

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

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**RESOURCE MANAGEMENT WEEK 2021**

ENABLING SUSTAINABILITY PRINCIPLES IN RESOURCE MANAGEMENT



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- **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<sup>1</sup>:**  
define project → characterise material → evaluate status → categorise & classify

**Nomenclature:** RMs: raw materials. TSF: tailings storage facility. W: tungsten.

<sup>1</sup> adopted from: Mueller et al. (2020)

<https://doi.org/10.1016/j.jclepro.2020.120490>





# Case Study Cabeço do Pião (Portugal): Status Quo



- $V_{\text{total}} = 1.9 \text{ mio. m}^3$
- $V_{\text{tailings}} = 0.7 \text{ mio. m}^3$
- grades:
  - $\text{FeWO}_4$ : 0.2 wt%<sub>WO<sub>3</sub></sub>
  - ZnS: 1.4 wt%
  - $\text{CuFeS}_2$ : 1.3 wt%
  - $\text{FeS}_2$ : 27 wt%
  - FeAsS: 29 wt%

adapted after: Suppes and Heuss-Aßbichler 2021  
<https://doi.org/10.1016/j.jclepro.2021.126446>



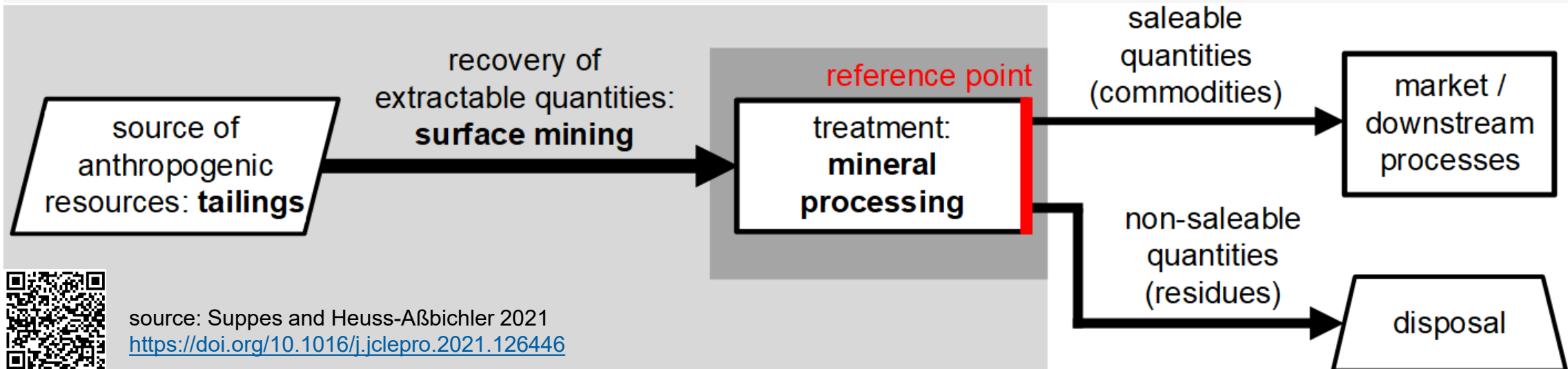
# Case Study Cabeço do Pião (Portugal): Status Quo



# Case Study Cabeço do Pião (Portugal): Scenario Modelling



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



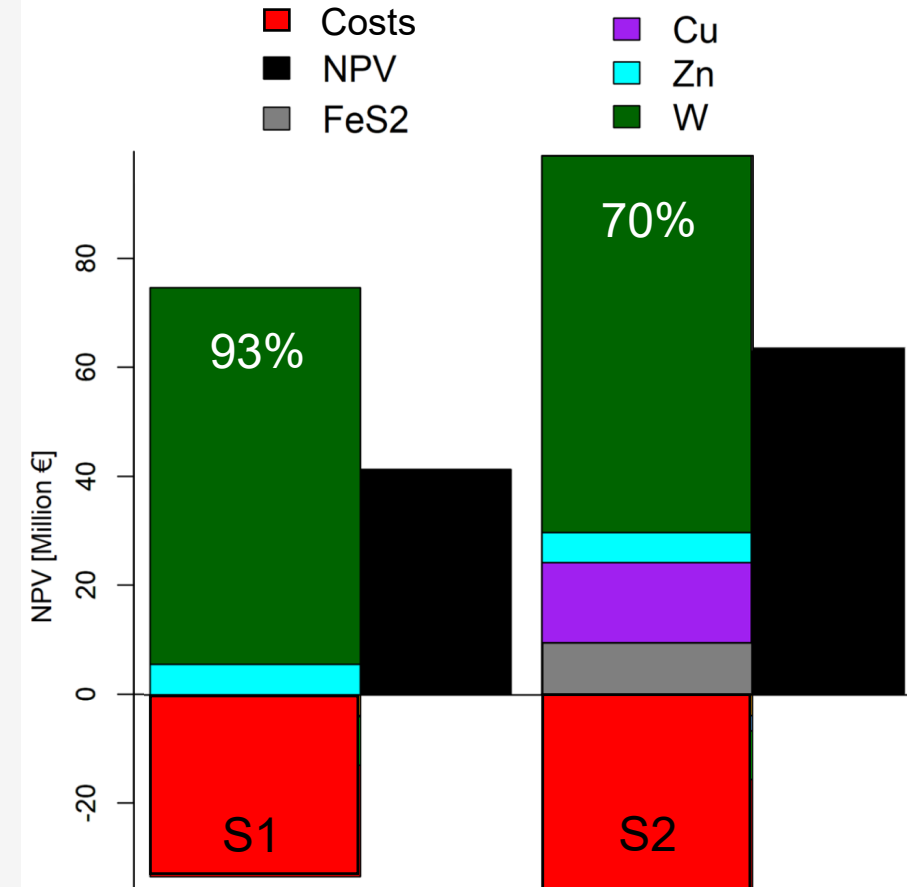
source: Suppes and Heuss-Aßbichler 2021  
<https://doi.org/10.1016/j.jclepro.2021.126446>



# 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



	Communicated Economic Information	CRIRSCO	UNFC
S0	no economic viability		
S0	RM potential preserved		
S1&S2	economic viability & relevant elements (W, Cu, S & Zn)		
S2	higher returns & lower operational risks		
S0,S1&S2	externalities (due to current & continued emissions)		

# Differentiation with UNFC Perspective:

## Economic, Environmental & Social Aspects



Positive Impacts		S0	S1	S2
<b>Environmental &amp; Social Aspects</b>	health & environmental protection as key driving factors	✓	✓	✓
<b>Mining Company Commitment</b>	reduced externalities due to omitted rehabilitation		✓	✓
<b>Co-Production of CuFeS<sub>2</sub> &amp; FeS<sub>2</sub></b>	higher resource efficiency higher revenues less disposal costs reduces aftercare issues			✓



# Conclusions



- **Goal:** UNFC's applicability to tailings demonstrated

- **Research question:**

■ S0: non-economic TSF rehabilitation	CRIRSCO	✗	UNFC	✓
■ S1: RMs recovery viable option	CRIRSCO	✓	UNFC	✓
■ S2: prioritisation of environmental & social benefits	CRIRSCO	✗	UNFC	✓

- **UNFC's development potential:**

- more differentiated categorisation & classification
- enhanced user guidance



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# Thank you!

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