

APPLYING SLCA TO THE MINING SECTOR

A case study exploring the hotspots of small-scale mining in Bosnia and Herzegovina

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IMP@CT: improve the viability of small complex deposits exploitation (including CRMs)

A new mining paradigm: the SOSO approach: Switch on-switch off

Technological innovations

- Mining equipment design
 - Development of mining modular elements
- Mine planning improvement
 - By reducing time/amount of different project components:
 - from the feasibility study to the throughput of the extracted material and the associated wastes

Indication of success

- The designed approach is easily transferable to multiple deposits and commodities
 - Tested in the West Balkans
 - Tested on a Pb and a Sb deposits

Associated potential risks

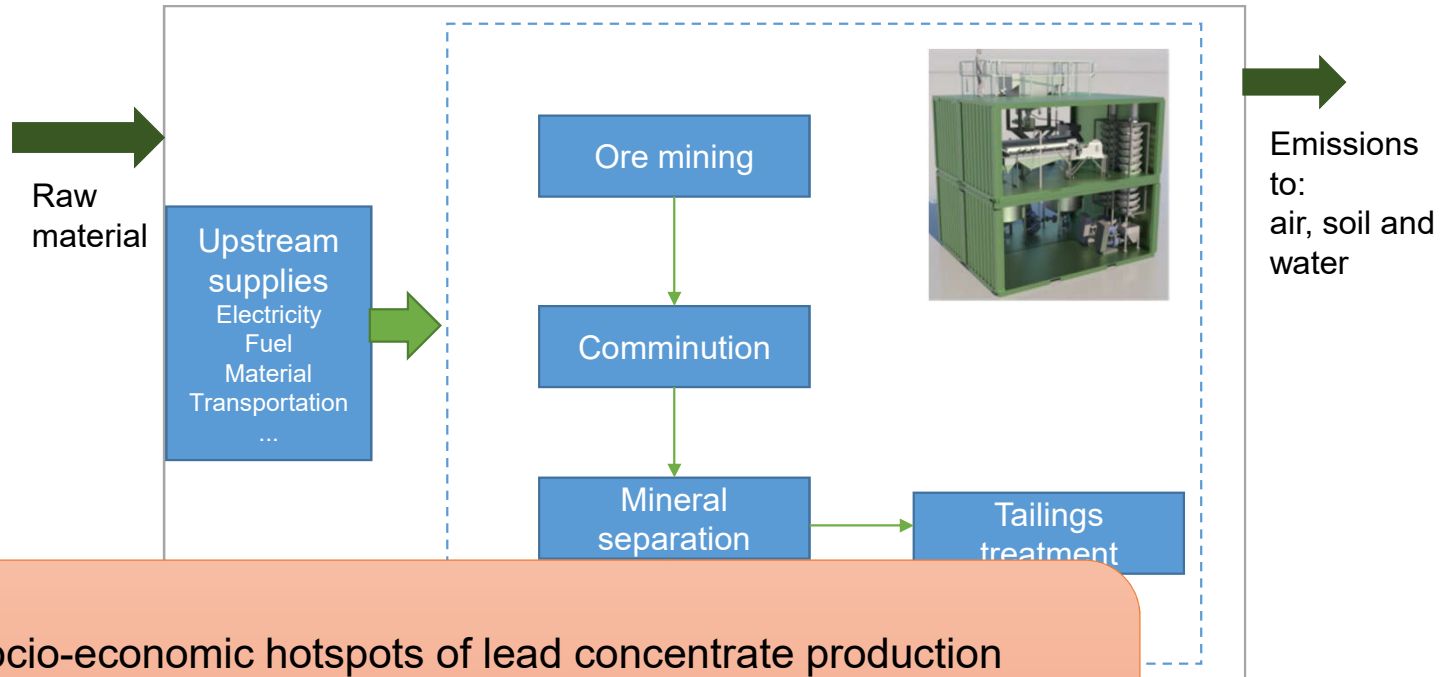
- Geological uncertainty
- Metallurgical variability
- Social acceptance



Context and goal of the study



Olovo lead deposit



Explore the social and socio-economic hotspots of lead concentrate production

Provide knowledge regarding the most vulnerable spots in order to establish mitigation measures in the frame of massive deployment of SOSO mining in Europe

Overall methodology: reference point method – type I sLCA



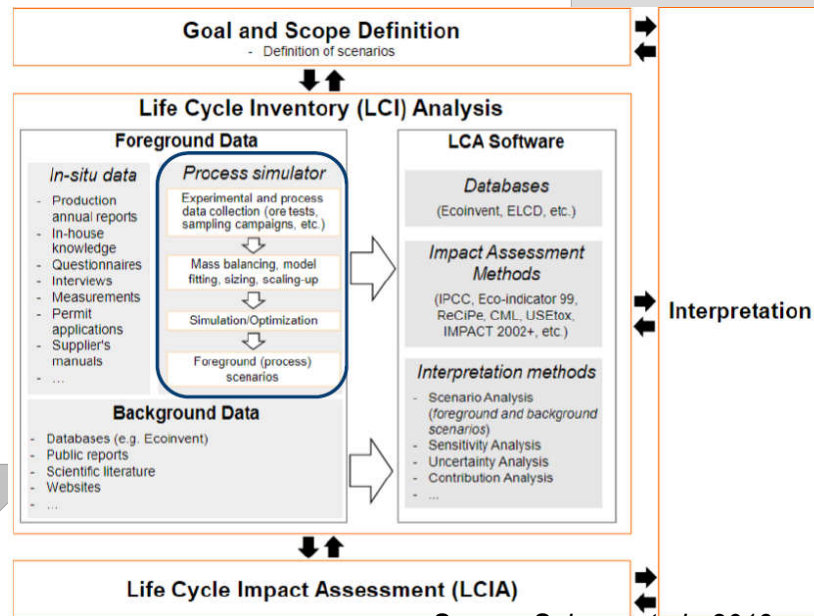
FOREGROUND SYSTEM
Modeled through on-site data collection

BACKGROUND SYSTEM
Modeled through PSILCA database

1

QUANTIFICATION OF EXCHANGES BETWEEN INDUSTRIAL ACTIVITIES MOBILIZED BY THE ASSESSED PRODUCT SYSTEM

Process-based information based on on-site data collection



Mineral separation unit					
Name of the exchange	Price quantity	Price unit	Data used to derive the price quantity	Associated PSILCA activities	Comments related to PSILCA activities
<i>Mineral separation</i>					
Concrete pillars	2.68E-04	USD	400 EUR/unit	Construction - BA	Country of operation: BA - Bosnia and Herzegovina. It is supposed that the pillars are manufactured nearby the mining site
Electricity				Electricity supply - created by the authors - see below	
Water				Water supply - created by the authors - see below	
Gravity separation equipments production	5.68E-02	USD	175843 GBP/unit	Manufacture of machinery for mining, quarrying and construction - GB	Country of operation: GB - United Kingdom. All the gravity separation equipments were designed and fabricated in the United Kingdom.
Container production	2.96E-03	USD	1984 USD/Container	Manufacture of tanks, reservoirs and containers of metal - GB	Country of operation: GB - United Kingdom. It is assumed that the containers are manufactured in the United Kingdom (as it is where the equipments are manufactured).
Maintenance of the gravity separation equipment	2.68E-03	USD	Consideration of the average costs for the mineral separation unit equipments	Maintenance and Repair - BA	Country of operation: BA - Bosnia and Herzegovina. It is supposed that the maintenance is performed by a local company

Overall methodology: reference point method – type I sLCA



1

**QUANTIFICATION OF EXCHANGES
BETWEEN INDUSTRIAL ACTIVITIES
MOBILIZED BY THE ASSESSED
PRODUCT SYSTEM**

2

**QUANTIFICATION OF SOCIAL AND
SOCIO ECONOMIC INDICATORS
PER INDUSTRIAL ACTIVITY**

FOREGROUND SYSTEM
Modeled through on-site
data collection

Process-based information based
on on-site data collection

BACKGROUND SYSTEM
Modeled through PSILCA
database

EORA database used through
PSILCA database

Selection of the indicators relevant to the mining sector in BiH



Selection processus

Hotspot assessment
'Mining and quarrying,
BiH'



Thematic
assessment of
field interviews
with local
representatives

Resulting kept sub-categories

65 different socio-economic indicators in 19 sub-categories



Which ones are key in the system user study?

Society	Contribution to economic development
Value chain actors	Corruption
	Fair competition
	Promoting social responsibility
Local community	Access to raw material resources
	Safe and healthy living conditions
	Local employment and migration
	Respect of indigenous rights
Workers	Health and safety
	Fair salary
	Social benefits
	Working time
	Child labor
	Freedom of association

Overall methodology: reference point method – type I sLCA



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QUANTIFICATION OF EXCHANGES BETWEEN INDUSTRIAL ACTIVITIES MOBILIZED BY THE ASSESSED PRODUCT SYSTEM

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QUANTIFICATION OF SOCIAL AND SOCIO ECONOMIC INDICATORS PER INDUSTRIAL ACTIVITY

FOREGROUND SYSTEM Modeled through on-site data collection

Process-based information based on on-site data collection

Adaptation of PSILCA indicators to the local context of the study



BACKGROUND SYSTEM Modeled through PSILCA database

EORA database used through PSILCA database

Overall methodology: reference point method – type I sLCA



FOREGROUND SYSTEM Modeled through on-site data collection

Process-based information based on on-site data collection

Adaptation of PSILCA indicators to the local context of the study

Risks qualifications and associated factors determination based on PSILCA risk scale

Information based on on-site data collection

BACKGROUND SYSTEM Modeled through PSILCA database







EORA database used through PSILCA database

Indicators as quantified in the PSILCA database

Activity variables as defined in the PSILCA database

Some results

75% of the overall impacts is represented by 6 hotspots
Contribution to environmental load
Social responsibility along the supply chain
Public sector corruption
Sanitation coverage
Certified environmental management system
Workers affected by natural disasters

A majority of the impacts/opportunities occur in the country of operation		
Contribution to environmental load		60%
		27%
	Other countries	13%
Social responsibility along the supply chain		65%
		16%
	Other countries	19%
Contribution to economic development		62%
		10%
	Other countries	28%

Some recommendations

An opportunity to implement the most appropriate mitigation measures in a future business plan

Foreground contribution to a majority of the hotspots is quite important

Hotspots linked to initiatives put in place to promote CSR and ESG

- ‘Social responsibility along the supply chains’, ‘public sector corruption’, ‘certified environmental management systems’
- Linked to the management system put in place

The case of the hotspot ‘contribution to the environmental load’

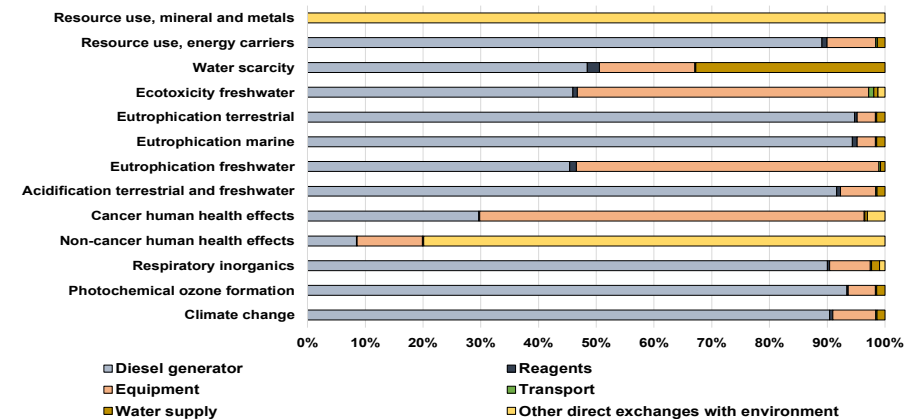
- An eLCA was conducted on the same product system with the same functional unit
 - Use the more detailed results to propose mitigation measures



CSR in the small scale mining sector

POLICY BRIEF

Policy agenda towards socially responsible small-scale mining in Europe



Beylot, A., Muller, S., Segura-Salazar, J., Brito-Parada, P., Paneri, A., Yan, X., Lai, F., Roethe, R., Thomas, G., Goettmann, F., Braun, M., Moradi, S., Fitzpatrick, R., Moore, K., Bodin, J. 2020. *Switch on-switch off small-scale mining: environmental performance in a life cycle perspective*. Submitted to Journal of Cleaner Production.

Conclusions – Open (and maybe naïve) questions

sLCA on pilot operations

- A tool to define the management systems to put in place in the future industrial operations?
- Are there any ‘upscaling’ effect to be aware of when performing sLCA on pilot operations?

Are all social mining issues covered by type I sLCA? Must they?

- Temporal and spatial characteristics
- Reducing the supply risk of CRMs to the European economy and the European energy transition

sLCA and representativeness

- How to improve the representativeness of used data?
- How to combine different types of social assessments?

sLCA and communication

- Communication to industrials of the mining sector
 - Multiplication of indicators in a context of triple bottom-line
 - What can bring MCDM tools bring to the decision making process?
- Communication to the local community / society
 - What can life cycle thinking tools bring to the SLO?

Thank you for your attention!

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