Project or are being negotiated	high, medium, low	E1 (established and allows Project) E2 (being negotiated, in dispute, uncertain) E3.2 (not determined) E3.3 (not approved)	
Royalties	Have been established and allows the Project or are being negotiated	high, medium, low	E1 (established and allows Project) E2 (being negotiated, in dispute, uncertain) E3.2 (not determined) E3.3 (not approved)	
Production sharing	Have been established and allows the Project or are being negotiated	high, medium, low	E1 (established and allows Project) E2 (being negotiated, in dispute, uncertain) E3.2 (not determined) E3.3 (not approved)	
corporate tax	Have been established and allows the Project or are being negotiated	high, medium, low	E1 (established and allows Project) E2 (being negotiated, in dispute, uncertain) E3.2 (not determined) E3.3 (not approved)	
Others				

<sup>45</sup> Source: Guidance for Social and Environmental Considerations for UNFC, [https://unece.org/sites/default/files/2022-01/ECE\\_ENERGY\\_GE.3\\_2021\\_6e.pdf](https://unece.org/sites/default/files/2022-01/ECE_ENERGY_GE.3_2021_6e.pdf), page 7

## Social Considerations

Includes "social" contingencies could inhibit or prevent a decision to proceed with the Project. Could be formally or not formally expressed.

Table 24. Potential E Categories for Social Considerations

Issue / potential CF	Level of support	Probability of approval	Potential E Category	Comments
National/regional/local (political) interests	Support from national, regional, local authorities	high, medium, low	E1, E2 (formal support) E2 (support but not formal) E3.2 (support unknown) E3.3 (opposition)	
Local community interests	Support from local community	high, medium, low	E1, E2 (formal support) E2 (support but not formal) E3.2 (support unknown) E3.3 (opposition)	
Other organizations involved	Support from third organizations	high, medium, low	E1, E2 (formal support) E2 (support but not formal) E3.2 (support unknown) E3.3 (opposition)	

## Economic Considerations

Table 25. Potential E Categories for Economic Considerations

Issue / potential CF	Level of support	Probability of approval	Potential E Category	Comments
Preliminary economic assessment (Scoping study)		high, medium, low	E2	
Prefeasibility		high, medium, low	E2	
Detailed feasibility		high, medium	E1, E2	
Pre-planning and design		high, medium	E1, E2	
Construction		high	E1, E2	
Operation		high	E1	
Mine closure		low	E3	Mine closure may be on-off
Post closure monitoring		low	E3	
Timing	Not applicable			

## F-Axis – Technical Feasibility

### Technology Readiness Levels

Controlling Factors (CF) relate to the status of activities taking place and their results. The analyses are straight forward, as it is a matter of ascertaining which activities are taking place, as defined in UNFC and its Specifications.

Technology readiness levels (TRLs) help in estimating the maturity of technologies. They may help in deciding when to advance from one activity to the next, but do not replace the decisions of doing so, that determines the assignment of categories.

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)

- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

An aggregated approach may be appropriate, so rather than responding on whether the various considerations have been made and what the outcomes are, the questions may be asked whether the activities have progressed to the next level, i.e. is exploration taking place, is design underway, have the technical facilities been approved for construction, is construction under way, is production going on and has decommissioning started. Decommissioning may in fact be an addition to the F-axis as it is not defined in UNFC (2019). This makes categorization and classification quite simple in contrast to the complex task undertaken in each of the Classes. Note that the status of commitment to project funding is part of F-axis and needs to be taken into account when using TRLs stages to evaluate F-Axis.

Table 26. UNFC Stages with frequently used TRLs

<b>TRL Definition</b>	<b>TRL</b>	<b>Potential F Category</b>	<b>Definition</b>	<b>Comments</b>
Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)	9	F1.1	Extraction is currently taking place	
System complete and qualified	8	F1.2	Capital funds have been committed and implementation of the development Project or mining operation is underway	
System prototype demonstration in operational environment	7	F1.3	Sufficiently detailed studies have been completed to demonstrate the feasibility of extraction by implementing a defined development Project or mining operation.	
Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)	6	F1.3		
Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)	5	F1.3		
Project activities are ongoing to justify development in the Foreseeable Future.	3/4	F2.1		
Project activities are on hold and/or where justification as a Viable development may be subject to significant delay.	3/4	F2.2		
Technology validated in laboratory	4	F3	Feasibility of extraction by a defined development Project or mining operation cannot be evaluated due to limited technical data	
Experimental proof of concept	3	F3		
Technology concept formulated	2	F4	No development Project or mining operation has been identified	
Basic principles observed	1	F4		

## Mining Methods

There are numerous conventional and unconventional mining methods, which could be utilized to exploit mineral resources. Each has its pros and cons depending on situation-specific characteristics like deposit type, ore morphology, mineralization style, mineralization depth, rock mechanics, safety, national interest, geopolitical factors, infrastructure, economics etc.

The following mining methods are considered as conventional mining technologies:

- Surface Mining (Open Pit Mining, Quarrying)
- Subsurface Mining (Room & Pillar, Longwall, Slope Mining, and others)
- Placer Mining (Trenching).

Unconventional mining technologies:

- In-situ Recovery (ISR) or In-situ Leaching (ISL)
- Solution Mining
- Brine Mining
- Borehole Mining
- Seafloor Mining
- Tailings Re-mining
- Space Mining.
- Extraction of salt from sea water

Product quantity/volume estimates vary significantly depending on the deployed mining method. The most significant differences in quantity estimates become evident when comparing conventional open pit to underground production methods. Underground mining is more commonly applied to high-grade, low tonnage deposits whereas open pit mining provides an economically feasible approach for a homogenous low- to medium-grade high tonnage deposits with limitations based on the depths and strip ratio. Key parameters defining the quantity estimates for both methods vary significantly since the overburden or strip ratio is crucial for an open pit operation making it amenable only to shallow deposits while underground operations do not consider any overburden thickness and instead require a precise understanding of the ore morphology and have much higher unit costs.

## Mining Projects

Table 27. Potential F Categories for Mining Projects

<i>Issue / potential CF</i>	<i>Level of support</i>	<i>Potential F Category</i>	<i>INSPIRE category</i>
<b>Technical feasibility</b>			
	F1.1 (extraction on-going)	F1 if TRL > 5	
Detailed Feasibility Studies	F1.2 (detailed feasibility studies)		
Prefeasibility Studies Complete and Successful or Ongoing	F2.2		resource assessment (geological interpretation, approximate calculation of the resource)
Scoping Study Completed or Ongoing	F2.2		resource assessment (geological interpretation, approximate calculation of the resource)
Detailed Feasibility (expired) / Prefeasibility Studies Not Planned	F2.3		closed, abandoned, historic

Table 28. Potential F Categories for Exploration Projects

<b>Issue / potential CF</b>	<b>Potential F Category</b>	<b>Comments</b>	<b>INSPIRE category</b>
<b>Exploration Projects</b> Site-specific geological studies and exploration activities have identified the potential for an individual deposit with sufficient confidence by permit to warrant drilling or testing that is designed to confirm the existence of that deposit in such form, quality, and quantity that the feasibility of extraction can be evaluated	F3.1	TRL 3 and 4	subsurface exploration
Local geological studies and exploration activities indicate the potential for one or more deposits in a specific part of a geological province, but requires more data acquisition and/or evaluation in order to have sufficient confidence to warrant drilling or testing that is designed to confirm the existence of a deposit in such form, quality and quantity that the feasibility of extraction can be evaluated	F3.2		detailed surface exploration
Earliest stage of exploration activities, where favorable conditions for the potential discovery of deposits in a geological province may be inferred from regional geological studies.	F3.3		regional reconnaissance
Conceptual studies Ongoing or Planned	F4	TRL 1 and 2	
<b>Remaining Products not developed from identified Projects, or from Prospective Projects:</b>			
Technology under active development	F4.1	TRL 2	
Technology being researched	F4.2	TRL 1	
Technology not under research or development	F4.3	TRL 1	

## G-Axis - Degree of Confidence<sup>46</sup>

The G Axis designates the degree of confidence in the estimate. Translated into minerals and mining relevant conditions, the G Axis usually reflects the degree of geological knowledge or confidence in geology and quality of data used regarding quantities and qualities (Table 29).

Product quantity estimates may be categorized discreetly as G1, G2 and/or G3 (along with the appropriate E and F Categories), based on the degree of confidence in the estimates (high, moderate, and low confidence, respectively) based on direct evidence.

Table 29. Potential G Categories for Exploration Projects

<b>Issue / potential CF</b>	<b>Potential G Category</b>	<b>Comments</b>
<b>Geological Evidence</b>		
Derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation.	G1	
Derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation	G2	
Sufficient to imply but not verify geological and grade or quality continuity.	G3	
Based primarily on indirect evidence.	G4	

<sup>46</sup> The G-axis reflects the degree of confidence in estimates of the metrics included in the inventories.



Minerals Projects may adopt various methodologies in the various stages of the mineral life cycle including in the estimation of quantities as appropriate to the Project. The basis for any estimations shall be appropriately referenced in the evaluation. This includes not only third-party data but also methodologies or procedures that have been used by the evaluating entity to generate in-house data.

An alternative approach is that the G-axis value is to be considered based on confidence in estimate reflect the range in quantities giving information on low, medium, and high levels where the high will have the least confidence.

### UNFC in Two-Dimensional Form

The Projects go through many phases. To match these, subcategories are defined within both the E and the F categories as shown in the 2-dimensional matrix of E and F categories in Figure 5. The metrics that the Projects carry (G-categories) are referred to in the lower part of the matrix.

Product sold or used		Technical Feasibility (F) Categories											
		F1.1	F1.2	F1.3	F2.1	F2.2	F2.3	F3.1	F3.2	F3.3	F4.1	F4.2	F4.3
Environmental - Socio - Economic (E) Categories	E1.1	x											
	E1.2												
	E2												
	E3.1	x											
	E3.2										x		
	E3.3												
Products unused or consumed in operations													
Estimates with degree of confidence (G) Categories	G1	High											
	G2												
	G1+G2	Medium											
	G3												
	G1+G2+G3	Low											
	G4.1										High		
	G4.2												
	G4.1+G4.2										Medium		
	G4.3												
	G4.1+G4.2+G4.3										Low		
Probability of discovery										100%			

Figure 5 UNFC in two-dimensional form. The color scheme reflects the following:

- Magenta: Resource potentials associated with G4 estimates for which recovery Projects are not conceived.
- Blue: Exploration potentials to define Projects capable of producing products from the "magenta" Classes.
- Red: Projects or sub-Projects that may not produce Products for sale or use. They either produce Products for internal Project use or no use, are not well enough defined to address the environmental-socio-economic conditions or have been abandoned.
- Yellow: Projects contingent on resolution of environmental-socio-economic (E) or physical (F) conditions.
- Green: Projects in execution.

The entries in the matrix in figure 5 illustrate how UNFC works. The crosses in the upper matrix show where the Project fits with respect to the E and F categories. In this schematic the Project is cleared with respect to the environmental, social, and economic framework conditions. It is also not subsidized and is therefore categorized E1.1. The Project is in operation and therefore categorized F1.1. This puts the primary Project in Class E1.1, F1.1. This Project also produces Products that are used internally by the Project or not used (E3.1F1.1) and there are Sources remaining in place for which no development Project or mining operation has been identified (E3.2, F4.1). Each of the EF Classes of the Project carries metrics, in this case Sources and Products. They are indicated by conventional measures of uncertainty ranges as a low, high confidence value, G1 a medium value or best estimate categorized as G1+G2, and a high value of low confidence, G1+G2+G3. For the quantities remaining in place where information is mostly indirect and poorly understood, the G4 categories are used.





# **UNFC GUIDANCE EUROPE**

## **ANNEX IV**

### **Glossary of Terms**

## ANNEX IV: Glossary of Terms

This section provides a glossary of terms used in this document. Full glossaries are provided in UNFC (2019) and in Supplementary Specifications for Minerals (2021) and Anthropogenic Resources (2018) in Europe<sup>47</sup>.

<b>Term</b>	<b>Definition</b>
Aligned System	A classification system that has been aligned with UNFC as demonstrated by the existence of a Bridging Document that has been endorsed by the Expert Group on Resource Management.
Anthropogenic Material	An Anthropogenic Material is physical matter without any attribution from an economic, legislative, social, or environmental perspective, and without a specification of the aggregate state (solid, liquid, gaseous). Anthropogenic materials include, for instance, mineral materials, sewage sludge, biomass, and off-gas.
Anthropogenic Resource	An Anthropogenic Resource is a concentration or occurrence of Anthropogenic Material of intrinsic economic interest, in such form, quality and quantity that there are Reasonable Prospects for eventual economic exploitation. It is recognized that in traditional resource classification systems, the quantity is subdivided into resources and reserves with elaborate definitions of the two. UNFC does not use these terms but refers to "Classes" (Section C) instead. The term "Anthropogenic Resource" has been adapted from the term "Mineral Resource" as defined in CRIRSCO.
Anthropogenic Material Product	is a quantity that is saleable in markets. The cumulative quantities are equivalent to "Sales Production" according to UNFC. It is noted that the term Anthropogenic Material Product does not necessarily correlate with legal Product declarations. Guidance for Projects with multiple Anthropogenic Material Products and energy quantities is given in section III.C.
Bridging Document	A document that explains the relationship between UNFC and another classification system, including instructions and Guidelines on how to classify estimates generated by application of that system using UNFC Numerical Codes.
Category	Primary basis for classification using each of the three fundamental Criteria of environmental-socio-economic viability (related Categories being E1, E2, and E3), field Project status and feasibility (related Categories being F1, F2, F3 and F4), and level of knowledge and/or confidence in estimates of quantities (related Categories being G1, G2, G3 and G4). Definitions of Categories are provided in UNFC Part I.
Competence	The power of a person, business, court, or government to deal with something or take legal decisions.
Class(es)	Primary level of resource classification resulting from the combination of a Category from each of the three Criteria (axes).
Criteria	UNFC utilizes three fundamental Criteria for resource classification: favorability of environmental-socio-economic conditions in establishing the viability of the Project (E axis); maturity of technology, studies, and commitments necessary to implement the Project (F axis); and degree of confidence in the estimate of quantities of Products from the Project (G axis). These Criteria are each subdivided into Categories and Sub-categories, which are then combined in the form of Classes or Sub-classes.
Critical Raw Materials	Raw materials are materials or substances used in the primary production or manufacturing of goods. Critical Raw Material are raw materials that are economically and strategically important for the economy but have a high-risk associated with their supply.
Effective Date	The date for which assessments are valid.
Foreseeable Future	The period of time that a Project can make a reasonable projection of the occurrence of future conditions, events or other factors that determine the environmental-socio-economic viability or technical feasibility of a Project.
Generic Specifications	Specifications that apply to the classification of Products of any resource Project using UNFC.

<sup>47</sup> A glossary of terms that were common to UNFC (2019) and its subsidiary documents was produced. See [https://unece.org/sites/default/files/2022-03/ECE\\_ENERGY\\_GE.3\\_2022\\_3.pdf](https://unece.org/sites/default/files/2022-03/ECE_ENERGY_GE.3_2022_3.pdf)

Guidelines	Additional instruction on how UNFC should be applied in specific circumstances.
Minerals Source	A Minerals Source is a concentration or occurrence of material quantity of intrinsic commercial or Political interest, in such form, quality and quantity from which a benefit is produced.
Numerical Code	Numerical designation of each Class or Sub-class of resource quantity as defined by UNFC. Numerical Codes are always quoted in the same sequence (i.e., E; F; G).
Potential Source	A Minerals Source that has not yet been demonstrated to exist by direct evidence but is assessed as potentially existing based primarily on indirect evidence or evidence with limited density of exploration data.
Product	The quantity that will cross the reference points of a Project and that will be delivered from or consumed by the Project. Estimates should be classified separately for each Product that will be sold, transferred, used, unused or consumed in operations. Where estimates for different Products have been aggregated for classification, and separate estimates are not provided, the aggregated estimates shall be accompanied by a statement clarifying which Products have been aggregated and the conversion factor(s) used to render them equivalent for the purposes of aggregation.
Project	A Project is a defined development or operation which provides the basis for environmental, social, economic, and technical evaluation and decision-making. In the early stages of evaluation, including verification, the Project might be defined only in conceptual terms, whereas more mature Projects will be defined in significant detail. Where no development or operation can currently be defined for all or part of a source, based on existing technology or technology currently under development, all quantities associated with that source (or part thereof) are classified in Category F4. These are quantities which, if produced, could be bought, sold, or used.
Prospective	Used in association with Projects as Prospective Projects: Where the existence of a developable Product is based primarily on indirect evidence and has not yet been confirmed.
Qualified Expert	An independent person with education, training, and relevant professional experience in a discipline pertinent to a Project, acting in compliance with the professional standards of competence and ethics established by his/her professional organization. This person is responsible for the standards and methodologies used for collecting, analyzing, and verifying information used in qualified assessments.
Remediation (or Reclamation)	The restoration of a Project site conditions that are required by regulatory or other provisions.
Reasonable Expectations	High level of confidence. This term is used within the E1 classification and concerns the likelihood that all necessary conditions will be met. It is also used in the F1.3 Sub-category and concerns the likelihood that all necessary approvals/contracts for the Project to proceed to development will be forthcoming.
Reasonable Prospects	Moderate level of confidence. This term is used within the E2 and E3 classification and concerns the likelihood that all necessary conditions will be met.
Sources	Sources, such as bioenergy, geothermal, hydromarine, solar, wind, injection for storage, hydrocarbons, minerals, nuclear fuels and water, are the origin from which products can be derived. The Sources may be in their natural or secondary (anthropogenic Sources, tailings, etc.) state.
Specifications	Additional details (mandatory rules) as to how a resource classification system is to be applied, supplementing the framework definitions of that system. Generic Specifications provided for UNFC in Specifications Documents ensure clarity and comparability and are complementary to the source specific requirements included in Aligned Systems, as set out in the relevant Bridging Document.
Sub-categories	Subdivision of a Category.
Sub-classes	Class is defined by the combination of its Sub-categories.
Viable	A Project is Viable when it has been confirmed to be economically, socially, technically, and environmentally feasible and satisfies all the relevant Criteria of the E, F, and G Axes that are required for it to proceed.





# **UNFC GUIDANCE EUROPE**

## **ANNEX V**

### **Additional Literature**

## ANNEX V: Additional Literature

Aasly, K.A., Pfliederer, S., Bulet, C., Dedić, Z., Ilijanić, N., Gizdavec, N., Jørgensen, L.F., Nørgaard-Pedersen, N., Eilu, P., Hokka, J., Eloranta, T., Herranen, T., Horváth, Z., Máthé, A., Polonkai, B., Simoni, M., Hibelot, T., Solberg, J.K., Gautneb, H., Heldal, T., Nesheim, H.F., Raaness, A., Coint, N., Rokavec, D., Lundqvist, L. & Ingvald, E. 2021. UNFC pilot case studies compiled as part of Mintell4EU WP4 (Appendix to Deliverable D4.1). 195 p. Online: <https://geoera.eu/wp-content/uploads/2021/10/D4.1-Mintell4EU-Case-Study-Overview-Appendix.pdf>

Committee for Mineral Reserves International Reporting Standards 2019. International Reporting Template for the Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves, November 2019. 79 p. Online: [www.criirSCO.com](http://www.criirSCO.com)

Hokka, J. & Eilu, P., Schjøth, F. & Aasly, K.A. 2021. Report on harmonization issues, data gaps and challenges, reviewing also the quality of Pan-European aggregated inventories for selected commodities. MINTELL4EU Deliverable 4.2. 22 p. Online: <https://geoera.eu/wp-content/uploads/2021/10/D4.2-UNFC-Harmonisation-issues-gaps-and-recommendations.pdf>

Simoni, M.U., Aasly, K.A., Eilu, P. & Schjøth, F. 2021. Case study review with guidance and examples for applying the UNFC to European mineral resources. Mintell4EU Deliverable 4.1. 24 p. Online: <https://geoera.eu/wp-content/uploads/2021/10/D4.1-Mintell4EU-Case-Study-Overview.pdf>

UNECE 2015. Bridging Document between the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) Template and the United Nations Framework Classification for Resource (UNFC). UNECE Energy Series No. 42. 7 p. Online: [www.unece.org/index.php?id=34487](http://www.unece.org/index.php?id=34487)

UNFC (Update 2019) (current version)

[https://www.unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/publ/UNFC\\_ES61\\_Update\\_2019.pdf](https://www.unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/publ/UNFC_ES61_Update_2019.pdf)

Supplementary Specifications for the Application of UNFC to Minerals

<https://unece.org/sites/default/files/2022-01/UNFC%20Mineral%20Specifications%202021.pdf>

Specifications for the Application of UNFC to Anthropogenic Resources

[https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic\\_Resources/UNFC\\_Antropogenic\\_Resource\\_Specifications.pdf](https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/Anthropogenic_Resources/UNFC_Antropogenic_Resource_Specifications.pdf)





**Guidance for the Application of the United  
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Anthropogenic Resources in Europe**

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