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Sustainable mining: how to quantify social issues in the mining industry and metals supply chain

Claudia Di Noi¹, Franziska Eisfeldt², Andreas Ciroth¹

¹GreenDelta GmbH, ²UL EHS

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Social LCA – Challenges and solutions in application and implementation

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Framework



Challenges – social issues

- **Dynamic**, cause-effect relations among social and socio-economic risks and impacts
- How to understand the **local context**
- **Complementarity** with the other sustainability dimensions
- How to measure issues expressed in a **qualitative** way
- **Data quality**

Challenges – social issues **in mining**

- How to **balance** business, environmental protection and social fairness
- **Positive** and **negative** impacts

Challenges – social issues in mining

- Positive and negative impacts

Job creation

Poor working conditions

Infrastructure construction

Rise of the cost of living

Local development

Resettlement, limited access to resources

Economic and income growth

Unfair distribution of the profit

Population growth

Social tensions and matters

Human health and safety issues

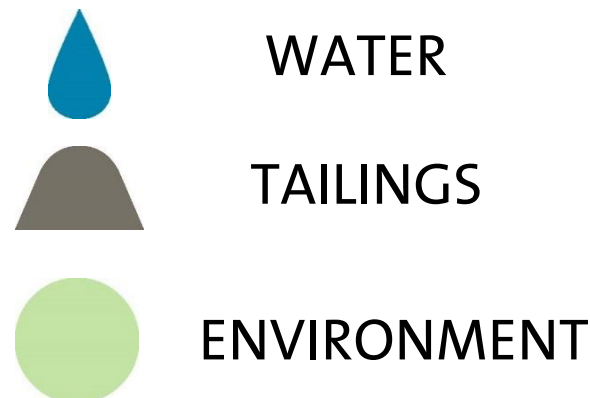
Discrimination

Challenges – social issues **in mining**

- How to **balance** business, environmental protection and social fairness
- **Positive** and **negative** impacts
- How to approach **local communities**
- **Collaboration** with the mine sites/companies
- **Data collection**
- How to measure risks/impacts in the **supply chain**

Integrated Mineral Technologies for more Sustainable Raw Material Supply

- H2020 issue “Sustainable selective low impact mining”
- 3 years: 1.6.2017 – 31.5.2020
- 7.9 M€ budget
- 16 partners



The ITERAMS project

▪ Sustainability assessment

- Environmental
- Cost
- Social

▪ Local communities

- Social perception
- Communication channels
- Communication action plan

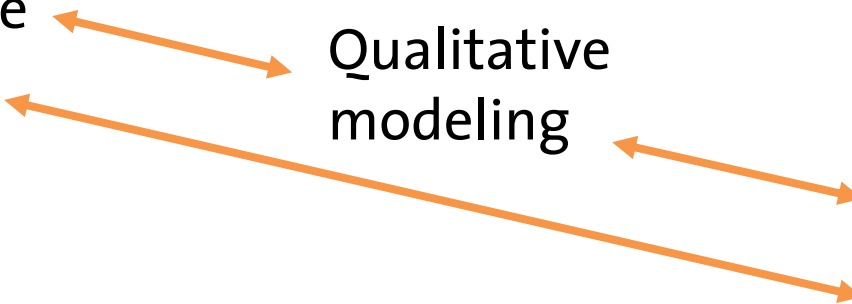


Social hotspots screening

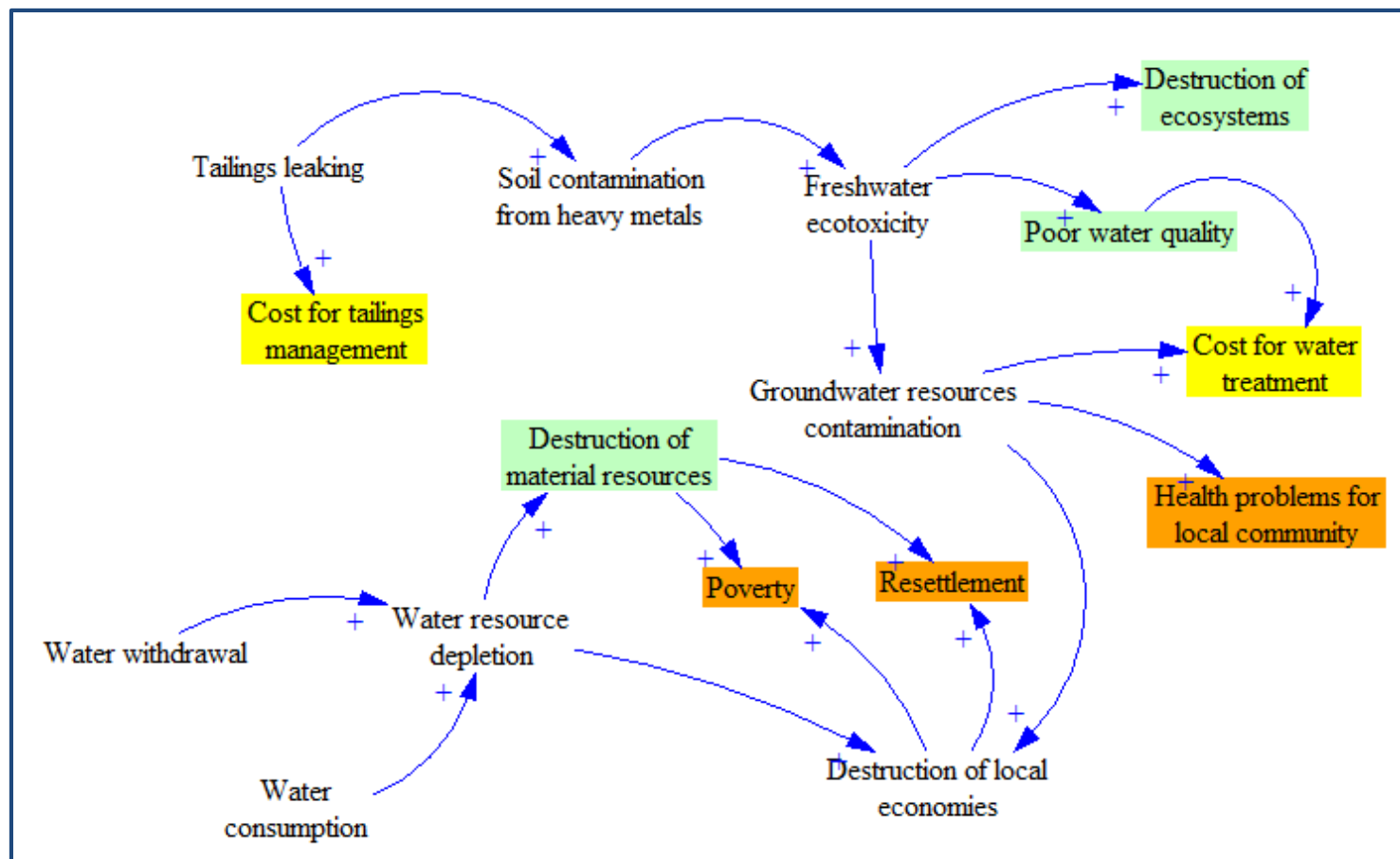
Literature
research

Qualitative
modeling

Social
LCA

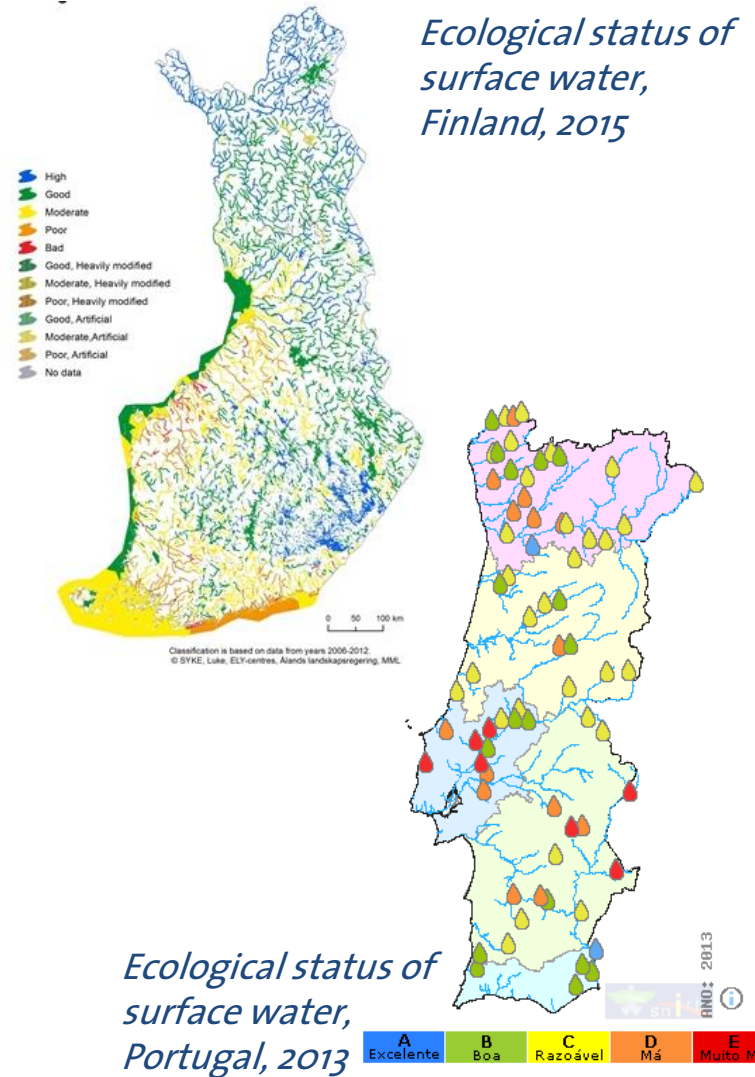


Understanding – a qualitative model



Understanding - the context of mining

- Vulnerability of local communities, e.g. their dependence on local water reserves
- Availability and quality of water and mineral resources
- Conflicts with other industries
- Importance of mining for the local/national economy
- Risks on a national scale (not sector-specific)
- Steadiness of risks/impacts



SLCA screening – a first quantification

- Country: Finland, Portugal
- Database: PSILCA
- IAM: Social Impacts Weighting Method in PSILCA
- Process: Mining of metal ores

SLCA screening steps:

1. Define social risks (without upstream chain)
2. Calculate social risks and impacts over the life cycle
3. Compare results with an average country sector
4. Explore relations between social impacts and governance and human development

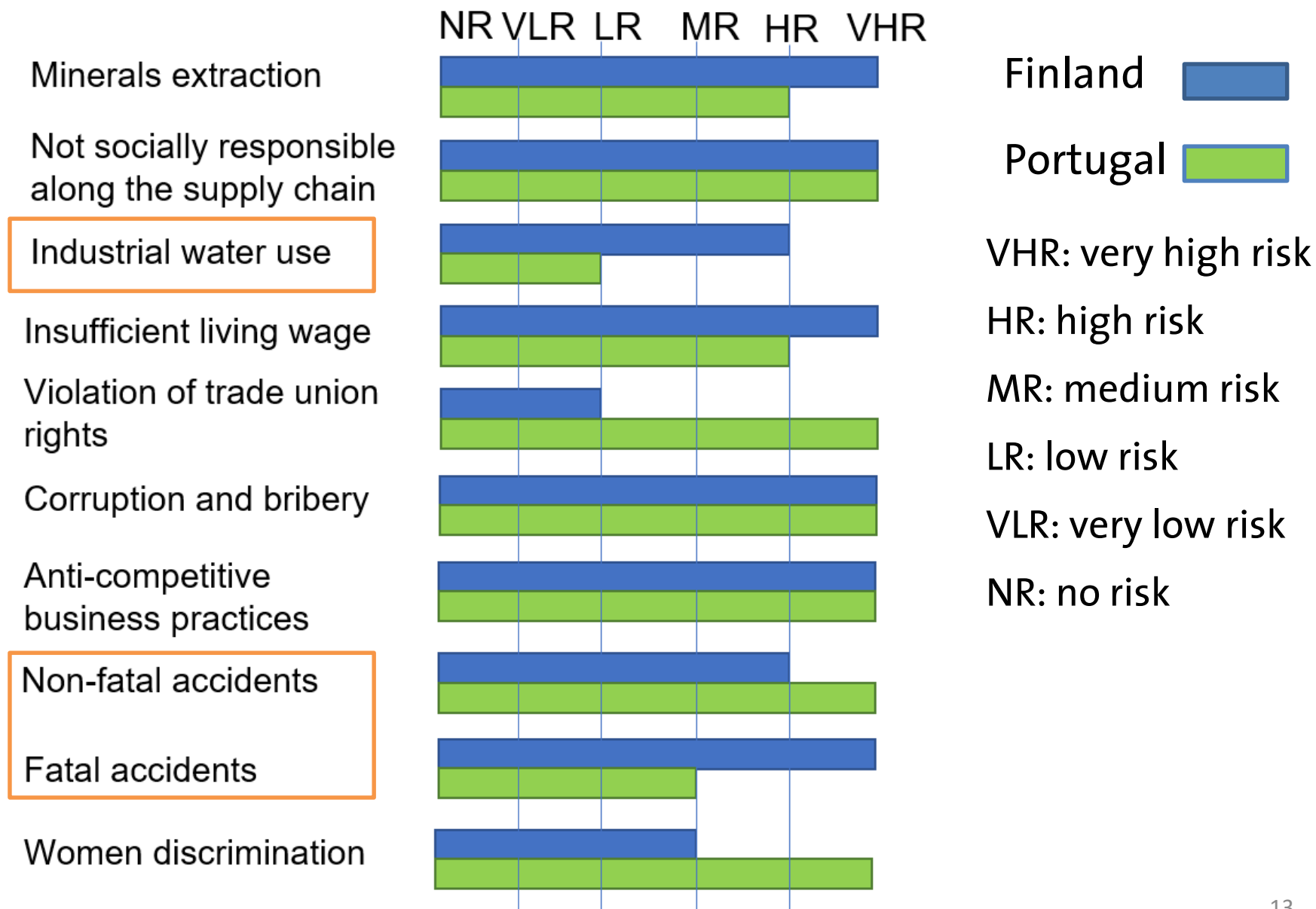
1. Social risks in the sector

Social aspects for the process Mining of metal ores, Finland, from PSILCA database

▼ Social assessment

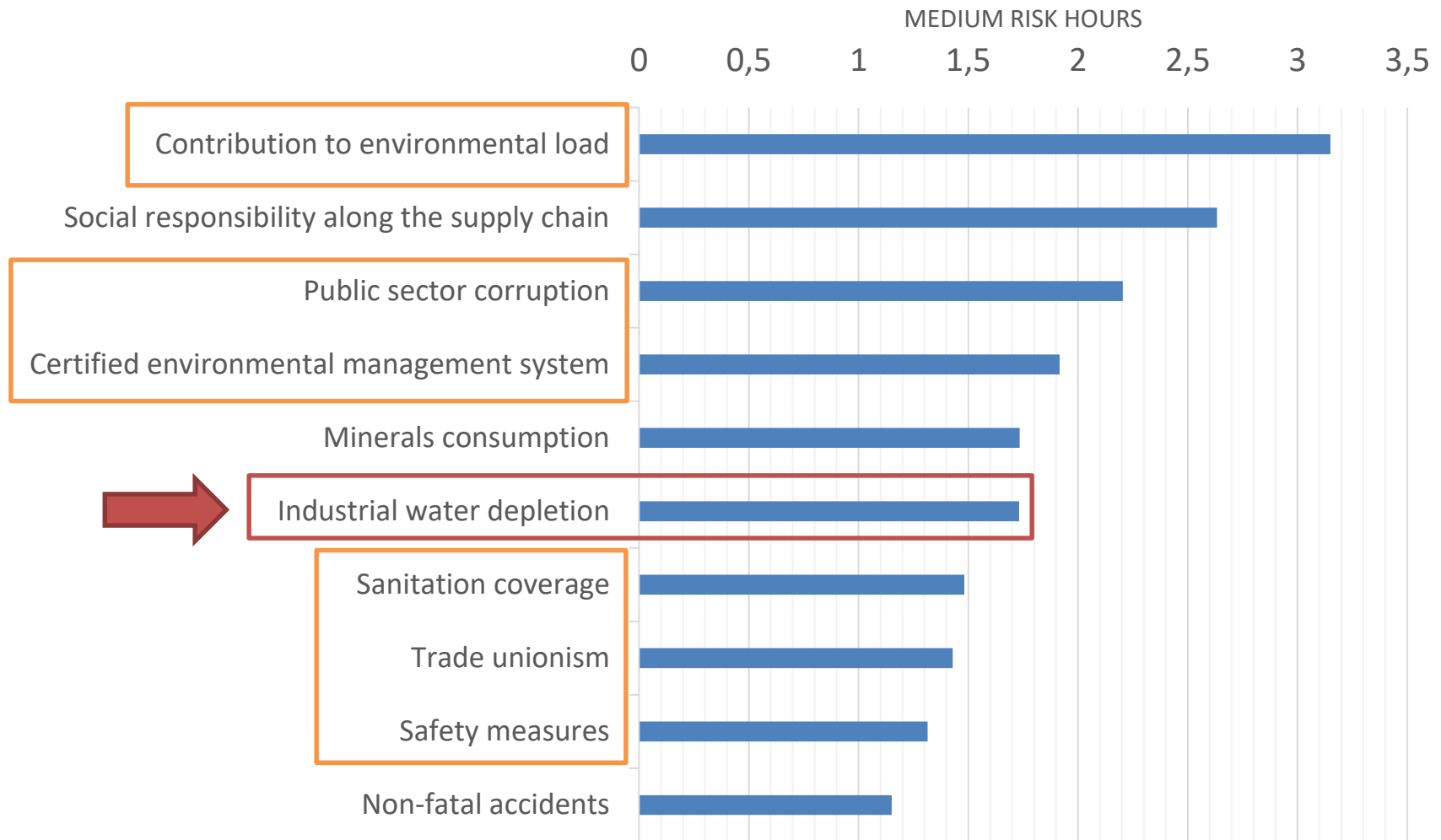
Name	Raw value	Risk level	Activity variable	Data quality	Comment	Source
▼ Local Community						
▼ Respect of indigenous rights						
👤 Presence of indigenous population	1 [Y/N]	Medium risk	0.00563033842697635 [h,...	(1;1;1;1;n.a.)	Data from: 2015; Las...	📖 FAO 2017: Presen...
👤 Human rights issues faced by indigenous people	3 [Score]	Medium risk	0.00563033842697635 [h,...	(2;3;1;1;n.a.)	Ratification of ILO C...	📖 ILO 1989: Indigen...
▼ Access to material resources						
👤 Extraction of ores	3.3592 [t/cap]	Very low risk	0.00563033842697635 [h,...	(2;1;4;1;n.a.)	Data from: 2013; Las...	📖 SERI/ WU Vienna ...
👤 Extraction of industrial and construction minerals	22.3624 [t/cap]	Very high risk	0.00563033842697635 [h,...	(2;1;4;1;n.a.)	Data from: 2013; Las...	📖 SERI/ WU Vienna ...
👤 Extraction of biomass (related to population)	10.2463 [t/cap]	High risk	0.00563033842697635 [h,...	(2;1;4;1;n.a.)	Data from: 2013; Las...	📖 SERI/ WU Vienna ...
👤 Level of industrial water use (related to renewable water resources)	1.930909091 [% of renewable]	Low risk	0.00563033842697635 [h,...	(2;2;5;1;5)	Data from: 1995; Las...	📖 FAO 2017: Water ...
👤 Certified environmental management systems	6.360856269 [# per 10k empl.]	Medium risk	0.00563033842697635 [h,...	(1;1;2;1;2)	Value calculated wit...	📖 ISO 2017: CEMS
👤 Level of industrial water use (related to total withdrawal)	32.3 [% of total]	High risk	0.00563033842697635 [h,...	(2;2;5;1;5)	Data from: 1995; Las...	📖 FAO 2017: Water ...

1. Social risks in the sector



2. Results: S-LCA screening

- Metal ores, Finland, PSILCA (1 USD output)



2. Results: S-LCA screening

- Industrial water depletion, metal ores mining sector, Finland

Contribution	Process
✓ 100.00%	■ Metal ores - FI
> 77.89%	■ Manufacture of basic metals - FI
> 17.00%	■ Manufacture of chemicals and chemical products - FI
> 00.20%	Iron and steel mills and ferroalloy manufacturing - US
> 00.17%	Non-ferrous metals - CA

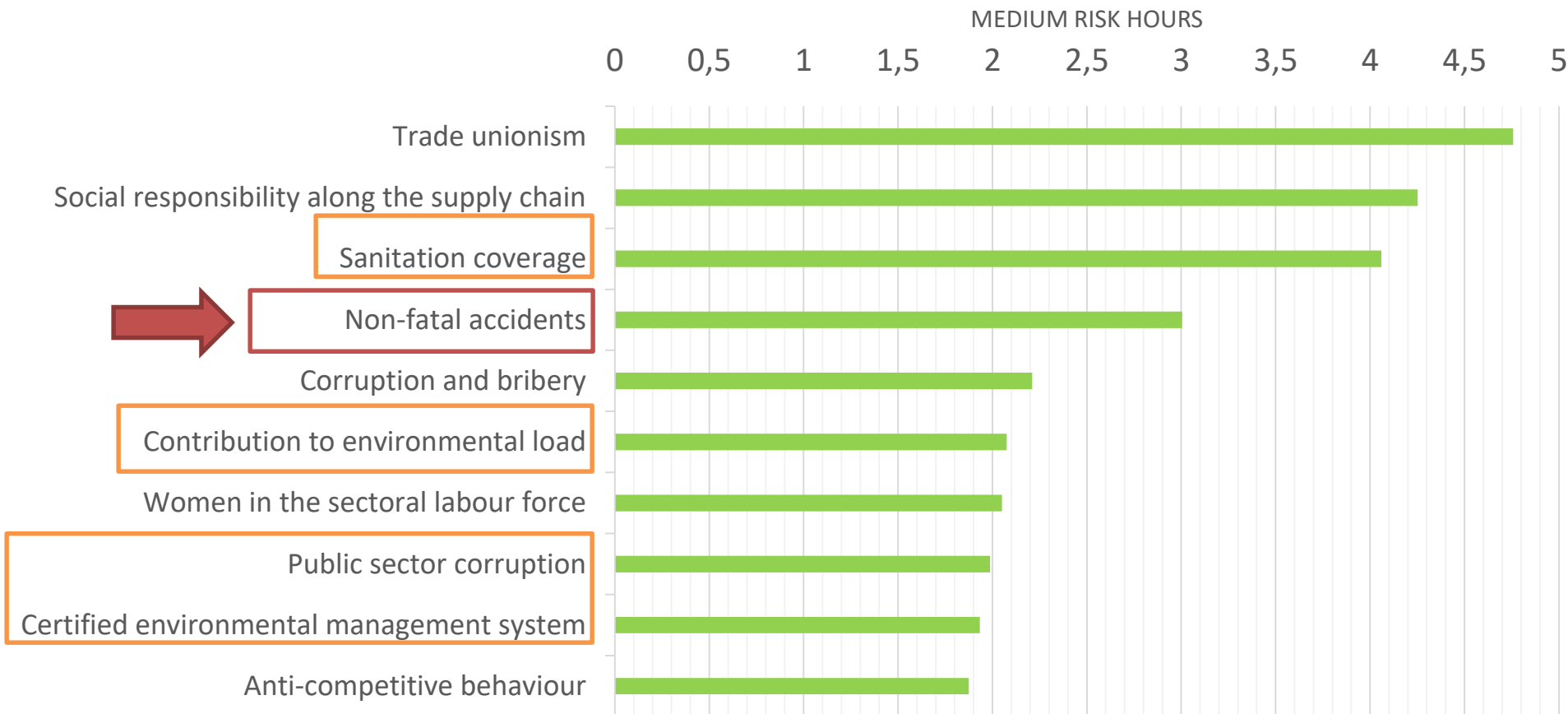
Direct process contribution to industrial water depletion

■	0.170 WU med risk hours: Machinery and equipment n.e.c. - RU
■	0.088 WU med risk hours: Non-ferrous metals - RU
■	0.081 WU med risk hours: Manufacturing n. e. c. & recycling - RU
■	0.078 WU med risk hours: Construction - RU
■	0.067 WU med risk hours: Iron and Steel - RU
■	1.247 WU med risk hours: Other



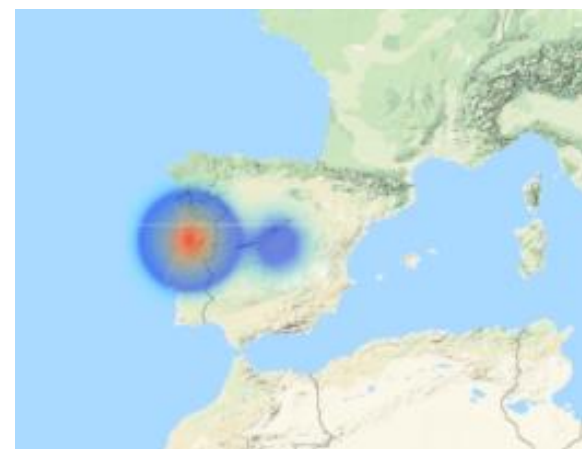
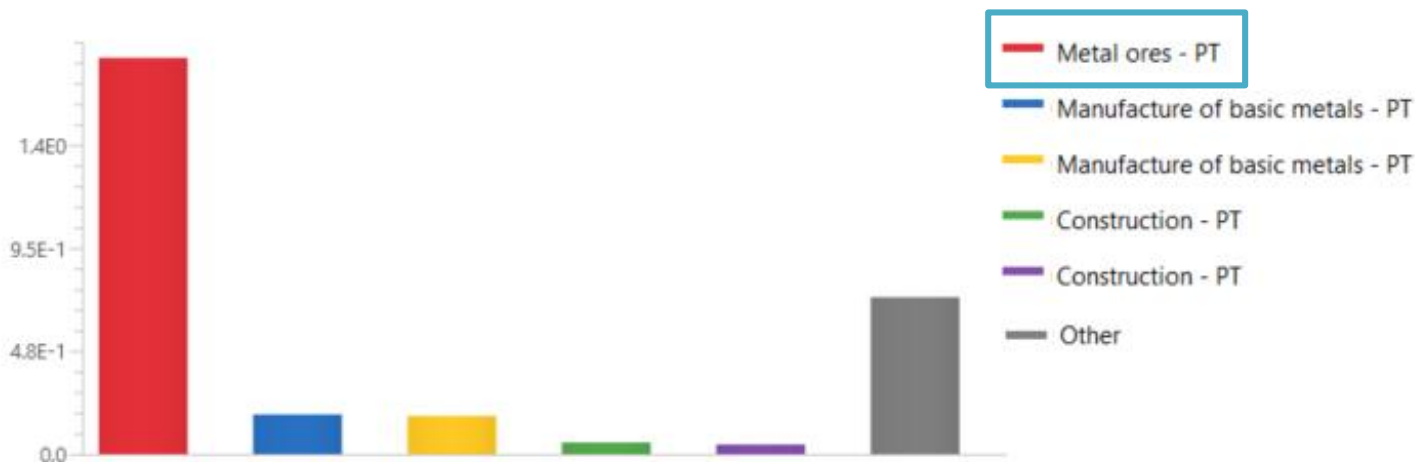
2. Results: S-LCA screening

- Metal ores, Portugal, PSILCA (1 USD output)

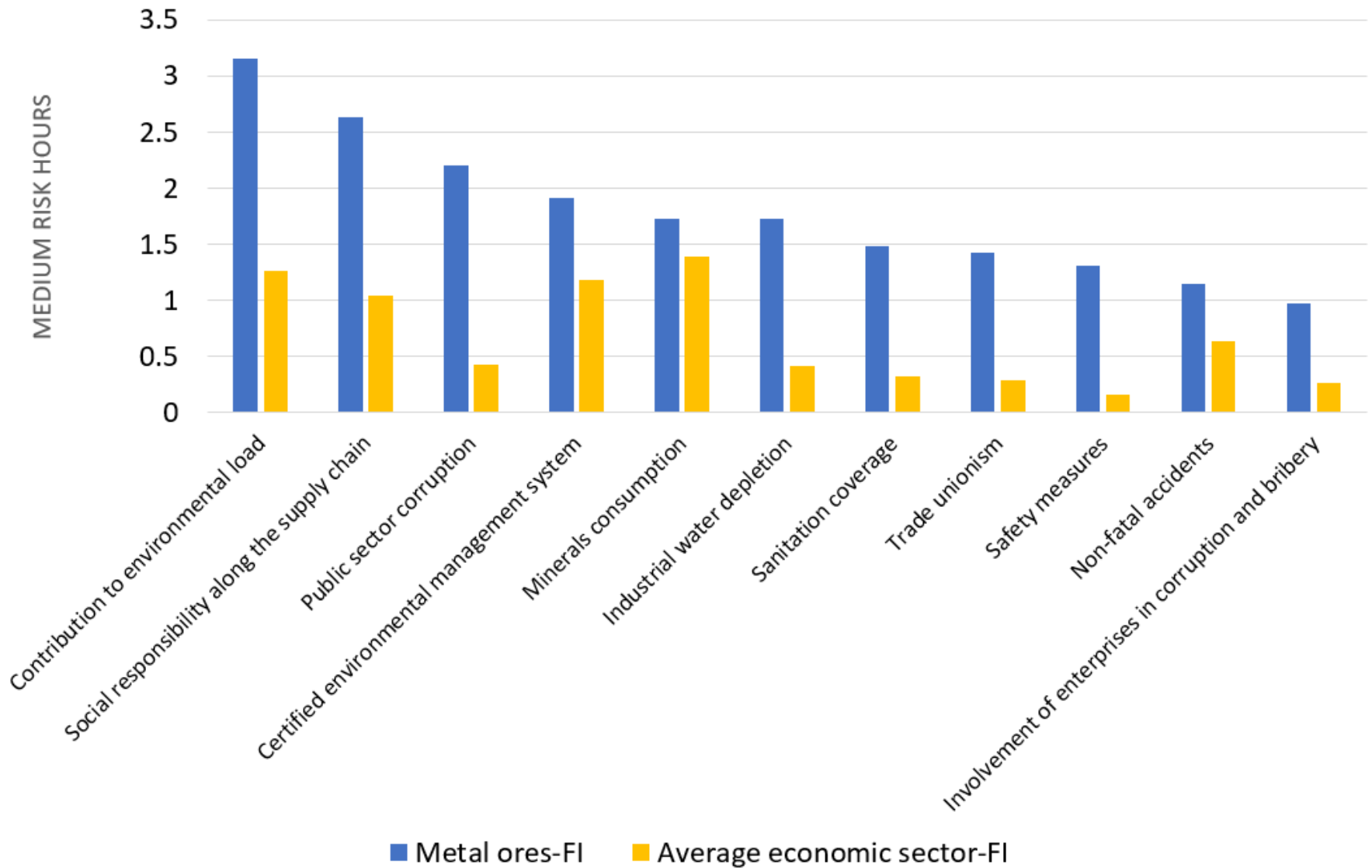


2. Results: S-LCA screening













- Non-fatal accidents, metal ores mining sector, Portugal



3. Comparison with an average country sector



4. Social and governance situation

Worldwide Governance Indicators	Finland	Portugal
Voice and Accountability	 1.55	 1.21
Political Stability and Absence of Violence/Terrorism	 1.07	 1.08
Government Effectiveness	 1.94	 1.33
Regulatory Quality	 1.82	 0.91
Rule of Law	 2.03	 1.13
Control of Corruption	 2.22	 0.87

“Estimate of governance ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance” (World Bank 2017)

Primary data collection and creation of the foreground model

Indicator	Data source and description of the value	Overall value		Ore mining	
Reference year		2017	2018	2017	2018
Non-fatal accident rate					
Number of workers					
Number of cases of non-fatal accidents					
Risk of non-fatal accidents (qualitative assessment)		select	select	select	select
Fatal accident rate					
Number of cases of fatal accidents					
Risk of fatal accidents (qualitative assessment)		select	select	select	select
Spending on locally based suppliers					
General information: Rate of non-fatal accidents at workplace					
		t	select	select	select

Additional information

Unit of measurement #/yr and 100k empl.

Evaluation schema 0- < 750 = very low risk; 750- < 1500 = medium risk; 1500- < 2250 = medium risk; 2250- < 3000 = very high risk; no data

Outputs

Flow

Public sector corruption; very low risk
Rate of fatal accidents at workplace; very high risk
Rate of non-fatal accidents at workplace; high risk
Right of Association; no risk

Amount	Unit
0.00563	h
0.00563	h
0.00563	h
0.00563	h

The way forward

- Involve local communities in data collection
- Study of background situations

- To be able to quantify social impacts we should first understand what there is **behind**
- **Context** is crucial
- **Collaboration** is needed between all parties involved
- The choice of the **tools** used for the assessment influences the data collection approach

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- Pictures slide 2:

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Thank you!

The logo for GreenDelta is a green rectangle with the word "GreenDelta" in white, bold, sans-serif font. Below it, in a smaller white font, is the text "sustainability consulting + software".

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Contact

Claudia Di Noi

GreenDelta GmbH

Müllerstrasse 135, 13349 Berlin

dinoi@greendelta.com

www.greendelta.com