UNFC Application on a Tailings Mining Project: Conventional & Sustainable Perspectives

Rudolf Suppes & Soraya Heuss-Aßbichler
Introduction

- **Goal:** UNFC test application on tailings (scoping study, private company)

- **Research question:** how do CRIRSCO & UNFC rate the same case study?

- **Materials:**
  peer-reviewed scientific literature, publicly available materials, model assumptions

- **Assessment & classification approach**: define project ➔ characterise material ➔ evaluate status ➔ categorise & classify

**Nomenclature:**

1 adopted from: Mueller et al. (2020)
https://doi.org/10.1016/j.jclepro.2020.120490
Case Study Cabeço do Pião (Portugal):

**Status Quo**

- $V_{\text{total}} = 1.9$ mio. m³
- $V_{\text{tailings}} = 0.7$ mio. m³
- **grades:**
  - FeWO₄: 0.2 wt% WO₃
  - ZnS: 1.4 wt%
  - CuFeS₂: 1.3 wt%
  - FeS₂: 27 wt%
  - FeAsS: 29 wt%

adapted after: Suppes and Heuss-Aßbichler 2021

https://doi.org/10.1016/j.jclepro.2021.126446
Case Study Cabeço do Pião (Portugal): Status Quo

adapted after: Suppes and Heuss-Aßbichler 2021
https://doi.org/10.1016/j.jclepro.2021.126446
Case Study Cabeço do Pião (Portugal):
Scenario Modelling

- S0: no RMs recovery, TSF rehabilitation, RM potential preserved
- S1: RMs recovery, FeWO$_4$ & ZnS (~1 wt%)
- S2: RMs recovery, FeWO$_4$, ZnS, CuFeS$_2$ & FeS$_2$ (~21 wt%)

source: Suppes and Heuss-Aßbichler 2021
https://doi.org/10.1016/j.jclepro.2021.126446
Case Study Cabeço do Pião (Portugal):
Economic Results & Interpretation

- No RMs recovery (S0):
  - rehabilitation costs

- RMs recovery (S1 & S2):
  - positive economics
  - W main economic driver
  - NPVs = 0 @ W price drop: S1 – 55%, S2 – 90%
  - W price volatility → main risk
  - NPV insensitive to other variations

adapted after: Suppes and Heuss-Aßbichler 2021
https://doi.org/10.1016/j.jclepro.2021.126446
Comparison of CRIRSCO & UNFC Perspectives: Recognition of Project Potentials

<table>
<thead>
<tr>
<th>Communicated Economic Information</th>
<th>CRIRSCO</th>
<th>UNFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0</td>
<td>![X]</td>
<td>![✓]</td>
</tr>
<tr>
<td>no economic viability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S0</td>
<td>![X]</td>
<td>![✓]</td>
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<tr>
<td>RM potential preserved</td>
<td></td>
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<tr>
<td>S1&amp;S2</td>
<td>![✓]</td>
<td>![✓]</td>
</tr>
<tr>
<td>economic viability &amp; relevant elements (W, Cu, S &amp; Zn)</td>
<td></td>
<td></td>
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<tr>
<td>S2</td>
<td>![✓]</td>
<td>![✓]</td>
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<tr>
<td>higher returns &amp; lower operational risks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S0,S1&amp;S2</td>
<td>![X]</td>
<td>![✓]</td>
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<tr>
<td>externalities (due to current &amp; continued emissions)</td>
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</table>
### Differentiation with UNFC Perspective: Economic, Environmental & Social Aspects

<table>
<thead>
<tr>
<th>Positive Impacts</th>
<th>S0</th>
<th>S1</th>
<th>S2</th>
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<tbody>
<tr>
<td><strong>Environmental &amp; Social Aspects</strong></td>
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<tr>
<td>health &amp; environmental protection as key driving factors</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td><strong>Mining Company Commitment</strong></td>
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<tr>
<td>reduced externalities due to omitted rehabilitation</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td><strong>Co-Production of CuFeS$_2$ &amp; FeS$_2$</strong></td>
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<tr>
<td>higher resource efficiency</td>
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<td></td>
<td>✔️</td>
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<tr>
<td>higher revenues</td>
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<td>less disposal costs</td>
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<td>reduces aftercare issues</td>
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Goal: UNFC’s applicability to tailings demonstrated

Research question:
- S0: non-economic TSF rehabilitation
- S1: RMs recovery viable option
- S2: prioritisation of environmental & social benefits

UNFC’s development potential:
- more differentiated categorisation & classification
- enhanced user guidance

Conclusions
Thank you!

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UNECE
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