104 - UNFC in Practice
Data Gaps, Harmonization Issues, Challenges

Michael Haschke, Dr.
Director Innovation & EU Relations, DMT (TÜV NORD GROUP)

UNECE
Purpose - Discuss UNFC Application in Practice

- Show how United Nations Framework Classification for Resources (UNFC) reporting increases harmonization of mineral resource data, and demonstrate strength of the United Nations Resource Management System (UNRMS) as a tool for improving the accuracy of Pan-European mineral inventories.

Source

## UNFC in Practice
### Data Gaps, Harmonization Issues, Challenges

<table>
<thead>
<tr>
<th>Country</th>
<th>Commodities assessed</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Aggregates (sand and gravel)</td>
<td>GIS-based assessment; local regional study</td>
</tr>
<tr>
<td>Belgium</td>
<td>Phosphate</td>
<td>Local regional</td>
</tr>
<tr>
<td>Croatia</td>
<td>Aggregates</td>
<td>GIS-based assessment; local regional study</td>
</tr>
<tr>
<td>Denmark</td>
<td>Carbonates</td>
<td>Partly GIS-based assessment</td>
</tr>
<tr>
<td>Denmark</td>
<td>Marine aggregates</td>
<td>Country-wide aggregated assessment. Information from national resource database</td>
</tr>
<tr>
<td>Finland</td>
<td>Cobalt, copper, gold, graphite</td>
<td>Country-wide aggregated assessments. Information from national resource database</td>
</tr>
<tr>
<td>Hungary</td>
<td>Manganese, perlite, gypsum–anhydrite</td>
<td>Local regional; country-wide</td>
</tr>
<tr>
<td>Norway</td>
<td>Aggregates from hard rock sources</td>
<td>Local regional</td>
</tr>
<tr>
<td>Norway</td>
<td>Dimension stone</td>
<td>Local regional, focus on one rock type with a long history of production</td>
</tr>
<tr>
<td>Norway</td>
<td>Graphite, phosphate</td>
<td>Local focus and extension to country-wide assessment</td>
</tr>
<tr>
<td>Slovenia</td>
<td>All national resources</td>
<td>Mapping all resources into UNFC; scant information in the case study report</td>
</tr>
<tr>
<td>Sweden</td>
<td>REE</td>
<td>2 deposit cases with a resource, 1 no-resource case where the REE are in iron ore</td>
</tr>
</tbody>
</table>
ISSUES IN APPLYING THE UNFC CLASSIFICATION SYSTEM (1/4)

- **E-axis** refers to degree of favorability of environmental, social, and economic [non-technical] conditions in establishing the viability of a project, incl. market prices, relevant legal, regulatory, social, environmental and contractual conditions. **E-axis issues** in case studies included:
  - E1 or E2 case study classifications without information on relevant permits.
  - E-axis classification derived from (attractive) commodity grade.
  - E-axis classification derived from exploration (drilling) data.
  - Ineffective use of UNFC sub-classes to distinguish and enhance clarity in differences between environmental and social issues.
ISSUES IN APPLYING THE UNFC CLASSIFICATION SYSTEM (2/4)

- **F-axis** refers to **technical feasibility** which indicates **maturity of technology, studies and commitments** necessary to implement the project. Projects generally range from early mapping and exploration studies to active mining stage, and reflect standard value chain management principles. **F-axis challenges** were:
  - E-axis categories affect the F-axis values (e.g. 1. A resource being „inside legal ban“ resulted in F4, 2. A „mining application pending“ resulted in F1, 3. A „filed application for a mining permit“ becomes F1).
  - Built land, road and railway lines mapped as F4, purely based on the assumption that these are no-go areas for mining.
  - High confidence F1/F2 categories given to non-active projects (with historical estimates) or predictive models, without PEAs / FS by the operator.
G-axis refers to degree of **geological confidence defined by exploration data** which defines the qualitative and quantitative resource estimation of a project. Reflects the spatial distribution of exploration data, ore grade, volumes of mineralized rock above cut-off grade, and/or volume and locations of aggregate bulk material. G-axis categories also reflect geological uncertainties (e.g. ore grade variability). **G-axis challenges** were:

- G-axis categories were affected by exclusion zones (e.g. building land, environmentally protected areas, cultural areas).
- G-axis values were assigned by using external factors (e.g. distance to markets as confidence threshold for economic viability).
- Application of UNFC categories, e.g. UNFC 224 unrealistic and not aligned with JORC, NI43-101, PERC. Probable reserves assigned with UNFC G1 (should be G2).
- Tonnage and grade figures not quoted according to level of estimate accuracy and precision.
ISSUES IN APPLYING THE UNFC CLASSIFICATION SYSTEM (4/4)

- **ALL AXES & GENERAL ISSUES**
  - Aggregate resource classification with different criteria (e.g. UNFC 111 for both active production and non-production cases, or both probable and proven reserves (only latter can be UNFC 111)).
  - Some resources potential predicted by GIS models (111, 112, 221, 222, 223 at E3, F3, G3, F4, G4 categories), partly based on unsubstantiated assumptions.
  - UNFC classification restricted to areas with exploration permits and/or mining rights → prevents national compilation of resource data.
  - National and/or company resource data often confidential → prevents external data compilation.
  - Misuse of classification terminology, i.e. inconsistent mapping and use of classification UNFC categories (e.g. resources cannot be E1/F1 or 111, reserves cannot be E2/F2 or 222).
### CRIRSCO vs. UNFC Bridging

(source: UNECE 2015 bridging document)

- Template illustrates the correlation between CRIRSCO template and UNFC classification.

<table>
<thead>
<tr>
<th>CRIRSCO Template</th>
<th>UNFC-2009 “minimum” Categories</th>
<th>UNFC-2009 Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Reserve</td>
<td>Proved</td>
<td>E1 F1 G1</td>
</tr>
<tr>
<td></td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>Mineral Resource</td>
<td>Measured</td>
<td>E2 F2 G1</td>
</tr>
<tr>
<td></td>
<td>Indicated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inferred</td>
<td></td>
</tr>
<tr>
<td>Exploration Target</td>
<td></td>
<td>E3 F3 G4</td>
</tr>
</tbody>
</table>
GENERAL SUGGESTIONS HOW TO SOLVE INCONSISTENT APPLICATION OF THE UNFC (1/2)

- **ALL AXES & GENERAL ISSUES**
  - UNFC classification of mineral inventories predominantly reflect the maturity of mineral projects.
  - Mapping of resource quantities into UNFC categories to be based on **robust references** → **no reported resource data, no UNFC classification**.
  - When using CRIRSCO-UNFC Bridging Doc
    - **Resources** of closed mines can be UNFC 221 to 334 (221/222/223 requires CRIRSCO-compliant resource reporting, and must be active project),
    - Abandoned closed mines are E3/F3-4,
    - Historical estimates can be classified into UNFC Exploration Target.
  - (Accredited) evaluator always reports **independently**, and cannot decide on behalf of the owner on commercial viability.
Thank you!

Michael Haschke, Dr.
Director Innovation & EU Relations
DMT (TÜV NORD GROUP)
UNECE
Date 5-6. April 2022, Geneva