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Assessing social impacts of novel technologies and their influence on local communities' perception about mining.

The Neves Corvo case in Portugal

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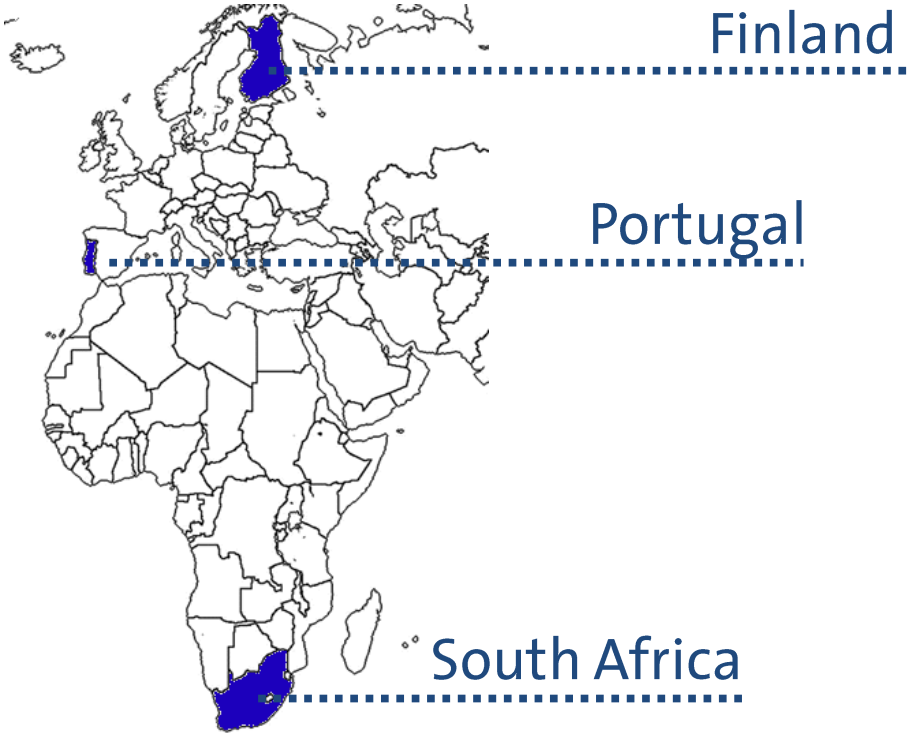
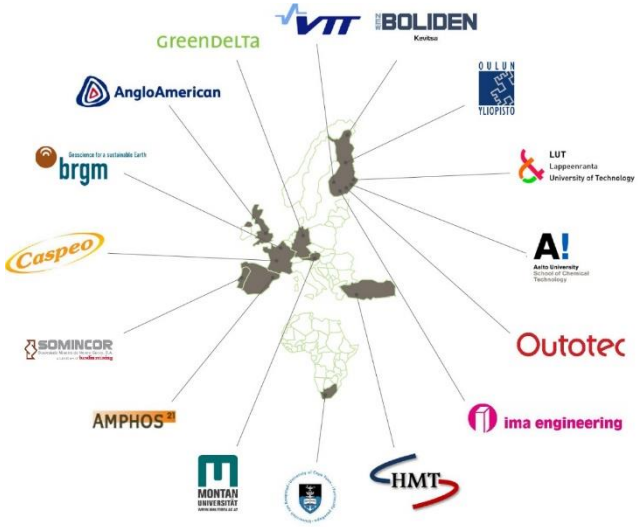
S-LCA workshop, 27th November 2020

H2020 ITERAMS project | Figures

- Integrated Mineral Technologies for More Sustainable Raw Material Supply
- 3 years: 1.6.2017 – 30.11.2020
- 7.9 M€ budget

- 16 partners
- 3 validation sites





H2020 ITERAMS project: objective

WATER

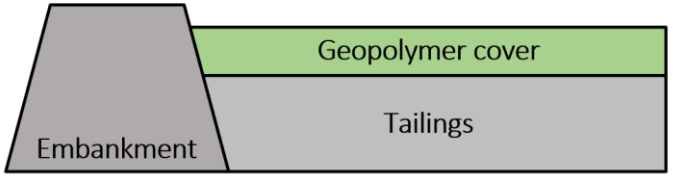
- Efficient water recycling
- Water quality optimization for each process step
- Recovery of valuable constituents from water solutions
- Efficient and economical water treatment methods

TAILINGS

- Geopolymerization for covers on deposited mining waste
- Geopolymerization for backfill material in underground mines or sold as products
- All remaining tailings deposited as a dry filtered cake

ENVIRONMENT

- No effluents to the environment
- No freshwater intake
- No dam failures
- Reduced land use
- Enhanced tailings value
- Preservation of water resources important for local communities



Obenaus-Emler et al. (2017) ITERAMS Integrated Mineral Technologies for More Sustainable Raw Material Supply, Conference presentation RICON17

Neves Corvo mine, Portugal

Profile

- Cu-Pb-Zn mine
- Agriculture (cork, olives) and farming
- Old, low income population
- Communities´ dependency on the mine

https://www.drillcon.se/press-release/drillcon-fornyar-raiseborrningskontra-kt-i-portugal/attachment/minas-neves-corvo-3/

Research question

- How do the novel ITERAMS technologies affect social impacts due to Neves Corvo mine operation?

-> First step: social hotspot screening

- Literature
- Initial formal and informal interviews with mine stakeholders
- Preliminary S-LCA of the mining sector in Portugal with PSILCA

resources

MDPI

Article

Environmental and Social Pressures in Mining. Results from a Sustainability Hotspots Screening

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Di Noi and Ciroth (2018) https://doi.org/10.3390/resources7040080

Social hotspot screening

- S-LCA of 1 USD from the sector “Metal ores” in Portugal

Metal ores - PT

Impact analysis: Social Impacts Weighting method

Subgroup by processes ☑ Don't show < 1 %

Name	I...	...	Impact r...	Unit
Trade unionism			4.75824	TU
Social responsibility along the supply chain			4.25214	SR
Sanitation coverage			4.05952	SC
Non-fatal accidents			3.00488	NI
Active involvement of enterprises in corruption and bribery			2.21009	AI
Contribution to environmental load			2.07539	CS
Women in the sectoral labour force			2.05034	W
Public sector corruption			1.98710	C
Certified environmental management system			1.93374	CM
Anti-competitive behaviour or violation of anti-trust and monopoly legislation			1.87439	AC
Safety measures			1.47346	SM
Industrial water depletion			1.14315	W
Gender wage gap			0.77367	GW
Biomass consumption			0.72043	BM
Pollution			0.70126	P

Metal ores - PT

Flow: Manufacture of other rubber products - South

Impact category: Non-fatal accidents

Don't show < 1 % Exclude zero entries ☑

Contribution tree for locations

Location/Process
Portugal - PT
P Metal ores - PT
P Manufacture of basic metals - PT
P Manufacture of basic metals - PT
P Construction - PT

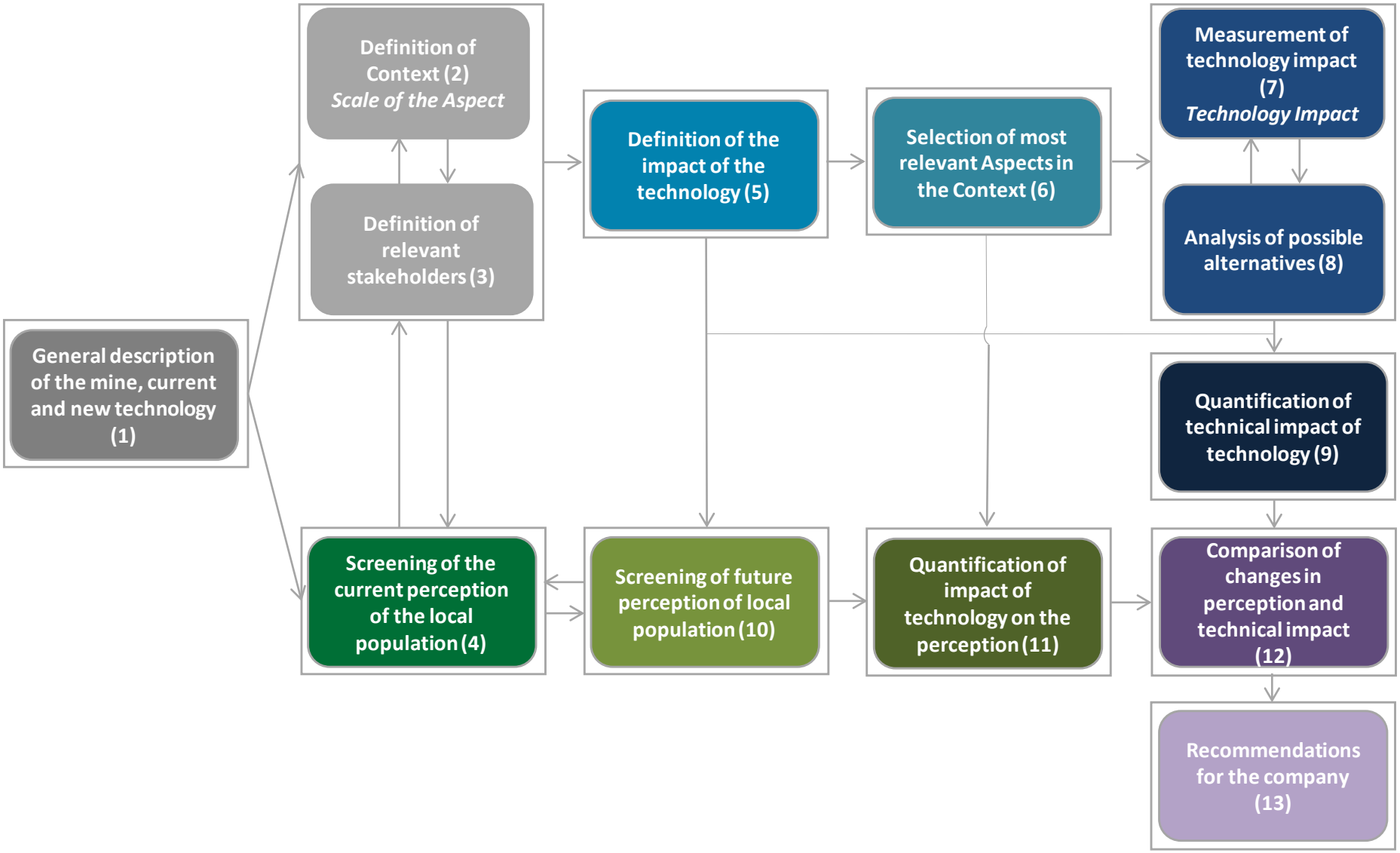
Map

Research question/updated

- The social hotspot screening displayed that many impacts are directly related to operations, hence not to the supply chain
- Due to confidentiality, not possible to receive specific primary data on social risks and impacts of mining processes
- When investigating social aspects, perception of social issues by local communities can be as important as the social impact
- ITERAMS technologies are designed to have an effect on site operation

- How do the novel ITERAMS technologies affect social impacts and local communities´perception about Neves Corvo mine operation?
- Are there any differences between technological impacts on social issues and what the communities perceive?

Methodology development



Definition of the context and stakeholders

- To describe the socio-economic and environmental characteristics in the mine and the surrounding region
- Identification of 44 aspects for 7 different context categories

Context categories:

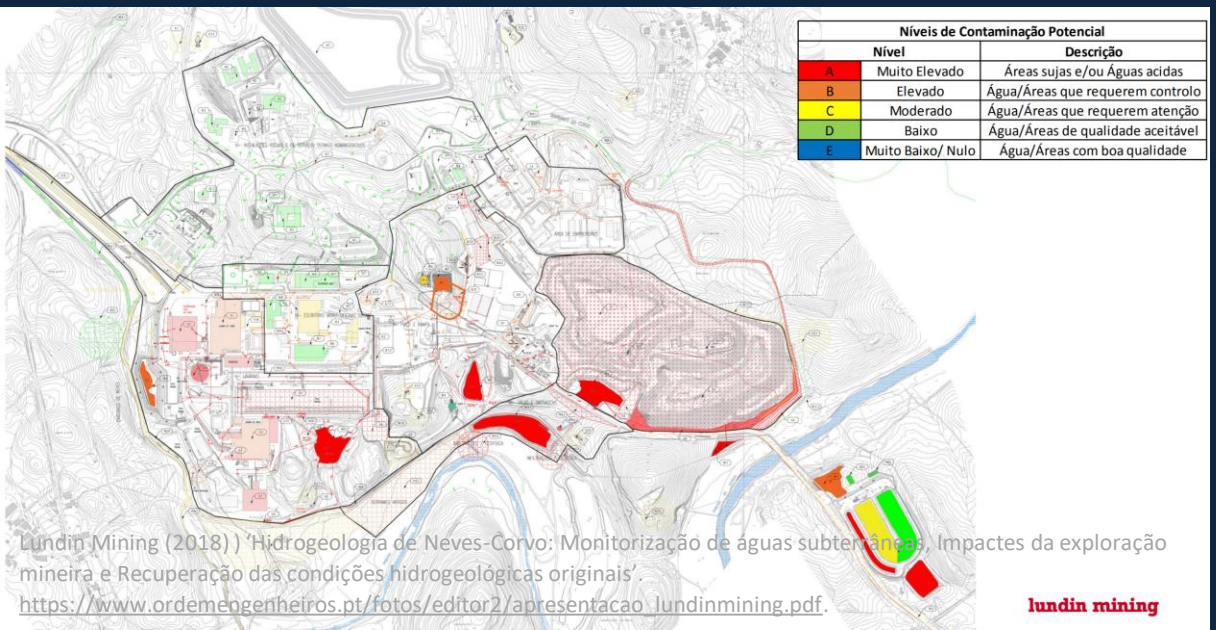
1. Vulnerability of Local Communities indigenous people, employment, health status, housing
2. Risks in the mining sector working conditions, working accidents, dam accidents
3. Conflict with other economic sectors tourism, agriculture, land use, workers availability
4. Local Resources water availability and quality, air quality, noise, biodiversity, odour
5. National and local risks apart from mining sectors risk of natural disasters, pollution
6. Importance of the sector for the national and local economy share in GDP, local economy
7. Communication and procedural fairness inclusion of stakeholders in decision process, distribution of added value

- Application of a scale (from 0 to 1) to define the "importance", the relevance of the Aspect for the area under study.

Definition of the context/Application "water quality"

Local Resources	Alternatives	Scale
Water availability	Water positive area (handling of water volume issues)	0.50
	Water negative areas (water scarcity issues)	1.00
Water quality	Good water quality	0.20
	Medium water quality, issue not only related to the mine	0.40
	Medium water quality, issue related to the mine	0.60
	Poor water quality, issue not only related to the mine	0.80
	Poor water quality, issue related to the mine	1.00
Groundwater areas	Presence with pollution risk (AMD)	1.00
	Presence without pollution risk	0.50
	Absence	0.00

Alternatives	Identification Procedure	Scale
Good water quality	The water quality is **good**, regardless the mine	0.20
Medium water quality, issue not only related to the mine	The water quality is **medium**, as a consequence of the **mining activities and other activities**	0.40
Medium water quality, issue related to the mine	The water quality is **medium**, as a consequence of the **mining activities**	0.60
Poor water quality, issue not only related to the mine	The water quality is **low**, as a consequence of the **mining activities and other activities**	0.80
Poor water quality, issue related to the mine	The water quality is **low**, as a consequence of the **mining activities**	1.00

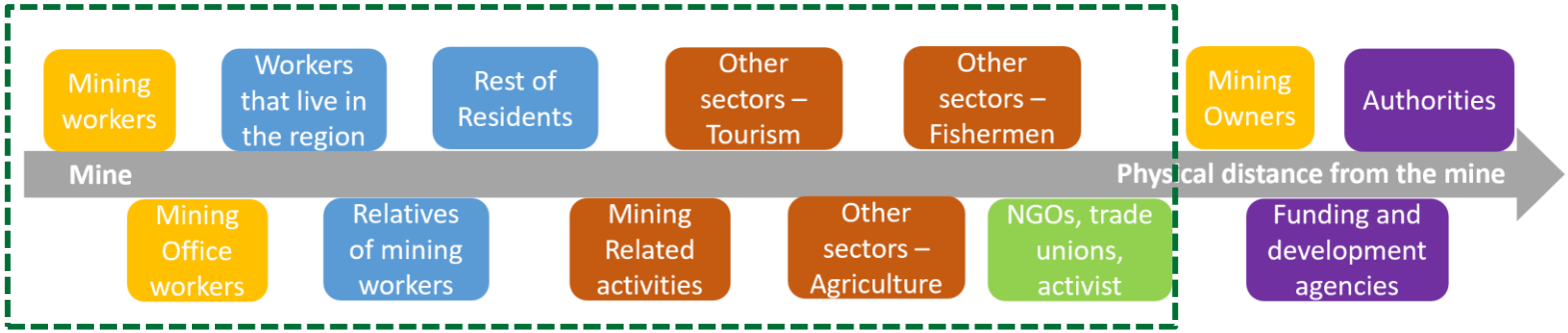


- The quality of Oeiras river is reported as "inferior to good"
- "Significant concentrations of sulphates" and low concentration of metals in the water discharged
- The quality of the Oeiras river is mainly only affected in the specific location of the discharge

Lundin Mining (2018)) 'Hidrogeologia de Neves-Corvo: Monitorização de águas subterrâneas, Impactes da exploração mineira e Recuperação das condições hidrogeológicas originais'. https://www.ordemengenheiros.pt/fotos/editor2/apresentacao_lundinmining.pdf.

Definition of stakeholders

- Which stakeholders should be included in the analysis?



Possible Groups of Stakeholders:

Government | Residents | Mining Industry | Associations | Economic sectors

Screening of the current perception

- Data collection: surveys, interviews, local news, social media webpages, and other available communication channels.
- It investigates if the stakeholders consider that each Aspect (with a score >0) of Context categories is "Good", "Indifferent", or "Not Good" for them.
- Application of a scale (-1;0;1) to quantify the perception level

Screening of the current perception/Application "water quality"

- Interviews with one environmental agency, one NGO, one trade union, two municipalities and resident survey
- Different opinions

(…) The fishermen of the region always consider that problems with the fishes are connected to the mine. Changes in the colour of the river are also associated with problems in the mine. Besides that, (…) a lot of cattle drink the water from Oeiras River, then when some problems with the cattle occur, it is commonly associated with the mine by the local population. However, these problems are not always related to mine. – Environmental Agency

Until the moment no [no problems with water quality], *the fishing activities keep happening in Guadiana River.* – Municipality B

(…) We think that small pollutions in the river are not related to the mine, there are no fishermen in the river, and we don't know about any complaints due to the mine pollution. – Municipality A

	What is the current perception? Good, Not good or Indiferent?											
Aspect	Stakeholders directly related to the mine		Residents			Other workers/ economic activities				Associations		
	Mining Workers	Mining office workers	Mining workers that live in the region	Relatives of Mining workers	Rest of Residents	Workers mining related activities	Touristic Sector	Agriculture/ Farmers	Fisherm en	NGOs	Activists	Trade Unions
Water quality	-1	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1

Measuring the impact of technologies in the social context

- A scale (-1;0;1) is applied to evaluate the impact of the technology for one specific stakeholder (no perception considered here)

Classification	Description
-1	Implementation of the technology will have a negative impact in this Aspect, in this term, for this Stakeholder.
0	Implementation of the technology will not affect this Aspect, in this term, for this Stakeholder.
+1	Implementation of the technology will have a positive impact in this Aspect, in this term, for this Stakeholder.

Measuring the impact of technologies in the social context/Application “water quality”

- Water treatment technologies allow for a better water quality on-site
- Less pollutants are discharged if more water can be recycled
- Geopolymer cover on tailings will reduce the risk of tailings leaking (AMD, heavy metals)

Impact	List of Stakeholders
-1	-
0	Mining workers (underground and office), and Workers Mining related activities.
+1	Mining workers that live in the region, Relatives of Mining Workers, Rest of Residents, Touristic Sector, Agriculture/Farmers, Fishermen, NGOs, Activists, Trade Unions, Mining Owners, Funding and Development Agencies, and National and Local Authorities.

Measuring the impact of technologies in the future social perception

- In order to understand how the technology affects the future perception, it is necessary to combine the information of the technical impact and the screening of current perception.
- Application of a scale, ranging from -1 to 1.

Future Perception				
		Current Perception		
Impact	-	1	0	-1
	1	A	B	C
	0	D	E	F
	-1	G	H	I

	The technology...	Scores	People...
A	improves something that was already good for local population	0,5	are positively affected
B	improves something that was indifferent for local population	0	are not affected
C	improves something that was not good for local population	1	are positively affected (best scenario)
D	does not affect something that was already good for local population	0	are not affected
E	does not affect something that was indifferent for local population	0	are not affected
F	does not affect something that was not good for local population	-0,5	are negatively affected
G	affects negatively something that was good for local population	-1	are negatively affected (worst scenario)
H	affects negatively something that was indifferent for local population	0	are not affected
I	affects negatively something that was not good for local population	-1	are negatively affected (worst scenario)

Measuring the impact of technologies in the future social perception/Application "water quality"

Impact	List of Stakeholders
-1	-
0	Mining workers (underground and office), and Workers Mining related activities.
+1	Mining workers that live in the region, Relatives of Mining Workers, Rest of Residents, Touristic Sector, Agriculture/Farmers, Fishermen, NGOs, Activists, Trade Unions, Mining Owners, Funding and Development Agencies, and National and Local Authorities.

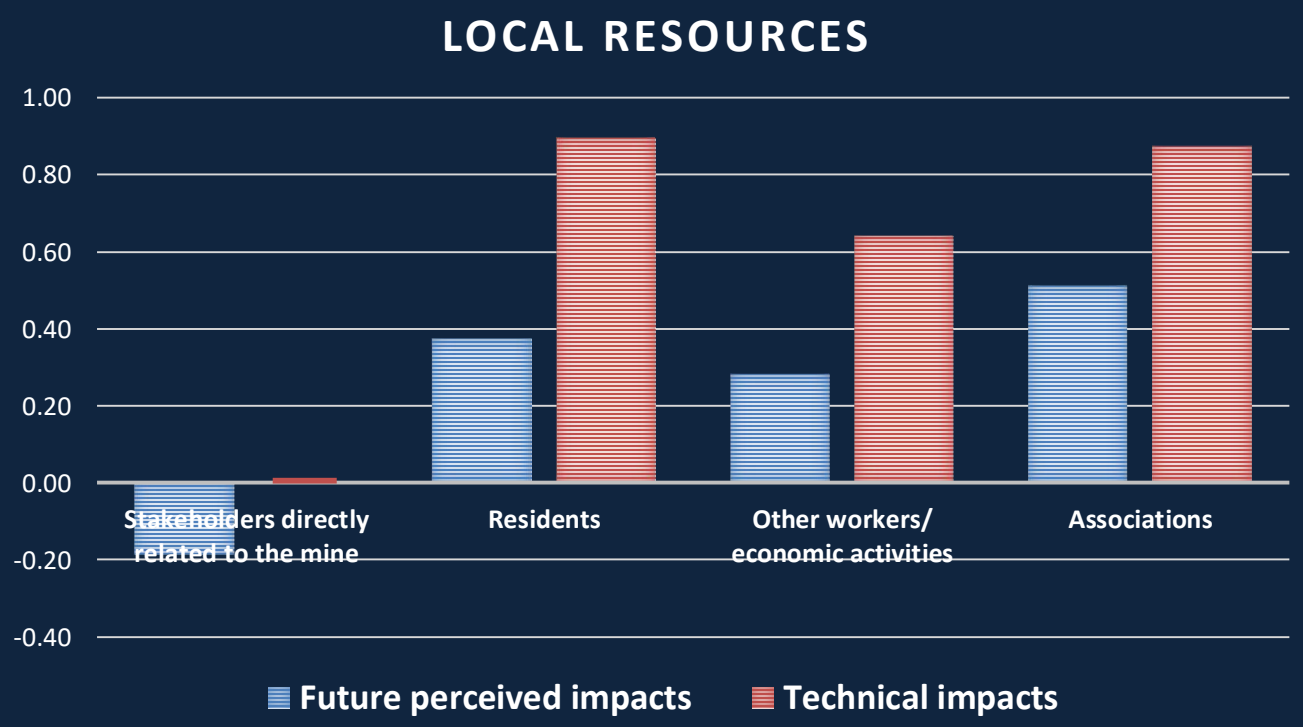
What is the current perception? Good, Not good or Indiferent?													
Aspect	Stakeholders directly related to the mine		Residents			Other workers/ economic activities				Associations		
	Mining Workers	Mining office workers	Mining workers that live in the region	Relatives of Mining workers	Rest of Residents	Workers mining related activities	Touristic Sector	Agriculture/ Farmers	Fishermen	NGOs	Activists	Trade Unions
Water quality	-1	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1

What is the future perception? Do technologies change something in the perception?												
Aspect	Stakeholders directly related to the mine		Residents			Other workers/ economic activities				Associations		
	Mining Workers	Mining office workers	Mining workers that live in the region	Relatives of Mining workers	Rest of Residents	Workers mining related activities	Touristic Sector	Agriculture/ Farmers	Fisher men	NGOs	Activists	Trade Unions
Water quality	-0.50	-0.50	1.00	0.50	0.50	-0.50	1.00	1.00	1.00	1.00	1.00	1.00

Comparison of changes in perception and technical impacts on social issues /Application "water quality"

Changes in the perception and technical impacts on social issues												
Water quality	Stakeholders directly related to the mine		Residents			Other workers/ economic activities				Associations		
	Mining Workers	Mining office workers	Mining workers that live in the region	Relatives of Mining workers	Rest of Residents	Workers mining related activities	Touristic Sector	Agriculture/ Farmers	Fisher men	NGOs	Activists	Trade Unions
Perceived impact	-0.50	-0.50	1.00	0.50	0.50	-0.50	1.00	1.00	1.00	1.00	1.00	1.00
Technical impact	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00

Water availability
Water quality
Groundwater areas
Environmental Regulation
Acid Mine Drainage
Air quality and Dust level
Environmental Protected Areas
Odour
Noise Pollution
Climate change emissions
Biodiversity
Soil quality



Conclusions

- For all context categories the expected technical impact resulted higher than the expected perceived future impact of ITERAMS technologies
- Not all positive and negative impacts due to the mine and ITERAMS are perceived by the local population
- Main perceived social aspects: employment, region development, accommodation prices, status of water resources, working conditions (safety, hours, salary), inclusion in mine decisions
- Proper communication of benefits with ITERAMS is key for their perception

(…) I believe that people/workers that pay more attention to the news are more or less informed. But many of them are not effectively informed about the repercussion of small changes in the process/management, (…) and [that] *contribute to the Trade Balance and impacts in the environment in the region.* – Municipality A

(…) this communication [from the mine] *has been well understood by all.* – Municipality B

Lessons learned and the way forward

- Considering local communities´ perception about social issues appears important in social assessment
- Social impacts of technologies and perceived impacts can differ -> we should be able to detect and fill this gap
- Knowledge of the context and speaking the local language are crucial for a successful assessment
- S-LCA gives an important contribution for hotspots detection in the life cycle
- …but S-LCA should not be the only approach in social assessment
- How to integrate the presented approach in a life cycle perspective and in S-LCA tools?
- Does a quantitative approach for social aspects make sense?
- Should we aggregate results for social aspects? How?

Thank you!

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