UNFC case study and guidance from Finland
Session 10: UNFC in action: Progress towards a modern view on integrated resource management
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UNFC case study and guidance from Finland

UNFC Guidance for and from Finland


- Guidance on mapping current and historical mineral inventories into UNFC in Finland

- The report provides:
  - Tool for experts (evaluators) to conduct consistent and coherent mapping of inventories into UNFC-2019
  - Criteria of classification for various commodities through a variety of case-examples from active and non-active projects
  - Criteria of applying UNFC-2019 directly for internal reporting (exploration target estimates)

- As part of Mintell4EU (UNFC-pilot) GTK produced aggregated resource figures for all commodities in national deposit database, based on transparent and consistent classification
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Mapping ‘historic’ resources into UNFC-2019

- These are non-compliant to CRIRSCO
- Bridging document cannot be used
  - No competence and responsibility (CP/QP)
  - Missing description of QA/QC, if anything such was done at all
  - Chemical assay data, feasibility and beneficiation studies (if any done), permitting, and references to commodity prices (sensitivity analysis) are outdated fully or for most parts
  - Holder of the deposit has been changed since, often more than once

=> E-axis value at 3, F- and G-axis values at 3 or 4
Old reporting documents and related data can be scanty to non-existent => Hard to assess the quality and data density => high numbers for UNFC categories

Some commodities reported in an older but not in the latest resource => Different UNFC categories in a deposit for individual commodities (e.g., 223 + 343)

CRIRSCO-compliant resource >10 years ago, then the company left the prospect, the possible new owner has not released a new resource => Change from 221, 222, 223 to 321, 322, 323 or to 331, 332, 333 (= compliant → non-compliant resource!)

Typical Industrial Mineral deposit: overall resource only given, only in an Environmental Impact Assessment (EIA) => all goes into 1,2,2 or 1,3,3 (if active project or a mine, and permit granted) or 3,3,3 (if non-active and not permitted)?
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Jouhineva Co-Cu-Au deposit, Finland: a 1984 mineral resource mapped into UNFC-2019

- 1950s-1970s: Regional geophysical and till geochemical surveys
- 1980-1984: 61 diamond drill holes (total 9,152 m, 25 m drill spacing)
  - Beneficiation tests, test mining (5,000 t of possible ore), economic and technical feasibility evaluation, mineral resource estimated

<table>
<thead>
<tr>
<th>Ore (t)</th>
<th>Au ppm</th>
<th>Ag ppm</th>
<th>Cu %</th>
<th>Co %</th>
<th>UNFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicated Resource</td>
<td></td>
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<tr>
<td>73,000</td>
<td>0.78</td>
<td>21</td>
<td>2.20</td>
<td>0.19</td>
<td>332</td>
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<tr>
<td>Inferred Resource</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>377,000</td>
<td>0.90</td>
<td>5.36</td>
<td>0.54</td>
<td>0.18</td>
<td>333</td>
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<tr>
<td>Indicated + Inferred</td>
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<tr>
<td>450,000</td>
<td>0.88</td>
<td>7.9</td>
<td>0.81</td>
<td>0.18</td>
<td>333</td>
</tr>
</tbody>
</table>
What was done: Drilling, global ‘in-situ’ resource estimate without consideration of dilution block modelling, beneficiation tests, test mining (5,000 t of ore), economic and technical feasibility evaluation

What is not there: No QP (such definition did not exist then), inaccuracy in location of data points (collar and down-hole surveys), no QA/QC information (incl. verification of sample representativity and recovery), no permitting (nothing regarding E-axis issues)

What is outdated: Beneficiation, feasibility studies (especially economic ones), ESG assumptions, possibly also the chemical analyses

⇒ UNFC 3,3,2 + 3,3,3

F3.1(?), as site-specific studies have identified a potential development with sufficient confidence to warrant further testing

F3.1 is supported by the fact that the current holder of the deposit is actively exploring it (www.europeancobalt.com/jouhineva-co-cu-au)
Projects are either active or non-active and project maturity varies from prospective to viable projects.

UNFC mapping should always reflect the confidence/uncertainty of the project, without interpretation of the evaluator:

- Evaluators (e.g., Geological Surveys) are not operators and, therefore, rely on publicly available information (Public Reports). If tonnage & grade estimates have not been disclosed, no UNFC categories can be given.
- Mapping of UNFC quantities and forecasting of future projects should not be mixed. Forecasting related to UNFC classification is strictly derived from the information given by the operator.

Relevant Bridging Documents should be used when performing UNFC mapping (e.g. CRIRSCO-compliant estimates to UNFC-2019)

When mapping CRIRSCO non-compliant estimates (“historical estimates”) the mapping should be transparent, consistent and coherent.
Evaluator’s competence is required when mapping problematic cases

- Active project to non-active project: e.g., in case of mine closure (e.g., company goes bankrupt, or slump in commodity markets puts the mine in care & maintenance)
  - Option 1: Active project => Non-active project (mine closure)
    - CRIRSCO: Mineral Reserves and Mineral Resources (RPEEE) no longer valid
    - UNFC-2019: 111;112 and 221;222;223 => 331;332;333

- Option 2: Active project (mine in care & maintenance) company puts the asset on hold but no change in ownership
  - CRIRSCO: Mineral Reserves => Mineral Resources
  - UNFC-2019: 111;112 to 221;222
  - If company reports plans on mine closure, the UNFC-2019 classification changes accordingly, from 221;222 to 331;332
Mapping of resource quantities into UNFC-2019 must be consistent and coherent in all EU countries to achieve:

- Reliable Pan-European resource aggregation to assist, e.g., long-term perspective that supports activities to secure future sustainable raw material supply
- Sustainable resource management (e.g., resources accounting, policy formulation)

Resource management needs continuous re-classification of resource quantities according to project status:

- Prospective to Potentially-Viable and Viable Projects
- Viable projects to Potentially-Viable and Non-Viable Project

UNFC case study and guidance from Finland
Harmonizing issues, data gaps and challenges
Thank you!

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