

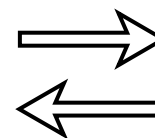
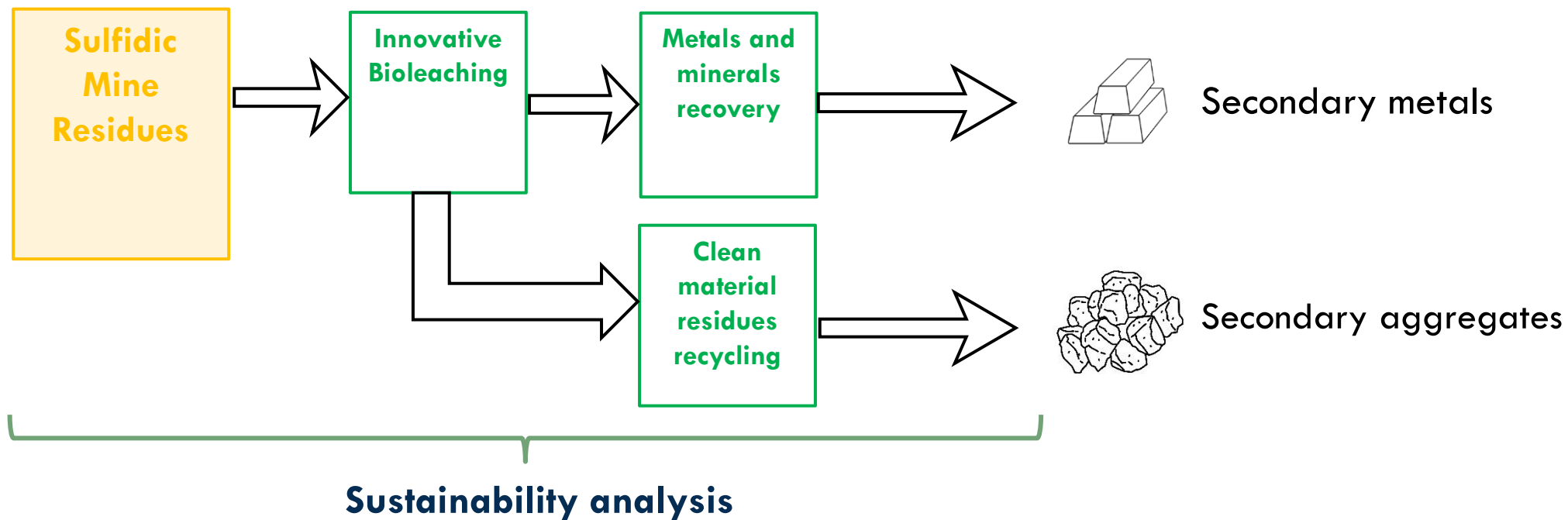


NEMO event (EIT-RM week 2022) Sustainability Assessment in NEMO

Andrea Di Maria (KU Leven-University of Liege)

15/11/2022

Sustainability analysis in NEMO



Sustainability analysis in NEMO



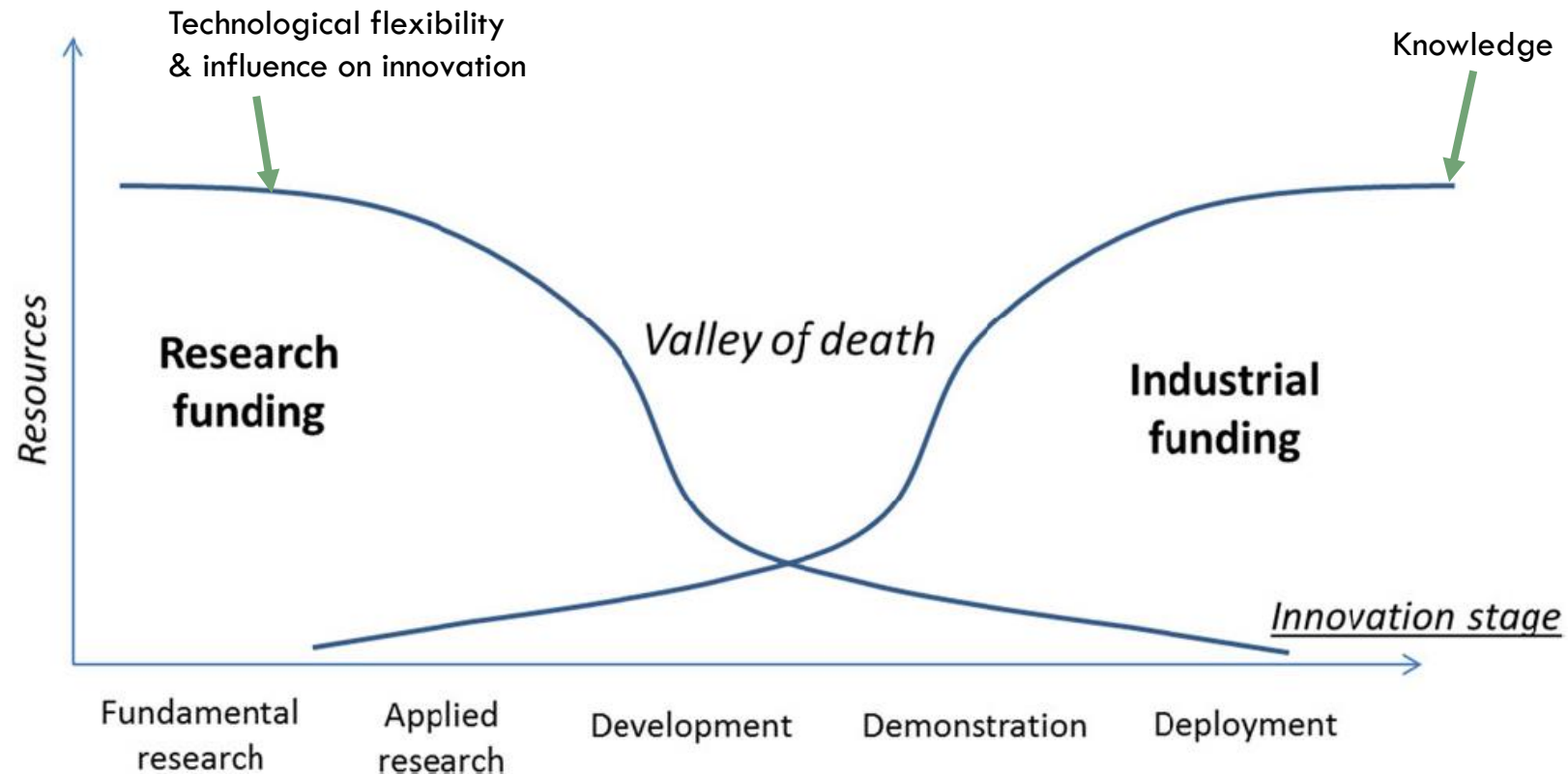
Goal:

1. Demonstrate, quantify the environmental and social costs and benefits of NEMO technologies
2. To demonstrate measureable economic benefits .

Sustainability analysis



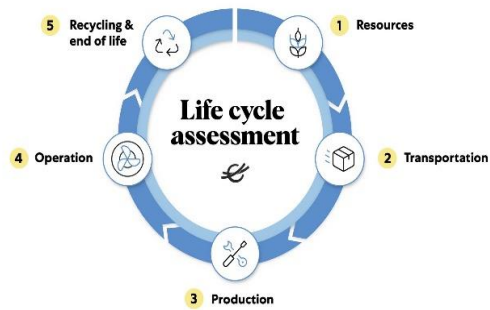
Sustainability assessment as an iterative process



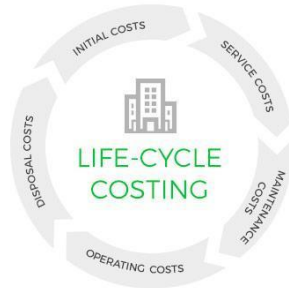
Sustainability analysis



Life cycle based methodologies



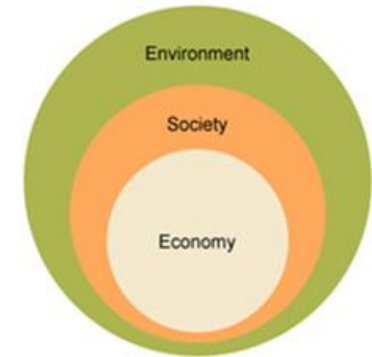
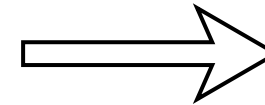
Environmental LCA



Economic LCC



Social LCA

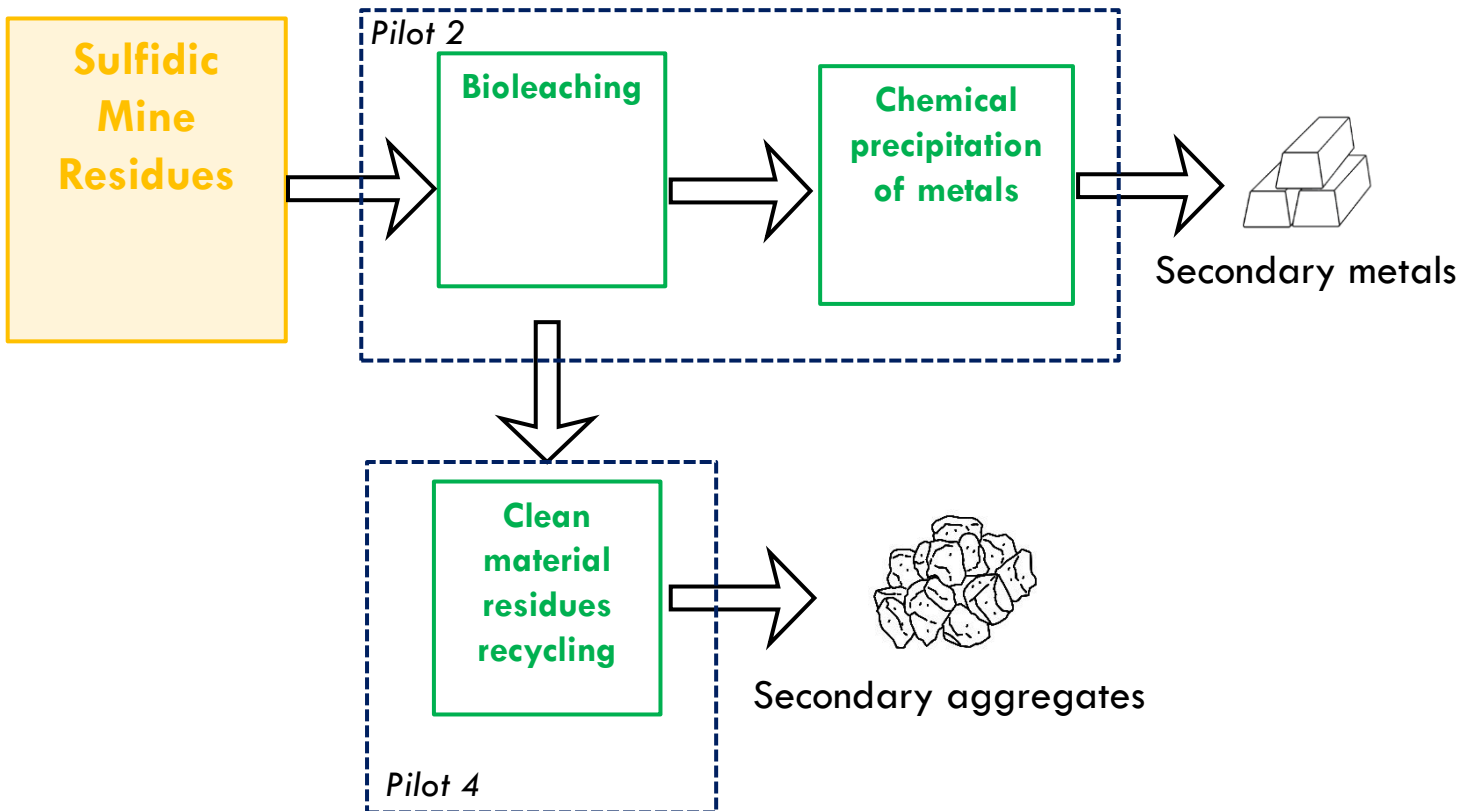


Sustainability framework



Sustainability analysis: pilot 2 + pilot 4

Results: pilot 2 + pilot 4

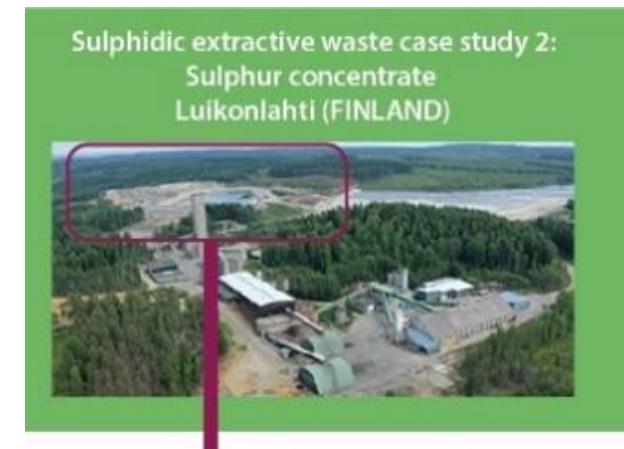


500 t/d

167 900 t/y

Deposit \approx 1 600 000 t

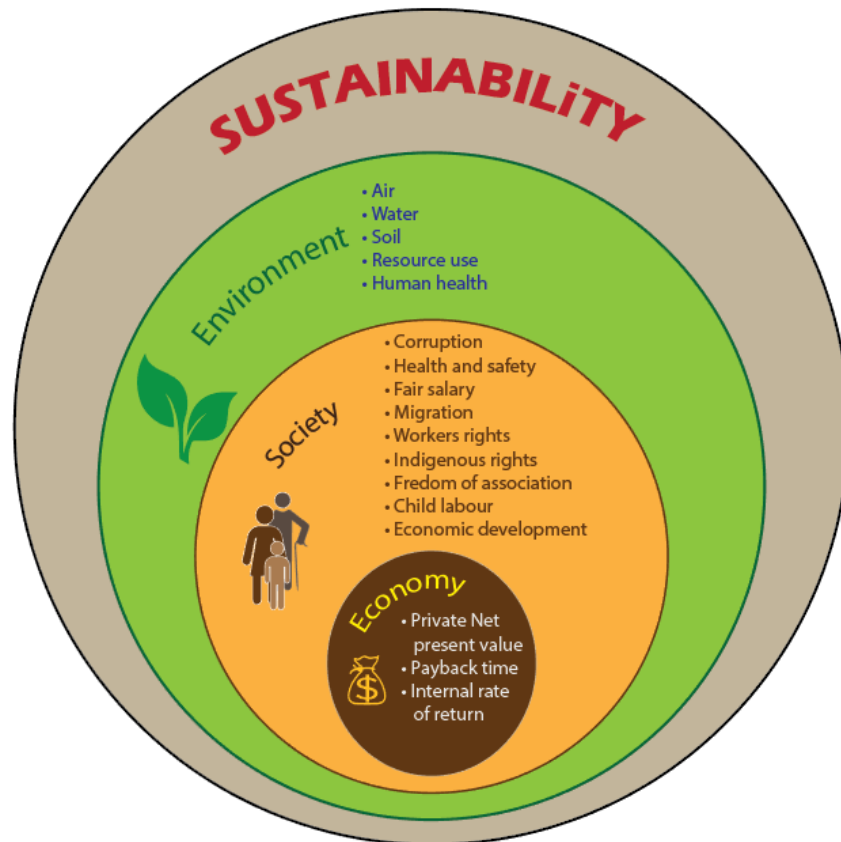
Lifetime \approx 10 years



Sustainability analysis: pilot 2 + pilot 4



Sustainability framework



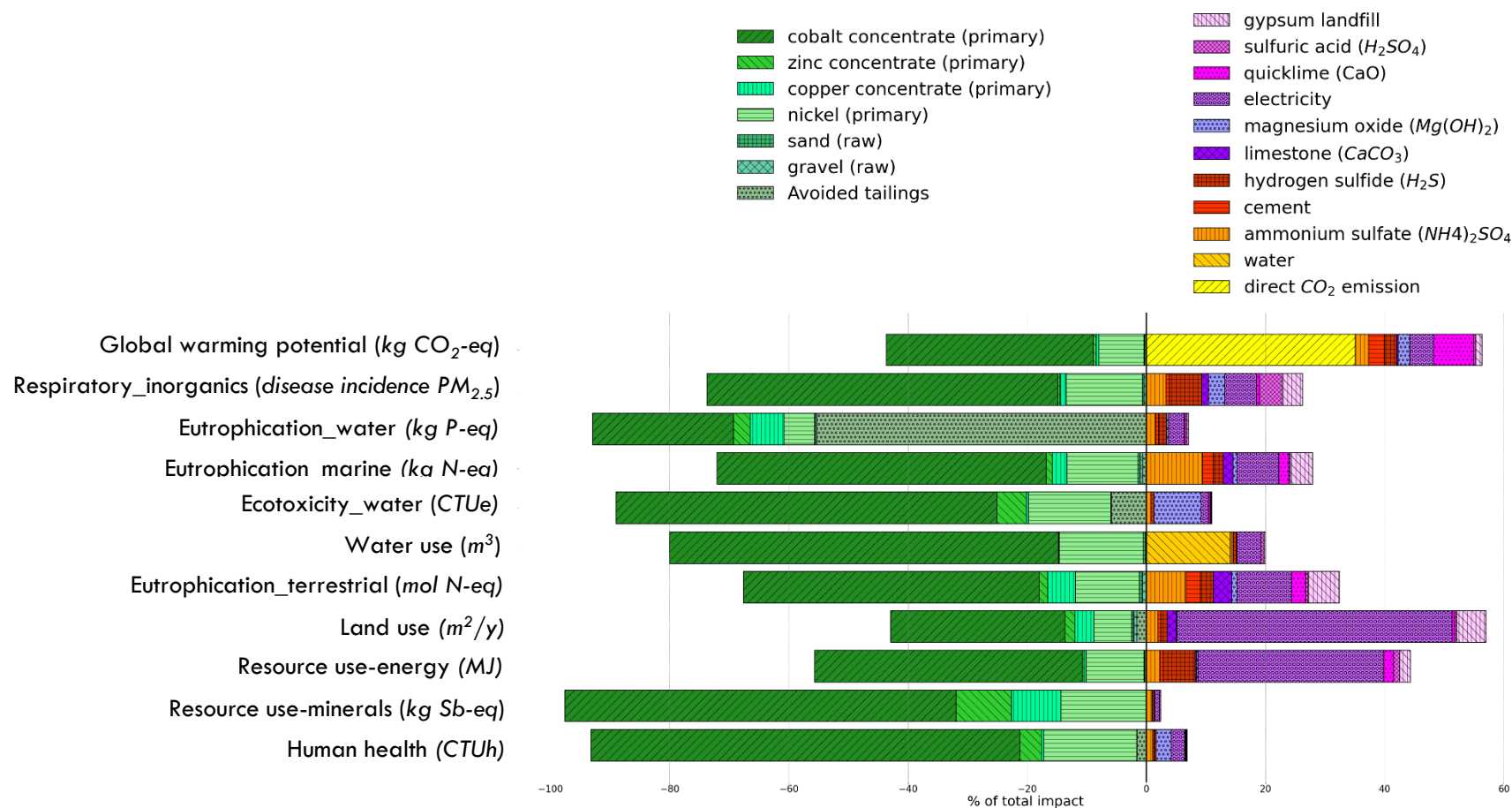
40 life-cycle-based indicators:

- 11 indicators (5 categories) for environment
- 26 indicators (9 categories) for social
- 3 indicators (1 category) for economy

Sustainability analysis: pilot 2 + pilot 4



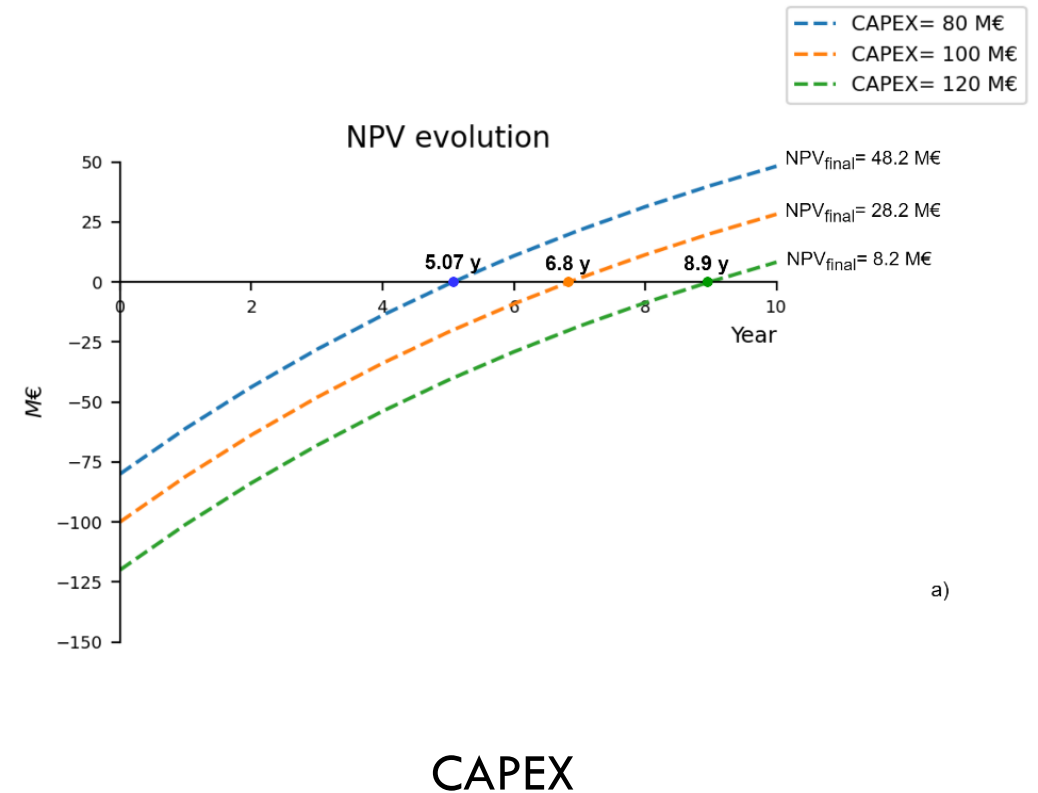
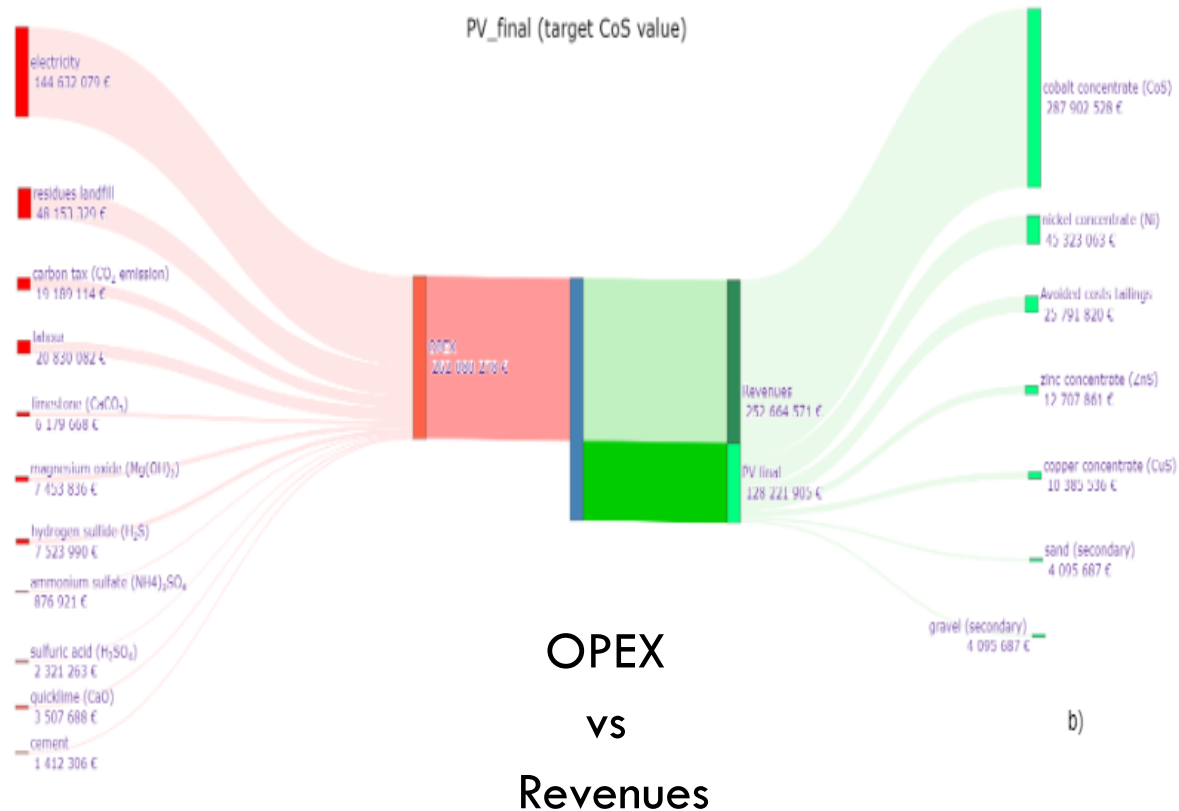
Environmental results



Sustainability analysis: pilot 2 + pilot 4



Economic results





Sustainability analysis: pilot 2 + pilot 4

Social Indicators

Social Categories								
Contribution to economic development	Corruption	Health and safety	Freedom of association	Child labour	Fair salary	Migration	Rights of Indigenous people	Rights of Workers
Contribution of the sector to economic development	Public sector corruption	Rate of non-fatal accidents	Trade union density	Child labour, total ²	Living wage, per month ³	International migrant workers in the sector	Presence of indigenous population	Working time
Public expenditure on education	Active involvement of enterprises in corruption and bribery ¹	Rate of fatal accidents	Right of association		Minimum wage, per month ³	International migrant Stock ⁴	Indigenous people rights protection index	Frequency of forced labour
Adult illiteracy rate (15+years), total		DALY due to indoor and outdoor air and water pollution	Right of collective bargaining		Sector average wage, per month	Net migration rate		
Youth illiteracy rate, total		Presence of sufficient safety measure	Right to strike					

Very high risk

High risk

Medium risk

Low risk

Very low risk

No Risk

Opportunity

No data

¹ Foreign Bribery Report (OECD 2014)

² Child labour(World Bank 2017)

³ WageIndicator.org (2019)

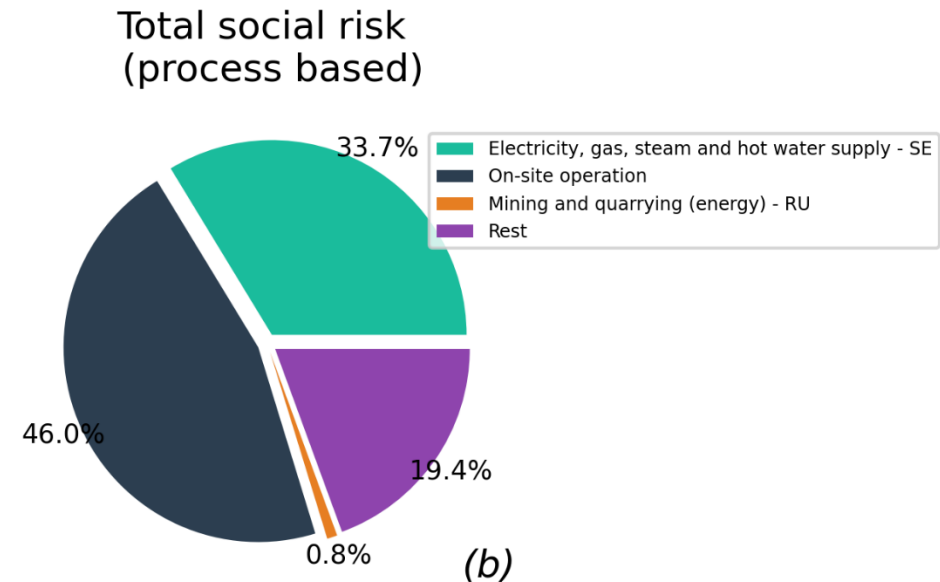
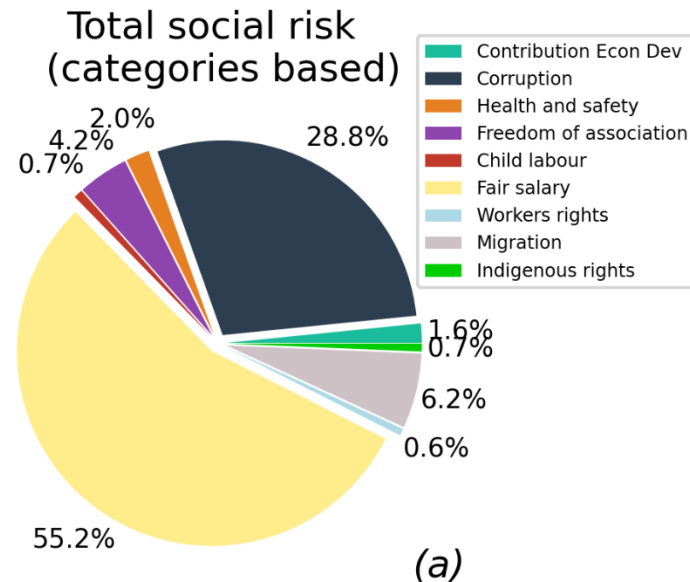
⁴ World development Indicators (World Bank 2017)

Sustainability analysis: pilot 2 + pilot 4



Social results

Final results in Risk-Hours
(total: 7.50E+07 h)





Sustainability analysis

Sustainability analysis in NEMO

- Development of a framework integrating several aspects of sustainability
- All life cycle-based indicators
- Identification of environmental, economic and social hotspot already at a pilot scale
 - Environment: trade-off between benefits and costs
 - Economy: viability is driven by the selling price of metals recovered (especially Co)
 - Social: Identification of risk at national and global scale

Future developments

- Use of primary data (on-site) should be integrated to national and global databases
- Next step: integration ? (e.g. socio-economic analysis)

Thank you !

Andrea Di Maria (KUL): andrea.dimaria@uliege.be

Karel Van Acker (KUL): karel.vanacker.kuleuven.be

Bernhard Teigler (DMT): ernstbernhard.teigler@dmt-group.com

Alberto Vazquez (CATAPA): alberto.vazquez@catapa.be

Yblin Roman (CATAPA): yblin.roman@catapa.be