

**Economic Commission for Europe
Expert Group on Resource Management**

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

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

Report prepared by the Review Team

I. Introduction

The first draft of Guidance for the Application of the United Nations Framework Classification for Resources (UNFC) for Mineral and Anthropogenic Resources in Europe (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 are available on the UNECE website¹.

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:

- Alistair Jones, Imperial College London, United Kingdom
- Hendrik Falck, Canadian Institute of Mining Metallurgy, Geoscientists Canada
- Janne Hokka, Geological Survey of Finland (Primary Reviewer)
- Pasi Eilu, Geological Survey of Finland
- Sigurd Heiberg, Petronavit a.s, Norway
- Ulrich Kral, Environment Agency Austria

The review process was supported and facilitated by EGRM Secretariat where in addition to Charlotte Griffiths and Slavko Solar, Duanxia Xu, UNECE intern, contributed the most.

II. Review Process

All comments received during the public consultation period were carefully reviewed by the Review Team. The comments were divided into two categories, 1) general comments and 2) specific comments. The former is regarding general content of the document, and the latter is regarding specific parts of the content. The Review Team had a comprehensive discussion on the general comments and shortlisted those which might require significant changes of the document. A new outline of the revised document was created based on the shortlisted comments and the discussion determined the revised structure and the content. The document was then revised based on the new outline, other general and specific comments. As the primary reviewer, Janne Hokka led the process of rewriting also by adding the

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

suggested text from public comments or by Review Team discussions with the support and agreement from other members.

The process and timeline are detailed in Annex I. The public comments and the Review Team's response are detailed in Annex II (general comments) and Annex III (specific comments).

Annex I

Detailed Review Process

June 2022	A Review Team consisting of Alistair Jones, Janne Hokka, Ulrich Kral, Pasi Eilu, Sigurd Heiberg was created. The Secretariat compiled all public comments received and created a spreadsheet consisting of general comments and specific comments
29 June 2022	<u>Review Team Meeting I</u> <i>Discussed the process and timeline of the Review Team work.</i>
Interval Progress	Review Team members worked on screening public comments and writing down responses. The Secretariat updated the spreadsheet of public comments. Hendrik Falck agreed to join the Review Team.
25 July 2022	<u>Review Team Meeting II</u> <i>Discussed general comments, shortlisted comments which might require significant changes of the document.</i>
Interval Progress	Review Team members created an outline of the revised document. The Secretariat clarified the purpose and the history of the document.
17 August 2022	<u>Review Team Meeting III</u> <i>Continued the discussion on general comments, made agreements on the structure of the revised document, decided that Janne Hokka will be the primary reviewer of the document.</i>
Interval Progress	Review Team members worked on revising the document according to the public comments and discussion outcomes within the Review Team.
31 August 2022	<u>Review Team Meeting IV</u> <i>Discussed the revised document, decided that the Secretariat shall draft the responses to public comments and the Review Team shall review afterwards.</i>
Interval Progress	Review Team members continued working on revising the document according to the public comments and discussion outcomes within the Review Team. The Secretariat drafted responses to public comments.
9 September 2022	<u>Review Team Meeting V</u> <i>Discussed the revised document and draft responses to public comments.</i>
Interval Progress	Review Team members continued working on revising the document according to the public comments and discussion outcomes within the Review Team.
15-16 September 2022	<u>Review Team Meeting VI</u> <i>Discussed the revised document and draft responses to public comments.</i>
Interval Progress	Review Team members continued working on revising the document according to the public comments and discussion outcomes within the Review Team. In addition, Review Team members reviewed the draft responses to public comments.
30 September 2022	<u>Review Team Meeting VII</u> <i>Discussed the revised document and draft responses to public comments.</i>
Interval Progress	Review Team members continued working on reviewing the draft responses to public comments. The Secretariat worked on editing and proofreading of the document with the support of Review Team members.
6 October 2022	<u>Review Team Meeting VIII</u> <i>Checked the final draft and responses to public comments.</i>

Annex II

Responses to the general comments received between 9 March 2022 and 6 June 2022

<i>From</i>	<i>Item</i>	<i>Page²</i>	<i>General Comment</i>	<i>Response</i>
Alan Hurd, Los Alamos	1.1	-	I find the Classification scheme logical and useful for mineral resources.	Thank you.
	1.2	-	The “quantum numbers” E, F, and G span the phase space nicely for policy makers. I suspect their mutual orthogonality is weak in some cases (En and G4 for exploratory projects may be such an area of strong correlation) but their usefulness is not damaged by this observation.	Thank you.
	1.3	-	The inclusion of regulatory and legal factors in classification is brilliant.	Thank you.
	1.4	5	As a reader freshly exposed to E-F-G, I studied Fig 1 first to understand whether “1” is “good” or “bad,” that is, the direction and sense of the scale. But Fig 1 misled me by the coloured boxes: The green “viable products” boxes cover G1 through G3 leaving me confused over the “goodness” of G1 vs G3. Likewise, the red “non viable” boxes fall under the same feasibility value as the yellow “potentially viable” boxes—confusing. I recommend a single, opaque white “ideal project” box at E1, F1, G1 to define visually the sense of the scale. Otherwise the reader must search the caption and text for scale.	The comment was considered and discussed by the Review Team. However, the modification of UNFC is out of the scope of the Guidance document.
Alistair Jones, Imperial College London	2.1	-	Much of the contents is useful – some as an overview for those who do not need to know the details on UNFC and some for practitioners. It would be helpful to make the distinction a bit clearer between overview and detail, so as to guide the reader.	The comment was considered and discussed by the Review Team. It was incorporated in the new document which consists of two parts, the first part providing guidance for users including regional and national authorities, and the second part providing guidance for qualified experts and estimate preparers.
	2.2	-	I think it best to omit Annex I UNFC-Europe Mineral and Anthropogenic Resource Specifications. This is for two reasons: <ul style="list-style-type: none"> • These are not guidance but specifications. If they were to be published then they should be in a separate document. • Annex I adds little to existing specifications and having multiple UNFC specifications will be potentially unhelpful. The more versions there are, the harder it will be to keep them up to date. Mineral and Anthropogenic Specifications have already been published as UNECE documents. The minerals document is up to date whilst the anthropogenic document is being updated to be consistent with UNFC 2019. Annex I is incomplete as it contains only a subset of the material which is in these documents. It is also a bit out of date as some of the specifications follow UNFC 2009 and are not required in UNFC 2019. Similarly, some terminology is out of date. There does not seem to be new, critical contents additional to the existing specifications. 	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document. The original ANNEX I "UNFC-Europe Mineral and Anthropogenic Resource Specifications" was replaced by "Supplemental Guidance for the National Resource Reporting".
	2.3	-	I understand that one motivation for the contents of the document is to provide everything required in one place. However, as suggested above, it seems best not to duplicate specifications, and it may also be best to issue a separate full bridging document to INSPIRE (see comments below). However, it could be helpful to provide, in this guidance document, a guide for making robust classifications. This could include: <ul style="list-style-type: none"> • pointers to key documents, • advice on the considerations, checks and qc steps in making a robust classification such as: 1) guidance that where bridging documents or decision trees have been used to facilitate classification, the results should be checked against the definitions in the E/F/G categorization tables; 2) checklist which would help the user to that all the relevant specifications have been addressed e.g. effective date, reference point etc. I have found such a checklist quite helpful in qc of classifications; 3)etc. 	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document. A more detailed bridging guidance to INSPIRE was added as an annex of the new document.

² Refer to pages in the draft document that published on UNECE website for public consultation.

<https://unece.org/sed/documents/2022/03/reports/draft-guidance-application-unfc-mineral-and-anthropogenic-resources>

From	Item	Page²	General Comment	Response
	2.4	-	This guidance could initially be a draft for testing, and then consolidated over time.	The comment was considered and discussed by the Review Team. The Review Team decided that the Guidance shall be published as the first version and a second version shall follow in the future with further reviews.
	2.5	-	There are a few inconsistencies in terminology between this document and UNFC 2019. (Most/all of these are uses of older terminology from UNFC 2009. There are also some places where the language could be clearer. Comments are provided in the attached annotated version of the document. (See sheet "2: Specific Comments" in this file)	The comment was considered and discussed by the Review Team. The consistency of the Glossary in the new document has been checked.
	2.6	5-7	The section UNFC for Europe Guidance - Terms and Definitions for Mineral and Anthropogenic Resources does not seem appropriate for an overview, although a version of Fig 2, without the Inspire and TRL columns, would probably be useful to include in the overview. This section on Terms and Definitions provides some, but not all, definitions which are already in the UNECE Minerals Specifications and will likely be in the UNECE Anthropogenic Specifications which are currently being updated. So they seem redundant (see also my comments, above, suggesting omission of the specifications from this document).	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	2.7	5-7	The other aspect of the Terms and Definitions section is a mapping from INSPIRE and TRL. The INSPIRE mapping is a partial version of a full bridging document e.g. it does not describe INSPIRE. It does not allow checking of the mapping without detailed knowledge of both UNFC and INSPIRE. It would be best to make this bridging more complete and make a separate section or publish as a separate bridging document (alongside other UNFC bridging documents) which could then be referenced.	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	2.8	4-10	The opening sections: Introduction, UNFC for Europe Guidance, Conclusions and Recommendations provide a helpful overview e.g. for decision makers who do not need to know the details on UNFC.	Thank you.
	2.9	18-30	Annex II Sectoral Guidance looks useful as a working document, but because much of it is interpretation, and I don't think has been widely discussed or tested, it seems wise to trial this as draft guidance, check it works and is sufficiently clear and complete, and then publish as a final version at a later stage.	The Review Team decided that the Guidance shall be published as the first version and a second version shall follow in the future with further reviews.
	2.10	18-30	Sub-categories of E2 do not yet exist (used in Table 7, 8). So this is inconsistent with UNFC 2019. E2 sub-categories are also not defined in the specifications in Annex I. Are these sub-categories definitely required? If so then it should be made clear that this is an extension of UNFC 2019 and clear definitions provided (see definitions of other categories in UNFC 2109).	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	2.11	18-30	The guidance on the mapping of Technology Readiness Levels to F categories seems misleading since it makes no mention of the status of commitment to project funding. This should be clarified.	The comment was considered and discussed by the Review Team. Capital funding is now indicated in the text and in "definitions of F categories" in Table 26 "UNFC Stages with frequently used TRLs". Mapping of TRLs to F categories was deleted from Table 10 to avoid confusion.
	2.12	31-36	The Glossary should be checked for consistency and redundancy between both the recently drafted common glossary and the existing minerals and anthropogenic specifications.	The comment was considered and discussed by the Review Team. The consistency of the Glossary in the new document has been checked.

<i>From</i>	<i>Item</i>	<i>Page²</i>	<i>General Comment</i>	<i>Response</i>
Dirk Nelen, VITO NV	3.1	-	<p>The objectives of the Guidance include the facilitation of Regional European resource management, enabling and supporting coherent and consistent regional resource management policies and associated regulations at European level (p. 4).</p> <p>In that context, the European sustainability policy includes the new circular economy action plan (CEAP), adopted in March 2020, as one of the main building blocks of the European Green Deal, Europe’s new agenda for sustainable growth. In the context of circular economy, a categorization system has been proposed that consists of 14 circular categories, that aim to contribute to increasing resource efficiency and decreasing environmental impacts throughout value chains by applying or enabling one or more of the so-called 9 circular economy ‘R’ strategies or principles, referred to as the 9 R’s, only one of which refers to material recycling. Consequently, these categories include the following:</p> <ul style="list-style-type: none"> • ‘2.a Reuse, repair, refurbishing, repurposing and remanufacturing of end-of-life or redundant products, movable assets and their components that would otherwise be discarded • 2.b Refurbishment and repurposing of end-of-design life or redundant immovable assets (buildings/infrastructure/facilities) • 3.a Separate collection and reverse logistics of wastes as well as redundant products, parts and materials enabling circular value retention and recovery strategies • 3.b Recovery of materials from waste in preparation for circular value retention and recovery strategies (excluding feedstock covered under 3.c) • 3.c Recovery and valorisation of biomass waste and residues as food, feed, nutrients, fertilisers, bio-based materials or chemical feedstock • 3.d Reuse/recycling of wastewater’ <p>The main objective of the circular economy is to increase sustainability by avoiding the extraction of primary resources from nature, by preserving, as long as possible, the functionality of those materials and products that are already in use. At the inevitable point where the functionality is lost, we will preferably use the anthroposphere to obtain the resources required for the restitution of the lost functionalities.</p> <p>It is therefore our conviction that the classification of anthropogenic resources should explicitly refer to the so-called ‘inner circles’ of the circular economy in which the functionality of, preferably, whole products that were (close to being) discarded, is recovered, in priority followed by functional product parts and components, substances and mixes of substances, alloys, composite materials, high grade metals and minerals, and, in particular cases, chemical elements.</p>	<p>The comment was considered and discussed by the Review Team. The document focuses on the recovery of raw materials from mineral resources including a) primary sources (earth crust) and b) from secondary sources (extractive industry residues). Post-consumer residues (e.g. WEEE) are not covered by the Guidance document. The scope of document was defined in the "introduction" section.</p>
	3.2	-	<p>Regarding the waste hierarchy, we recognize that the hierarchy has been an extremely useful and relevant tool for improving waste management. The hierarchy ranks waste treatment options applicable to waste materials, with the aim to at least recover as much as possible materials from waste. In a circular economy however, this conventional materials perspective is substituted by a products perspective. In a circular economy, the recovery of materials from collected discarded products is the least preferred option, that should be restricted to those circumstances in which product functionality cannot be recovered at a higher level of product structure. This means that for exploiting that part of the urban mine that consists of discarded products, buildings and infrastructure, all different waste treatment options considered in the waste hierarchy will be relevant, as partly anticipated in the section of the Guidelines that refers to the waste hierarchy (p. 29).</p>	<p>The comment was considered and discussed by the Review Team. The scope of the document is exclusively on mineral resources in the mining sector. The reuse of products and material recovery from post-consumer residues are out of scope.</p>
Janne Hokka, Geological Survey of Finland	4.1	-	<p>The estimated quantities need to reflect the true current situation related to project maturity which, e.g., indicate realistic timeframes of saleable product input to the market. (Please see the file [Comment on Draft from Geological Survey of Finland] P1-3 for details. https://unece.org/sites/default/files/2022-06/Public%20Comment%20on%20Draft%20Guidance%20for%20Application%20of%20UNFC%20for%20Mineral%20and%20Anthropogenic%20Resources%20in%20Europe%20from%20Geological%20Survey%20of%20Finland.pdf)</p>	<p>The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.</p>

From	Item	Page²	General Comment	Response
	4.2	-	<p>The Guidance document is for Mineral and anthropogenic resources and, therefore, more precise explanatory should be used in respect to the following:</p> <p>a. Currently there is no description of data types regarded as “quantity” (e.g., tonnage, grade, volume, quality) mapped according to UNFC. In the footnote of Figure 2 it is indicated that also projects can be classified. How is this done in the context of INSPIRE and why is there no examples of this?</p> <p>b. The Guidance should be written in plain English so that it assists and provides a clear practical way forward to, for example, GSOs mapping the mineral inventory estimations in accordance with UNFC without any risk of misinterpretation or misuse. (Please see the file [Comment on Draft from Geological Survey of Finland] P3-4 for details. https://unece.org/sites/default/files/2022-06/Public%20Comment%20on%20Draft%20Guidance%20for%20Application%20of%20UNFC%20for%20Mineral%20and%20Anthropogenic%20Resources%20in%20Europe%20from%20Geological%20Survey%20of%20Finland.pdf</p>	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	4.3	-	<p>The Sectoral Guidelines (ANNEX 2) for E axis is very interesting approach but also raises some questions as follows:</p> <p>a. Does the lowest ranking issue mean that it prevails also between the topics described in Tables 1 to 14?</p> <p>b. How is the country-specific Mining Law and/or Act considered and taken into account as it is very different between EU Member States (e.g., in permitting and licensing)? Also, the national/regional/local (political) interest may have an effect to approvals process in both positive and negative sense.</p> <p>c. How can topics such as policy, legal framework, regulatory approval, social considerations, and economic considerations be compared with each other, if the same E4-E1 categories are applied to all of these? Who really can make a balanced judgement considering the number of relevant topics and issues?</p> <p>d. The issues addressed in Tables 1 to 14 need information which are scattered between various governmental organizations, e.g., mining authority, ministry, local government, and entities holding the asset. It might also be difficult or even prohibited for governmental organizations to give out probabilities of approval or otherwise indicate any viewpoint during the process when application is pending. This can be viewed as ethical issue and conflict of interest. Shouldn't a public organisation, such as a GSO, be strictly neutral for such issues?</p> <p>e. How is this data collected and managed (e.g., application or software platform?) and is this data collected in INSPIRE?</p>	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
Oluwole Ayinde Oyediji, Independent Expert, Nigeria	5.1	-	For me the document looks fine. It took care of the social, environmental, economic and legislative perspectives. Further reviews however may be deemed necessary as it is being put to use on country level.	Thank you. The Review Team decided that the Guidance shall be published as the first version and a second version shall follow in the future with further reviews.
Oscar Galvis, Independent Expert (Petroleum Engineer)	6.1	-	<p>I would like to get clarification on the guidelines for oil and gas reserves estimates from rock volumes near to the reservoir limits/border from different mineral right holders.</p> <p>For example, in brown or development fields, considering the flow of fluids in porous media, offset oil/gas fields from different mineral holders may account for the same oil/gas reserves volumes from the rock volume near to the property border.</p> <p>The guidelines in this matter not only will support the development and full implementation of UNFC practices but also they may reduce the risk of cumulative error booking oil and gas reserves volumes from rock volumes near to the different properties' limits with different mineral rights holders at local or regional level.</p>	Guidelines for oil and gas reserves are out of the scope of this document which has a focus on mineral resources.
Pim Demecheleer, Sibelco (Past	7.1	-	This document is useful as it demonstrates the complexity in the classification of mineral resources, with various aspects that need to be evaluated by the expert doing the job, in order to make a right classification.	Thank you.

From	Item	Page²	General Comment	Response
Chairperson of PERC)	7.2	-	<p>I have followed the development of UNFC since many years. This document is useful as it demonstrates the complexity in the classification of mineral resources, with various aspects that need to be evaluated by the expert doing the job, in order to make a right classification.</p> <p>Today, the few small companies that have used UNFC in Europe, are those that have supported the UNECE with “case studies”.</p> <p>No serious exploration, mining or mineral firms are using the UNFC classification. The global mineral industry is completely oriented to CRIRSCO codes, and most globally active European headquartered industrial mineral companies are using the PERC code, part of CRIRSCO.</p> <p>In 2021 a new PERC code version has been launched integrating more clearly all aspects of ESG (environmental, social, governmental) within the modifying factors. This is also mitigating the past (and I believe false) criticism of UNECE representatives that “only UNFC evaluates ESG type of considerations”.</p> <p>The UNFC classification has low-confidence categories, which are potentially of interest to geological surveys, but are of no interest as classification categories for companies. While this should be an apparent advantage (UNFC as a “broader system”), in its current shape, I believe no-one in the global mineral and financial industry will support to use UNFC as the basis for a UNRMS.</p> <p>I believe UNRMS will remain an unpractical and theoretical dream, that will be of little significance for mineral resources management in the foreseeable future, in the EU and globally.</p>	<p>The comment was considered and discussed by the Review Team. However, the modification of UNFC is out of the scope of the Guidance document. The Review Team has revised the Introduction Section to provide a better clarification about the purposes of the document.</p>
	7.3	-	<p>UNFC should focus on developing a very comprehensive classification system. In order to play to its strengths, UNFC should endorse (only) CRIRSCO codes for economic evaluation of mineral reserves and resources. UNFC guidance should stop any reference to pretending that it is a potential alternative for the economic evaluation and development of mineral resources. From a European perspective, UNFC may help to improve classification of resources information. However, the EU and the EU citizen should know, that by no means the adaptation of the UNFC by countries geo surveys, will currently be of any economic significance for mineral resources development in Europe. Such developments will be done by company initiatives, making official assessments of resources and reserves by making use of CRIRSCO codes, and declared by Competent Persons (as defined in CRIRSCO), and as required by the stock market.</p>	<p>The comment was considered and discussed by the Review Team. However, the modification of UNFC is out of the scope of the Guidance document.</p>

<i>From</i>	<i>Item</i>	<i>Page²</i>	<i>General Comment</i>	<i>Response</i>
	7.4	-	The current UNFC classification is incomplete and not comprehensive enough. The “3-axis system” was a good idea 20 years ago, and it makes a nice visual cube, but this guidance document demonstrates the many aspects that need to be considered to classify mineral resources correctly. I refer particularly to the Tables 1 to 14, of Annex 2, Pages 19 to 28. Within a truly comprehensive system the choice or evaluation made for each of the 14 Tables, should be recorded, and can potentially be used as a separate “axis” or “sorting category”. In my opinion, in a digital environment (as with a digital resource assessment signature) this would make the system more practical, because it would record the detail as needed for specialists. The current aggregation of various and very different aspects (as differentiated in the tables) behind one category, like eg. “E2.1.” is then stopped. All this complexity is covered behind one sentence on page 19 : “Lowest Ranking Issue: for the tables below (Tables 1 to 14) the rule of lowest ranking issue should be respected, which means that the lowest rank prevails.” : This sentence is actually only mentioned for the E-axis (10 Tables to be considered), but should be repeated for the F-axis as well (3 Tables to be considered). Within the E-axis THE problem remains that ECONOMICS and PERMITS are within the same axis or classification group. Personally I struggled many years with that idea, but on UNECE lead training sessions, I understood the idea designed for governments being the socialist idea that governments can impact both economics (by providing subsidies) as well as permits. This is not the reality from a global mineral resources perspective, and in the EU countries. The evaluation of the economical feasibility is very different to the permitting situation, and the reality of difficult or impossible permitting (for good reasons) is exactly what many exploration and mining companies are facing in Europe. Hence the importance of an accurate permitting environment assessment and to differentiate that from the economics of a project. In the current UNFC, uneconomic projects will get the same category as economic un-permittable projects: “Lowest Ranking Issue: for the tables below (Tables 1 to 14) the rule of lowest ranking issue should be respected, which means that the lowest rank prevails.” Unfortunately, this remains a fundamental failure of the current 3-axis UNFC system, and to use it as a useful tool in databases and public assessments.	The comment was considered and discussed by the Review Team. However, the modification of UNFC is out of the scope of the Guidance document.
	7.5	-	I believe that thanks to the comprehensive tables in the guidance document, the weakness of the current UNFC proposition becomes very clear. My recommendation is a complete review of the classification method, and to consider to expand it, in order to adapt it to the current societal needs.	The comment was considered and discussed by the Review Team. However, the modification of UNFC is out of the scope of the Guidance document.
R Dixon, E Sides, M Burnett, CRIRSCO	8.1	-	It would be helpful if the authors of this document could be identified, along with their education and professional qualifications.	The comment was considered and discussed by the Review Team. Authors of the document are indicated in the Acknowledgements Section.
	8.2	-	It would also be helpful to identify the review process undertaken prior to publication that this document has been exposed to within the structures of the EGRM.	The review process is indicated in the new document.
	8.3	-	As this is a major project for the EGRM, can we be informed on the budget allocated for this project, who allocated and funded the budget and who controlled adherence to that budget?	There is no special funding allocated for the creation and review of the UNFC Guidance Europe document.
	8.4	-	The objective of the guidance is stated as: <ul style="list-style-type: none"> • Regional European resource management • National resource project management • Company internal business process innovation Later in the introduction, however the document states that the guidance is provided to facilitate the establishment and/or maintenance of a UNFC raw materials project-based inventory. Some clarity should be provided as to who will control the data base, who is responsible for updating and maintaining of the data base and how the information contained within the data base will be validated and curated.	The comment was considered and discussed by the Review Team. The Review Team has revised the Introduction Section to provide a better clarification about the purposes of the Guidance document.

From	Item	Page²	General Comment	Response
	8.5	-	The impression is given that the inventories compiled will be derived from Resources within the confines of the European Union. Our understanding, is however, that UNECE is compiling an inventory, on a global basis, of those Critical Raw Materials necessary to achieve the climate change targets. This should be clarified.	The comment was considered and discussed by the Review Team. The Review Team has revised the Introduction Section to provide a better clarification about the purposes of the Guidance document. It should be noted that UNECE is not compiling an inventory.
	8.6	19	The document refers to Resource management but also refers to Raw Materials. The difference is not explained nor are the expected outcomes. This is further complicated by the use of the term Critical Raw Materials which is also not defined (Table 1 P19).	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document. CRM is now added into the Glossary.
Sigurd Heiberg, Petronavitas	9.1	-	<p>I recommend reviewing the document in detail to ensure coherence with the documents defining the UNFC (UNFC 2019, specifications and glossary). While the current document is designed to be a guidance for Europe, the document preserves the global applicability of the UNFC as industry, supply chains, product chains and finance will impact activities. These functions are in principle global.</p> <p>A brief paragraph on quality assurance and control may be constructive. This will naturally follow quality assurance and control requirements legislated or recommended for large engineering projects of the kind addressed.</p> <p>Annex II points attention to a wide spectrum of concerns that may impact classification. A less prescriptive approach would be safer and should be evaluated during the review. In this approach preparers would simply be entering categories according to observable facts and decisions. If required, the concerns leading to the choice of categories may be explained in notes to a report containing the inventories, possibly standardising the information by pointing at defined recurring conditions observed as suggested by the controlling factors. A check list for preparers containing observations that determine the category to choose may be useful.</p> <p>When reviewing the guidance, efforts to shorten the document should be considered, by linking to the UNFC defining documents and by applying a precise plain English language whenever possible. This is not meant as a criticism of the text presented, but as an encouragement to continue that good work. It is particularly important given that these texts need to be known by heart by preparers and user and will burden interpreters when translating the text into the relevant languages. (Please see the file [Comment on Draft from Sigurd Heiberg] for details. https://unece.org/sites/default/files/2022-06/UNFC%20for%20Europe%20response%20general%20comments Sigurd H eiberg.pdf)</p>	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
Stig-Morten Knutsen, Chief Geologist, NPD	10.1	-	I sincerely appreciate the efforts of the team that put together this UNFC Guidance for the application of the UNFC for mineral and anthropogenic resources in Europe: it is a significant documentation of a very important work!	Thank you.
	10.2	-	Should or could the resource security be more emphasised and highlighted: as a value-in-itself, or included using the UNFC?	The comment was considered and discussed by the Review Team. However, the modification of UNFC is out of the scope of the Guidance document.
	10.3	-	Timing: could this be a document to also include the “time-factor” for 2030? Maybe not to be a key notion, but to be included as a factor – maybe withing the “E-axis”? Given the 7,5 years to 2030, projects and use of resources should or would not be indifferent in which order they are executed to ensure sustainable developments – within the 203 goals?	The comment was considered and discussed by the Review Team. Forecasting and foresight should NOT be mixed into resource classification. This could be topics of other studies and reports.

From	Item	Page²	General Comment	Response
Ulrich Kral, Environment Agency Austria	11.1	-	SCOPE: The document focuses on the recovery of raw materials from mineral resources including a) primary sources (earth crust) and b) from secondary sources (extractive industry residues). Post-consumer residues (e.g. WEEE) are not covered by the draft guidance document. The document would profit from a) a title that reflects the scope of the document (e.g. Guidance for the application of UNFC in Europa: Mineral resources (primary and secondary)), and from b) A sound definition of the scope of the document in the introduction section, including the specification of the sources.	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	11.2	-	STRUCTURE: The document includes two new components: 1) a bridging table between UNFC categories and INSPIRE codelist (mineral resources) and 2) a set of contingencies for assessing project viability in alignment with UNFC (Annex II). I suggest to separate this two components and either publish them as two separate documents (as suggested by Alistair) OR publish them in the same document with two separate chapters. OPTION 1 - Two documents. Document 1: Main title 1: Guidance notes for the application of UNFC to mineral resource in Europa: A bridging table for the relationship between UNFC categories and INSPIRE code list. Document 2: Guidance notes for the application of UNFC to mineral resource in Europa: Contingencies (or critical factors) that affect the development of recovery projects in the mining sector. OPTION 2 - One document. Title: Guidance notes for the application of UNFC to mineral resource in Europa. Chapter 1: Introduction, chapter 2: A bridging table for the relationship between UNFC categories and INSPIRE code list., Chapter 3: Contingencies (or critical factors) that affect the development of recovery projects in the mining sector., Chapter 4: Glossary.	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document which consists of two parts, PART I providing guidance for regional and national authorities, PART II providing guidance for technical experts.
	11.3	-	DUPLICATIONS: The Draft Guidance document duplicates a lot of text from other UNFC documents. This potentially produces inconsistencies in the future, because UNFC documents are lively documents. If one document becomes updated (e.g. Mineral Specification), the UNFC Guidance needs to be updated as well. Against this background, I suggest to remove all overlaps with other UNFC document (e.g. Annex I, and p29-30) and include only the two components (INSPIRE + Critical factors)	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	11.4	-	AUTHORSHIP: The document does not mention authors and affiliations. I recommend to add this.	The comment was considered and discussed by the Review Team. Authors of the document are indicated in the Acknowledgements Section.

Annex III

Responses to the specific comments received between 9 March 2022 and 6 June 2022

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
Alistair Jones, Imperial College London	1.1	4	Bullet should be inserted before "Financial reporting"	The related text was deleted.
	1.2	4	A new paragraph should start from "This document should be read and applied in conjunction with the latest version of UNFC and its Generic Specifications (2019), and Specifications for Minerals (2021) and Anthropogenic Resources (2018)."	The related text was deleted.
	1.3	4	"appropriate of" should be "of appropriate"	The related text was deleted.
	1.4	4	"base" should be "basis"	The related text was deleted.
	1.5	4	"make use" should be "produce" or "develop"	The comment was incorporated in the new document.
	1.6	5	"field project status and feasibility" should be "technical feasibility (and status of commitment of capital funds)"	The comment was incorporated in the new document.
	1.7	5	"general level of knowledge/confidence in the estimates" should be "degree of confidence in the estimates"	The comment was incorporated in the new document.
	1.8	5	"various" implies others, what are they?	The comment was incorporated in the new document.
	1.9	6	"to" should be "with"	The comment was incorporated in the new document.
	1.10	6	"to" should be "with"	The comment was incorporated in the new document.
	1.11	6	"G1,2" should be "G1,2,3" ?	The comment was incorporated in the new document.
	1.12	6	No G categories except under "In Production" and development not viable	The comment was incorporated as appropriate in the new document.
	1.13	7	different level of heading?	The comment was incorporated in the new document.
	1.14	7	"to" should be "with"	The comment was incorporated as appropriate in the new document.
	1.15	7	"Exploration projects" should be "prospective projects"	The comment was incorporated in the new document.
	1.16	7	"Additional quantities in place" should be "Remaining products not developed from identified projects, or from prospective projects"	The Review Team agrees that consistency should be kept throughout all UNFC documentation. The comment was incorporated in the new document.
	1.17	7	" a known deposit" should be "known source". Clearly remaining products associated with identified projects is being discussed	The Review Team agrees that consistency should be kept throughout all UNFC documentation. The comment was incorporated in the new document.
	1.18	7	"additional quantities"	The Review Team agrees that consistency should be kept throughout all UNFC documentation. The comment was incorporated in the new document.
	1.19	12	"have been adapted to aid application of UNFC to mineral and anthropogenic resources in Europe"	The related text was deleted.
	1.20	12	"[No further provisions are proposed]"	The comment was incorporated in the new document.
	1.21	13	"[No further provisions are proposed]"	The comment was incorporated in the new document.
	1.22	14	"[No further provisions are proposed]"	The comment was incorporated in the new document.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	1.23	14	"must" should be "shall"	The comment was incorporated as appropriate in the new document.
	1.24	19	"[Here it is suggested to follow the E-Axis Categories and Sub-Categories-Definitions and Supporting Explanations]" ?	The comment was incorporated in the new document. The text has been removed from the document.
	1.25	25	What about status of commitment of funds?	The comment was incorporated as appropriate in the new document.
	1.26	26	"system prototype of demonstration in operational environment, 7, F1.3" To be classified as F1.3 there is a requirement that "There shall be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming" as well as "Studies have been completed to demonstrate the technical feasibility of development and operation." The table focusses on the technical requirements (because TRL is about technical readiness) but does not make it clear that the status of capital commitment and contract approvals must also be considered in the mapping to the F axis of UNFC.	The comment was incorporated as appropriate in the new document.
Andrea Waldie, Geoscientists Canada	2.1	14	Professional Organization - The information provided is a definition. The definition does not indicate how this information relates to Evaluator qualifications and accountability. It is suggested that the first paragraph should indicate that, where available, the Evaluator should be registered/licenced/a member of a Professional Organization. The 'Executive Summary' (pg. 3 of the draft document) notes: <u>"Reliable and relevant information on sources and products is important, if not critical, for decision-making</u> at many levels, including: · in the public sector....; · in the economic sector:; · in the finance sector: as the basis for making <u>investment decisions</u> while considering not only economic, but also <u>environmental</u> and social aspects; The Professional Organizations (Associations/Regulators) have a role to play, where such Organizations are available, in ensuring that Evaluators "possess an appropriate level of expertise and relevant experience in the estimation of quantities associated with the type of resource source under evaluation", and in helping the public sector, the economic sector, and the finance sector to identify and have confidence in appropriate Evaluators. The Professional Organizations also facilitate the accountability noted in the section title. Reference to the guidance document developed by the Competencies TF may be helpful here.	The comment was considered and discussed by the Review Team. However, the Review Team does not consider it necessary to include a requirement like this for an evaluator who maps the information into a database and does NOT make any resource estimate oneself.
Dirk Nelen, VITO NV	3.1	15	We suggest adding a reference to the Taxonomy Regulation in force, that establishes the basis for the EU taxonomy by setting out 4 overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable. Moreover, within the framework of the Taxonomy Regulation, the Technical Expert Group (TEG) on sustainable finance was asked 'to develop recommendations for technical screening criteria for economic activities that can make a substantial contribution to climate change mitigation and adaptation, while avoiding significant harm to the four other environmental objectives (sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention control, and protection and restoration of biodiversity and ecosystems).'	The comment was incorporated as appropriate in the new document.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	3.2	27	We suggest considering an analogue and equivalent section under the ‘UNFC for Europe Anthropogenic Resources Guidelines’ chapter, as to solve the issue raised in our comment #5. Different recovery techniques from mining and production wastes could be listed, as well as the main categories of waste collection, sorting, recycling, and energy recovery technologies. Recent literature is available that establishes conceptual analogies between geological and anthropogenic mining: 1) Mueller SR, Wäger PA, Widmer R, Williams ID. A geological reconnaissance of electrical and electronic waste as a source for rare earth metals. Waste Management (New York, N.Y.). 2015 Nov; 45:226-234. DOI: 10.1016/j.wasman.2015.03.038. PMID: 25957937; 2) Lederer, J., Šyc, M., Simon, F., Quina, M. J., Hyks, J., Huber, F., Funari, V., Fellner, J., Braga, R., Bontempi, E., Bogush, A., & Blasenbauer, D. (2020). What waste management can learn from the traditional mining sector: towards an integrated assessment and reporting of anthropogenic resources. Waste Management, 113, 154-156. https://doi.org/10.1016/j.wasman.2020.05.054	The comment was considered and discussed by the Review Team. The scope of the document is exclusively on mineral resources in the mining sector. The reuse of products and material recovery from post-consumer residues are out of scope.
	3.3	35	Can you explain the relevance of including this reference to the aggregate state?	The comment was incorporated as appropriate in the new document.
	3.4	35	We suggest to explicitly add reference to discarded products instead of referring to materials only (see General Comments): Anthropogenic materials include discarded products, buildings and infrastructure, discarded product and infrastructure parts and components, as well as substances and mixes of substances, alloys, composite materials, metals and minerals, and chemical elements, that can be recovered from any of a product’s life cycle stages, including mining, harvesting, production, use and end-of life treatment.	The comment was incorporated as appropriate in the new document.
	3.5	36	The proposed distinction based on the location of the process seems ambiguous and probably unnecessary. Can be added why/how the process definition would be location depending?	The related text was deleted.
	3.6	36	Resource extraction from the anthroposphere often implies combining different treatment levels as presented in the waste material hierarchy (see ‘Generic comments’). E.g., the process of recycling always will inevitably lead to sorting and recycling residues that can be used for energy recovery or that have to be disposed of. Reusable functional components can be obtained from e-waste dismantling, while the rest of the device is further processed to recover composite materials, non-ferrous metal alloys and recycling residues with high calorific value. Therefore, with regard to the discarded appliance, the process cannot be unambiguously categorized as ‘recycling’, ‘reuse’ or ‘disposal’.	The related text was deleted.
Janne Hokka, Geological Survey of Finland	4.1	3	What is ‘Prospection’? This expression must be explained as it has many meanings depending on context.	The comment was incorporated in the new document. “Prospecting” is used in the new document.
	4.2	5	1) Any raw materials inventories can be reported in UNFC, not only European. 2) There is no mention what type of data should be reported (e.g., tonnage and grade, tonnage and quality information, volume & quality)?	The comment was incorporated as appropriate in the new document.
	4.3	6	"Quantities associated to a mine operating continuously (INSPIRE code list “operating continuously”) should be classified as E1.1F1.1G1,2,3." Why there is G3? "Quantities associated to a mine operating intermittently (INSPIRE code list "operating intermittently") should be classified as E1.1F1.1G1,2." Why there is not G3? What is the distinction for G axis when comparing the continuously and intermittently operated mines? Generally, we would be looking at Probable and Proven Reserves for quantities associated to an operating mine which level to as: Proven Mineral Reserves ->E1, F1, G1; Probable Mineral Reserves ->E1, F1, G2 (UNECE, 2015). Maybe, for some industrial mineral project and aggregates the certainty for G-axis could be G3, as information has not been disclosed by the operator, but for majority this is not the case. Therefore, G3 should not be used with E1F1 and anything with G3 should be aligned with no better category than E2F2.	The comment was incorporated as appropriate in the new document. In most cases, G3 is not to be stand-alone, and it should link with G1 or G2.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	4.4	6	<p>Quantities In production have been subdivided into operations which operate continuously and intermittently with classification of E1.1, F1.1, G1,2,3 and E1.1, F1.1, G1,2, respectively. Why is the intermittency classified E1.1, F1.1, G1, G2 if there may not be ongoing production at the time? The description for 'In production' clearly states that the project is producing and supplying commodity product(s) to the market at the Effective Date of the evaluation (E1F1.1)?</p> <p>Intermittency could also be interpreted as a development pending or on hold. This should be better clarified in the footnote 7.</p> <p>For Commercial Projects reported in accordance with the CRIRSCO Template, the intermittency in operation, in long term causing production to be disrupted, would mean re-evaluation as stated: "If the 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 Reserves statements." (CRIRSCO, 2019).</p> <p>What is the period of intermittency referred here? When mapping CRIRSCO compliant quantities, the Public Reports should be carefully reviewed and referenced.</p>	The comment was incorporated as appropriate in the new document.
	4.5	6	<p>Is reasonable expectation sufficient for E1, if the necessary approvals/contracts (e.g., permitting) are not in place?</p> <p>There is a high risk of misleading interpretation which leads to confusing classification, differences between exactly similar cases.</p>	The comment was incorporated as appropriate in the new document.
	4.6	6	<p>Currently, E2F2.1 is only recognized in CRIRSCO. Therefore, CRIRSCO-compliant Mineral Resources can only be E2F2.1G1,2,3 but not E1F2 nor E2F1.</p>	The comment was incorporated as appropriate in the new document.
	4.7	6	<p>Quantities associated to a mine under care and maintenance (INSPIRE code list "care and maintenance") should be classified as E1F2.2; E2F1; E2F2.2If there are major non-technical contingencies that need to be resolved before the project can move towards development, E-axis value cannot be E1. In other words, there cannot be Mineral Reserves (CRIRSCO) reported if operation is put on care and maintenance due to non-technical contingencies.</p>	The comment was incorporated as appropriate in the new document.
	4.8	6	<p>What time frames are we talking about here? In UNFC-2019, it is stated "Where development or operation activities are suspended, but there are "reasonable prospects for environmentally, socially and economically viable production in the foreseeable future", the project shall be reclassified from E1 to E2. Where "reasonable prospects for environmentally, socially and economically viable production in the foreseeable future" cannot be demonstrated, the project shall be reclassified from E1 to E3." For example, Langer Heinrich Uranium mine (Namibia) has been on care and maintenance since 2018 (www.paladinenergy.com.au). The deposit is of surficial calcrete type deposit containing a JORC Code (2012) compliant Mineral Resource of 119.7 Mlb U3O8 at a grade of 445 ppm U3O8 and 38.8 Mlb V2O5 at grade of 145 ppm V2O5 at a cut-off of grade of 250ppm U3O8. UNFC: (E2F2G1-3) and E and F using appropriate sub-categories definition.</p>	The comment was incorporated as appropriate in the new document.
	4.9	6	<p>Non-viable project is written with lowercase letters. Capitalization should be checked throughout the report and used in consistent manner.</p>	The comment was incorporated in the new document.
	4.10	6	<p>This is somewhat confusing and will impose high risk of misinterpretation and misuse!</p> <p>If understood correctly, the development unclarified is used for a project that is at "inventory phase" and acquiring data for resource definition (e.g., prior to Maiden Resource). Then, the result (= resources tonnage and grade) should be reported using the following classes E2F2.1G3,2,1 or (E2F2.2G3,2,1) not E3.2F2.2G3,2,1.</p> <p>This way, it would also be aligned with CRIRSCO as defined in CRIRSCO-UNFC Bridging Document (UNECE, 2015). It is illogical that company/entity would invest ~1 million € for a Pre-feasibility Study that is defined as a Non-Viable Project.</p>	The comment was incorporated as appropriate in the new document.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	4.11	6	<p>Development unclarified' is described as Assessment of Resources (Advanced exploration, Resources' definition, Prefeasibility, Scoping study (resources)) in the INSPIRE Code list.</p> <p>Another thing is that what quantities are then going into this category Development unclarified? For example, commercial-listed exploration and mining companies usually report only Exploration Results (e.g., down-hole or true width of mineralized intercepts, preliminary mineralogical/metallurgical tests, and area of potential) and seldomly Exploration Target Results with range of tonnes and range of grade. The next Public Report comes out if project successfully moves towards Scoping Study and produces the Maiden Resource estimate, typically with Inferred Resources and Indicated Resources. This would already be mapped as E2F2G2 or G3 in accordance with the Bridging Document. The CRIRSCO-UNFC Bridging Document defines the Exploration Target Results (before resource definition) to be 334. In other words, we have either exploration or development, and the rest are "barriers" or "roadblocks" that project encounter before able to start production.</p>	The comment was incorporated as appropriate in the new document.
	4.12	6	<p>E3.2F2.2 – Indicates that initial recoverable quantities have been calculated (INSPIRE code list "resources definition")</p> <p>*These are always estimations not calculations (never precise)!</p> <p>There is no difference between these classes, as both are given 'E3.2F2.2', but the description has a huge difference (highlighted). To estimate Recoverable resources, we need minimum of Indicated or Measured Resources (not Inferred). Therefore, E3.2F2.2 is not aligned here with CRIRSCO and the Bridging Document as it should, in fact, mean E2F2G2 and E2F2G1 Indicated and Measured Resources, respectively).</p>	The comment was incorporated as appropriate in the new document.
	4.13	7	<p>First, it is stated that it is used where a technically feasible project can be identified but quantities associated to closed mine for technical ... reasons. This wording doesn't make sense at all, as it cannot possibly be a technically feasible project!</p>	The comment was incorporated as appropriate in the new document.
	4.14	7	<p>Development not viable is emphasizing to technically feasible project but could there also be an additional note on geology?</p> <p>For example: "where a technically feasible and/or geologically favourable project can be identified...". The case may well be that the geological and grade continuity may have been established in relatively good confidence (e.g., for a Critical Raw Material) but the process-technological methods to recover the commodity have not yet been developed.</p>	The comment was incorporated as appropriate in the new document.
	4.15	7	<p>Development Not Viable with INSPIRE Code List (Closed, Abandoned and Historic). The quantities associated with E3.3F2.3G1,2,3 are local quantities. Typically, the information from historical mines includes the following: total mined rock ("ore hoist"), processed ore, production figures, etc. Less often, there are known reserves and/or resources in the ground which have been estimated but not developed. And if there are such remaining resources, certainly the G-axis value cannot be any better than 2, and more probably it is 3. Value G1 would only occur for an active project with Measured Resources.</p>	The comment was incorporated as appropriate in the new document.
	4.16	7	<p>Development Not Viable with INSPIRE Code List (Closed, Abandoned and Historic). The quantities associated with E3.3F2.3G1,2,3 are local quantities. There are clearly two groups here: 1. "recently" closed mines which have had modern process technology and mining methodology together with industry best practices and international reporting guideline. 2. Historical mines which are lacking all of these, tunnels are full of water, and the mine infrastructure is old and damaged (no value)! Often the historic mines are lacking quality data but also general information and, therefore, quantities should go into E3.3F2.3G3 or E3F3G3 or even E3F4G3. For historic mines, F2 indicates too high confidence and should be downgraded similarly as for the E and G axes. If old non-active project is reactivated due to changing "modifying factors", the project starts typically from exploration (334 or 333) not from E3.2F2.2G1,2,3. This is because there is no guarantee that geology is favourable for additional mineralized quantities, not to mention that it would ever be economically viable to extract commodities.</p>	The comment was incorporated as appropriate in the new document.
	4.17	7	<p>What is F4E3.3F4G1,2,3? Should it be F4 (E3.3F4G1,2,3)? Maybe a typo here? If the "quantities in place" could we also consider F3?</p>	The comment was incorporated in the new document.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	4.18	8	<p>The INSPIRE Code “Assessment of Resources (Advanced exploration, Resources definition, Prefeasibility, Scoping study (resources))” is mapped as Non-Viable Project under sub-class 'Development Unclassified' E3.2F2.2G1,2,3.</p> <p>We suggest that the description is combined with Potentially Viable Projects (E2F2.1G1,2,3) INSPIRE Code “Evaluation of Resources (Detailed Feasibility, Prefeasibility)” for the following reasons: (1) It provides a full alignment with CRIRSCO Template which is set in CRIRSCO–UNFC Bridging Document. (2)Development unclassified should be used solely for situations where reporting is unclear due to acquisitions or mergers, or operation moves to non-active status. Or in situations where Project moves (“resource quantities”) from Development Not Viable (e.g., mine closed, abandoned) to an active phase (e.g., re-open the mine or assessment of resources).</p>	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	4.19	8	<p>If an exploration project with a maiden resource (INSPIRE Code list: assessment of Resources, Resources definition, Prefeasibility, Scoping Study) is forced to be abandoned due to geological and technical reasons (e.g., negative results from pre-feasibility study or challenging geological conditions), how should the resource quantities be mapped in accordance with UNFC? This would mean that the original resource classes are no longer meaningful and must be communicated by downgrading the classification.</p> <p>a. Development Unclassified is not suitable if there is no current asset holder, therefore, the project is determined as Non-Active.</p> <p>b. Development Not Viable is suitable but, as being an exploration project, there is no development done in the property (e.g., no infrastructure in-place). In these cases, it is illogical that only the E-axis is downgraded, to E3, but F-axis is still at F2 (F2.3). In closed mine environments, this is more reasonable as the infrastructure is in place and is a potential asset. In GTK, we have mapped such quantities which are no longer CRIRSCO-compliant Resources to E3F3G1,2,3 due to entity abandoning the project (non-active projects status) or acquired by a new owner which has not yet updated the resource estimate. In the latter case, even better might be if mapped as E3.2F2.2G1,2,3, because the UNFC class would then indicate that development is active but unclassified.</p>	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	4.20	8	<p>The INSPIRE Code “Closed, abandoned and historic” within Non-Viable Projects and subclass Development Not Viable (E3.3F2.3G1,2,3). This mapping is technically suitable but there is a major difference between a recently closed mine and a historic mine in respect to EFG-axes, especially for the G-axis. Practically, when company “revisits” a historical mine site to target the extension of known mineralised body, the activity is regarded as exploration and reported results are classified either as E3F3G4 (E3.1F3.1G4) or, if previous data is regarded as accurate and precise based on due diligence and evaluation, into E2F2.1G1,2,3 (new estimate). Also, the mine and other infrastructure may be activated with minor investments if closure of the mine and processing plant is recent. Whereas, if the mine has been closed ages ago the infrastructure may not have any value and geological information had been collected based on old methods affecting the confidence in estimation. The latter situation typically includes data based on small drill machinery (small sample volumes), no accurate collar location nor downhole deviation which would define the location of data points, no Quality Assurance/Quality Control (QA/QC) information to assess the analytical data quality, outdated analytical methods, no 3D software nor geostatistical methods used for more accurate geological and grade estimation, etc. Therefore, classification cannot go from E3.3F2.3G1,2,3 to E2F2.1G1,2,3 without first confirming the data quality (e.g., assay grades, existing model), and processing and metallurgical test work. The current owner needs to apply for exploration licenses and assess the magnitude of needed investments (e.g., to activate the infrastructure in-place) to make the operation running. It may well be that the remaining quantities in the ground do not cover the mining and processing costs and, therefore, the project is not profitable.</p>	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	4.21	8	<p>Prospective Projects (e.g., 3,2 or 3,1 or 3,3) are separated with comma not full stop.</p> <p>This should be corrected so that it is consistent throughout the table and the entire report. Other categories are separated with full stop (e.g. 3.3 or 2.2)</p>	The comment was incorporated in the new document.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	4.22	8	INSPIRE Code “Regional reconnaissance (Grassroots)” is mapped as Prospective Projects E3.2F3.3G4 We suggest that the classes for regional reconnaissance (Grassroots) should be reconsidered and modified to E3.2F4G4 or description changed. Grassroots exploration is typically considered as early-stage of exploration to identify the existence of mineral potential or initial targets on a regional scale (e.g., mineral prospectively modelling, undiscovered resources). Therefore, also F-axis should reflect the highest uncertainty and follow the F4 definition “No development project has been identified”. In the CRIRSCO–UNFC Bridging Document, Exploration Target is defined as E3F3G4 which would be done typically before resource definition drilling to indicate ore potential in a particular target, which is not regional reconnaissance.	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	4.23	8	The footnote b is not clear and should be revised. A practical example of this would be good! How this comes down to classification of quantities related to mining and exploration projects?	The related text was deleted.
	4.24	24	Governmental (Fiscal), Social and Economic considerations are detailed in Tables 8, 9 and 10, respectively. How are the classes given for E axis as Project should reflect the combination of all issues? How is the classification done if most of the issues are lower (high confidence) than E2.2 but one particular item gives E3.3? Some of the project information needed to assess the E-axis considerations will be difficult to obtain especially from private non-listed companies. The resource definition, when reported in accordance with CRIRSCO, should consider all these aspects. How should the Probability of approval be assessed (high, medium, low)? Probability of approval can only be based on subjective assessment. This will not result in a harmonized resource classification, as anyone mapping into UNFC may see such matters differently. How is all this information collected and managed? Is there some application or platform for this?	The comment was incorporated as appropriate in the new document.
	4.25	25	Preliminary economic assessment (Scoping Study) is referred to as E2.2. We consider that the E2.2 is much more appropriate for any economic assessment than E3.2. This is not aligned with INSPIRE Code List (Assessment of Resources (Advanced exploration, Resources’ definition, Prefeasibility, Scoping Study (resources)) which is E3.2.	The comment was incorporated as appropriate in the new document.
	4.26	26	In the Tables 11 the spacing between the words should be checked and corrected.	The comment was incorporated in the new document.
	4.27	28	In the Tables 13-14 the spacing between the words should be checked and corrected.	The comment was incorporated as appropriate in the new document.
R Dixon, E Sides, M Burnett, CRIRSCO	5.1	4	This is potentially misleading in that UNFC contains no guidance on risks and uncertainties regarding climate change.	The related text was deleted.
	5.2	5	The Inspire metadata only deals with two-dimensional geographic location (ie. latitude and longitude). For minerals projects, some guidance should be given on how to handle projects which may physically overlie one another in the same location (eg. a near surface weathered deposit and a much deeper deposit, possibly for another mineral)	The comment was considered and discussed by the Review Team. However, the Review Team thinks that repository issues are out of the scope of the Guidance document.
	5.3	6	no reference is made to the data required to estimate quantities and qualities for a mining/ mineral project. No reference is made to the use of appropriate methods for estimating and classifying quantities and qualities which make up the G-axis, which in the context of Mineral projects, is fundamental	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	5.4	6	The same project could be considered to be viable to one entity and not viable to another entity. Some guidance should be given on the need to specify the ‘threshold’ criteria that have been used to determine project viability. For many mineral projects assumptions on commodity prices are critical, particularly those with gradational boundaries. Changes in the price assumptions would significantly change the estimates of quantities and qualities for the same ‘project’ (or does a project include the assumptions such that the same physical occurrence may have multiple projects associated with it?)	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	5.5	6	The only difference between a mine operating continuously and one operating intermittently is the addition of G3 which is a resource category (Inferred Resources) This seems a strange differentiation.	The comment was incorporated in the new document.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	5.6	8	The title includes reference to the Technological Readiness Level (TRL) but no explanation is given as to what this is – the term is not used in UNFC 2019. And no linking reference is provided.	The comment was incorporated in the new document. Explanation of Technological Readiness Level (TRL) was added in the new document.
	5.7	10	Clarification is sought on what is meant by “strong professional and economic interests”	The related text was deleted.
	5.8	12	Page 12 refers to the latest version of the CRIRSCO Bridging Document. The link provided is to the 2015 version of the document. Page 12 also refers to the CRIRSCO Template 2013 whereas the latest published Template is November 2019.	The comment was incorporated in the new document.
	5.9	19	The Critical Raw Materials (CRMs) should be listed	The comment was considered and discussed by the Review Team. A CRM list is always evolving and varies for different countries or other economic entities. Instead, the definition of a CRM was added into the new document.
	5.10	25	The heading looks at the level of engagement. The different categories state the level of support. The level of engagement is very different to the level of support.	The comment was incorporated in the new document.
	5.11	34	The term Mineral Source is not one recognised by CRIRSCO and is not mentioned in any Bridging documents between UNFC and CRIRSCO	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document. Minerals Source is a broad term that defines the entire quantity from which products are recovered. This includes the CRIRSCO defined resources but it also includes quantities that are not currently producible.
Radoslav Vukas, National Consultant, Serbia	6.1	6	"by law" should be added after "in the case of long-term national resource planning"	The comment was considered and discussed by the Review Team. However, the Review Team considers it unnecessary to include legislation which differs between countries.
	6.2	6	"and in accordance with formal conditions of national law for competent person" should be added after "the estimation of quantities shall be done in accordance with professional quality assured methods"	The comment was considered and discussed by the Review Team. However, the Review Team considers it unnecessary to include legislation which differs between countries.
	6.3	6	"at exploration plan" should be added after "appraisal drilling"	The comment was considered and discussed by the Review Team. However, the Review Team considers it unnecessary to add the suggested addition.
	6.4	7	"in the prescribed manner in accordance with the obtained approvals" should be added after "Potential future recovery by successful exploration activities"	The comment was considered by the Review Team. However, the Review Team considers it unnecessary to add the suggested addition.
	6.5	8	", and without added evaluation" should be added after "Then the upside is excluded for financial reporting purposes in order not to mislead investors that unmeasured quantities are investment grade"	The related text was deleted.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	6.6	12	"and its verification at date" should be added after "the relevant Numerical Code(s) shall always be reported in conjunction with the estimated mineral or anthropogenic resource quantity and its associated social, environmental, economic, technical and confidence in estimates / level of knowledge information"	The related text was deleted.
	6.7	13	", at of law" should be added after "the quantities for each shall be estimated and included in a single report for the Project"	The comment was considered and discussed by the Review Team. However, the Review Team considers it unnecessary to include legislation which differs between countries.
	6.8	13	"and in the procedure or manner prescribed by law" should be added after "Any deviation from this location shall be clearly justified"	The comment was considered and discussed by the Review Team. However, the Review Team considers it unnecessary to include legislation which differs between countries.
	6.9	14	should be "possess an academic qualifications and appropriate level of expertise and relevant experience"	The related text was deleted.
	6.10	15	", by competent persons" should be added after "remaining quantities shall be reclassified from E1 to E3"	The comment was considered and discussed by the Review Team. However, the Review Team does not think that competent persons are needed for mapping resources into UNFC. The UNFC is classification which can be done by professionals with understanding how to proceed in classification relative to different confidence categories. This can be tackled with good practical guidance and training of individuals within organizations.
	6.11	16	", by competent persons" should be added after "where favorable conditions for the potential discovery of a mineral deposit or anthropogenic resources in an area may be inferred from regional studies"	The comment was considered and discussed by the Review Team. However, the Review Team does not think that competent persons are needed for mapping resources into UNFC. The UNFC is classification which can be done by professionals with understanding how to proceed in classification relative to different confidence categories. This can be tackled with good practical guidance and training of individuals within organizations.
	6.12	17	"in a professionally qualified manner" should be added after "in some situations, it may be helpful to express a range of uncertainty for mineral or anthropogenic quantities that are classified "	The comment was considered and discussed by the Review Team. However, the Review Team does not think it is necessary to add.
	6.13	19	"by competent persons" should be added after "based on a balanced judgement"	The comment was considered and discussed by the Review Team. However, the Review Team does not think that competent persons are needed for mapping resources into UNFC.
	6.14	20	Yes	The comment was incorporated in the new document.

From	Item	Page	Specific Comment	Response
	6.15	21	": prospection, geophysics, ..." should be added after "early exploration"	The comment was considered by the Review Team. However, the Review Team considers it unnecessary to add the suggested addition.
	6.16	21	", exploration works: drilling, metallurgy, ..." should be added after "advanced exploration"	The comment was considered by the Review team. It should be noted that many individual activities of exploration may take place already in early stages, drilling included.
	6.17	22	"by the competent authorities" should be added after "before they are authorized"	The comment was considered and discussed by the Review Team. However, the Review Team does not think it is necessary to add "competent authorities".
	6.18	22	"as secondary sources of CRM, " should be added after "The Extractive Waste Directive 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)"	The comment was considered by the Review Team. The Review Team does not consider it necessary to mention secondary raw material (SRM) sources here.
	6.19	22	"law regulation," should be added after "land use types are designated according their nature and location,"	The comment was considered and discussed by the Review Team. However, the Review Team considers it unnecessary to include legislation which differs between countries.
	6.20	27	"national interest and" should be added before "geopolitical factors"	The comment was incorporated in the new document.
	6.21	28	"by permit" should be added after "sufficient confidence"	The comment was incorporated in the new document.
	6.22	29	"at by new projects and by law" should be added after "through prevention, reduction, recycling and reuse"	The comment was considered and discussed by the Review Team. However, the Review Team considers it unnecessary to include legislation which differs between countries.
	6.23	29	"by standards and law" should be added after "decision-making"	The comment was considered and discussed by the Review Team. However, the Review Team considers it unnecessary to include legislation which differs between countries.
	6.24	29	", including permit" should be added after "significant detail"	The related text was deleted.
	6.25	30	", by adequate permits" should be added after "a development plan consisting of one or more Projects needs to be defined"	The related text was deleted.
	6.26	32	"(international or national)" should be added after "another classification system"	The comment was considered by the Review Team. However, the Review Team does not consider it necessary to address international or national here.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
	6.27	32	"Competent" should be added before "person"	The comment was considered and discussed by the Review Team. However, the Review Team does not think that competent persons are needed for mapping resources into UNFC categories. The UNFC is classification which can be done by professionals with understanding how to proceed in classification relative to different confidence categories. This can be tackled with good practical guidance and training of individuals within organizations.
	6.28	35	"evaluated by competent persons" should be added after "where relevant"	The comment was considered and discussed by the Review Team. However, the Review Team does not think that competent persons are needed for mapping resources into UNFC categories. The UNFC is classification which can be done by professionals with understanding how to proceed in classification relative to different confidence categories. This can be tackled with good practical guidance and training of individuals within organizations.
	6.29	35	", historical mining data, ..." should be added after "surface or airborne geophysical measurements"	The related text was deleted.
Sigurd Heiberg, Petronavitas	7.1	12	Reference points may be mentioned?	The related text was deleted.
	7.2	13	Discuss multiple product on a general basis.	The comment was incorporated as appropriate in the new document.
	7.3	13	could apply to minerals as well	The comment was incorporated in the new document.
	7.4	13	Discuss accounting principle. An equity issue that would fit under a discussion of the difference between projects and assets.	The comment was incorporated as appropriate in the new document.
	7.5	19	An alternate view of controlling factors will simplify both the preparation and use of the UNFC. In this view, a controlling factor will be used as supplemental information about what decisions have been taken or blocked that causes the category to apply. In other words, avoid considerations about what may happen by basing the classification on what is observed to have happened.	The comment was considered and discussed by the Review Team. It was incorporated as appropriate in the new document.
	7.6	19	the link is not working	The comment was incorporated in the new document.
	7.7	19	Ref. footnote 14. For classification purposes, this rule should be replaced by quotes defining the UNFC categories, and practising them to the largest possible extent by referring to observations, and not judgements. In resource management, the objective will be how to progress or not the projects, i.e. how to run the course, while the classification may be better used to log when the finishing line is crossed. Probability of approval should be considered carefully. A conscious choice is made in the UNFC not to include it. In certain applications, and in particular for long term national strategies, it will be necessary to assess how much of the contingent resources will eventually be produced. This requires an assessment of the probability of success. However, if this is broken down in sub-probabilities where each probability is judged subjectively and in practice be set to less than 100%, the probability of success will automatically fall as a function of the number of sub-probabilities and yield unreasonable results in the end.	The comment was considered and discussed by the Review Team. The review team thinks that it is not appropriate to include "assess how much of the contingent resources will eventually be produced" into mapping reported resources into UNFC categories by a public authority or organisation. The introduction of a probability of success will be assessed in the next version based on observed needs.

From	Item	Page	Specific Comment	Response
	7.8	25	There is a difference between TRLs and decisions to proceed. The UNFC should be practiced on the latter. TRLs may be used to explain the basis on which decisions are taken when they are based on TRLs.	The comment was incorporated as appropriate in the new document.
	7.9	28	Important here to distinguish between the level of investigation which is reflected on the F axis and the range of estimates that are reflected on the G axis. G1 to G3 must allow probability based estimates, i.e a range set by the probability distributions of length, width, height, porosity, mineral content, recovery, processing efficiency etc. The proposed text addresses issues that are regulated on the F-axis and ignores that each level of estimates named have a range of uncertainty associated with them. The range is an important source of information for putting value to opportunities and risks associated with taking the next step in progressing the project, whether this is a decision to proceed to detailed definition, design, development, production or abandonment.	The comment was incorporated as appropriate in the new document.
	7.10	29	"refers to" may be a better term. UNRMS should use it while UNFC merely records the status. It is agnostic to the motivation for taking decisions.	The comment was incorporated as appropriate in the new document.
	7.11	30	For improved definition, it may be useful to define an entry reference point at which future material will be defined both with respect to quantities, qualities and other information carried by the project (flowrates, prices, contracts etc.) This should be developed with a view to applications in the broader circular economy analyses.	The comment was incorporated as appropriate in the new document.
	7.12	30	It may also be defined by the investments.	The comment was incorporated as appropriate in the new document.
	7.13	30	A project may be economic even though an asset may not be. This paragraph may be expanded to make clear the difference between assets and projects.	The comment was incorporated as appropriate in the new document.
	7.14	30	This should refer to the definition of an asset: "legal rights to participate in a project to which value is attached).	The related text was deleted.
Soraya Heuss-Abbichler, LMU	8.1	13	This paragraph seems to me to be a collection of ideas and it would be good to rearrange the order of the sentences.	The comment was incorporated as appropriate in the new document.
	8.2	13	should be "classified as" (space is missing)	The comment was incorporated in the new document.
	8.3	14	I cannot follow the content of this sentence. I have no idea how would look like in practice. An example would be appropriate. The reference point should be established with the definition of the system. The categorisation and subsequent classification refer to this. In terms of transparency and comparability of a project, an additional option using different reference points could be problematic.	The comment was incorporated in the new document.
	8.4	14	As far as I can see, public reporting has not been addressed yet. This should be included in a separate paragraph, especially as it is not considered at UNFC, just like evaluator.	The comment was considered and discussed by the Review Team. ANNEX III: Supplemental Instructions for the national resource reporting was added to the new document.
	8.5	14	what is meant by "documentation" compared to "public reporting"?	The comment was incorporated as appropriate in the new document.
	8.6	17	Is that the usual way of looking at it? It is about the confidence level after all - so I would expect the probability of the accuracy of estimates to be given and therefore I would expect P90 for a very good estimate and P10 for a low estimate.	The related text was deleted.
	8.7	19	In our work, it has proven essential to explicitly distinguish between social, environmental and economic as well as legal aspects (also policy) for reasons of transparency. This makes easier to see where the opportunities and barriers of a project lie.	The comment was considered and discussed by the Review Team. The Review Team considers it as a good suggestion, and it shall be taken into account when updating the UNFC 2019.
	8.8	22	That sentence doesn't fit well in the context here because it's a general statement. It could be used as starting point for the last paragraph on this page.	The comment was incorporated as appropriate in the new document.

<i>From</i>	<i>Item</i>	<i>Page</i>	<i>Specific Comment</i>	<i>Response</i>
Specialists, State Commission of Ukraine on Mineral Resources	9.1	6	According to the text (p. 6, paragraph 4;) and tables (p. 8), the possibility of operational activities is indicated for G3 resources in the characteristics of viable and potentially viable projects. In our experts' opinion, any resource of G3 category should be considered as such that requires additional comprehensive research, provided the successful development of G1 and G2 resources, based on the mining experience in Ukraine. As a practical example, there are only a few successful projects in Ukraine that develop G3 resources (including amber placer deposits, redevelopment of technogenic open-cast iron ore deposits with previously lost resources during underground mining, development of quartz raw materials in chamber pegmatites). All objects are characterized by highly complex geological structure. We agree with footnotes to the Table 2 and propose to extend the use of footnote b to G3 resources for viable and potentially viable projects.	The comment was incorporated as appropriate in the new document. In most cases, G3 is not to be stand-alone, and it should link with G1 or G2.
	9.2	7	The notes on page 7 marked as F4E3.3F4G1,2,3 probably need to be corrected to E3.3F4G1,2,3 or explained	The comment was incorporated in the new document.
	9.3	12	Regarding the term "Effective date", it should be noted that information is subject to rejection during the project evaluation in cases when more relevant data becomes available and its use leads to changes in the final project evaluation. For example, a price rise leads to a change in project's considerations.	The related text was deleted.
	9.4	32	It is recommended to add the notion of Organization or competent Organization to the definition of the term "Evaluator"	The comment was considered and discussed by the Review Team. "Evaluator" is a defined term in UNFC 2019 and it is also used in this document.
	9.5	34	Regarding the term "Mineral Source", the following wording is recommended – "material formations of organic and inorganic origin in the subsoil, on the earth's surface, in water and gas sources, at the bottom of reservoirs, as well as technogenic material formations in places of production waste disposal and loss of mineral raw material processing products suitable for commercial use"	Thank you. To ensure consistency, the definition of "mineral source" was taken from the UNFC Mineral Specifications.