The experience of two European projects on how to combine social, environmental, and economic values in mining

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Mining: a multifaceted topic

• Complex and sometimes conflicting relations between different parties
• Dynamic business environment

“The problems are where conflicts of interest arise“

Finnish NGO
How can we create value in mining?
Creation of sustainability values

• By generating **positive impacts**
• By enhancing **opportunities**
• By reducing **negative issues**
• By mitigating **risks**
Which sustainability values can we create and combine?
H2020 ITERAMS project

Integrated Mineral Technologies for more Sustainable Raw Material Supply

Water
Tailings
Environment

Validation:
- Finland
- Portugal
- South Africa

Sustainable mineral supply in the EU

Economical sustainability
Environmental sustainability
Social sustainability

ITERAMS project

EFFICIENT WATER RECYCLING
- Reduction of water consumption by >90%
- Water quality optimization for each process step
- Recovery of valuable constituents from water solutions
- Efficient and economical water treatment methods

TAILINGS VALORIZATION
- Geopolymerisation for water and oxygen tight covers on deposited tailings
- Waste rock and tailings as hardening mine fill or sold as products
- All remaining tailings safely deposited as a filter dry cake

MINIMIZATION OF ENVIRONMENTAL FOOTPRINT
- No effluents to environment
- No fresh water intake
- No dam failures
- Area conserved
- Enhanced mining
- Enhanced tailings value
EIT RawMaterials SERENE project

A dynamic predictive solution for sustainable water balance management in mining

Water
Environment
Validation:
• Scandinavia

Monitor
Real-time information of water quantities and qualities

Manage
Forecasts and scenarios for operational conditions

Predict and evaluate
Scenarios to evaluate best investment and options for process optimization
Approach

1. Mapping **stakeholders** directly and indirectly affected by the novel solutions foreseen by the projects
2. Definition of **values** potentially generated by the projects
3. Definition of **pressures** and **risks**, and relation with **background situations** on site

HOW?

- Internal project discussions
- Literature and context research
- Hotspots screening
Value ecosystem

- Values
- Stakeholders
- Risks
- Pressures
- Background situations
- Local context
### Results: stakeholders and values

<table>
<thead>
<tr>
<th>Social – local communities</th>
<th>Water availability</th>
<th>Water quality</th>
<th>Trust</th>
<th>Land preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social – workers</td>
<td>Safety</td>
<td>Jobs creation</td>
<td>Human health</td>
<td></td>
</tr>
<tr>
<td>Environmental – ecosystems</td>
<td>Water balance management</td>
<td>Water quality</td>
<td>Land preservation</td>
<td></td>
</tr>
<tr>
<td>Economic – mining companies</td>
<td>Productivity</td>
<td>Visibility of the system and related risks</td>
<td>Respect of regulatory standards</td>
<td></td>
</tr>
</tbody>
</table>
Value: water quality

Local communities, ecosystems

Water quality

Risk of water contamination

Presence of groundwater reserves; monitoring and WWT effort; tailings composition

Release of pollutants into water

Local context

Presence of groundwater reserves; monitoring and WWT effort; tailings composition

Release of pollutants into water

Risk of water contamination

Water quality
Global values in local context: water quality

Finland

• Symbolic value of water
• Good freshwater quality
• Tourism
• Sami people
• Reindeer herders

South Africa

• Poor water quality
• Lack of water supply infrastructure
• Lack of sanitation services
• Agriculture
Value: trust

- Trust
- Local communities
- Risk of protests and conflicts
- Use of local resources, indigenous presence
- Communication channels; transparency; community engagement
- Local context

Risk of protests and conflicts
Use of local resources, indigenous presence
Communication channels; transparency; community engagement
How do we assess value?
Value assessment

- Risk Assessment

- Groundwater pollution
  - OR
  - Discharge pipe in the groundwater area
  - Leak in the discharge pipe
    - AND
    - Unsound pipes
    - Accidental break
  - OR
  - Infiltration from tailing ponds into the groundwater
Value assessment

- Risk Assessment
- Life Cycle Assessment
Value assessment

- Risk Assessment
- Life Cycle Assessment
- Causal loop diagram
Value assessment

- Risk Assessment
- Life Cycle Assessment
- Causal loop diagram
- Interviews with key stakeholders

Qualitative information is as important as quantitative results
Conclusions

• Avoid one-size-fits-all solutions
• “Consult beforehand and modify accordingly“ – Finnish NGO
• Impacts cannot be compensated/replaced by another sustainability dimension
Acknowledgements

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Thank you!