

Willkommen
Welcome
Bienvenue



Assessing Supply Risks within Life Cycle Sustainability Assessment – a Critical Review of Supply Risk Indicators

World Resource Forum conference, Geneva, 23 – 24 October 2019

Marcus Berr, Roland Hirschler, Patrick Wäger

Technology & Society Laboratory (TSL),

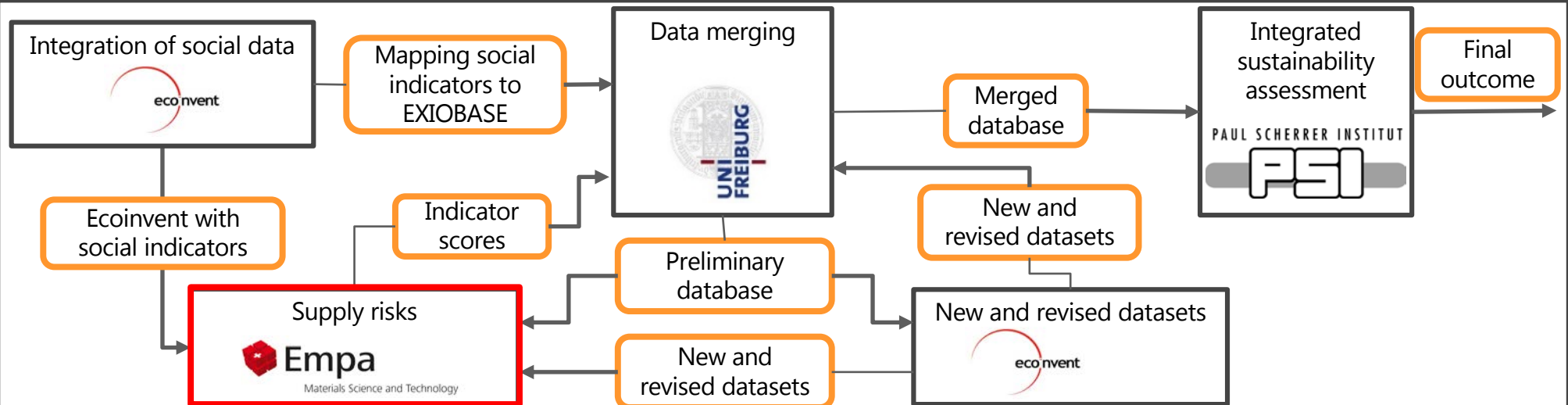
Empa, Lerchenfeldstrasse 5, 9014 St. Gallen, Switzerland

marcus.berr@empa.ch

Overview and Introduction

Open Assessment of Swiss Economy and Society (OASES)

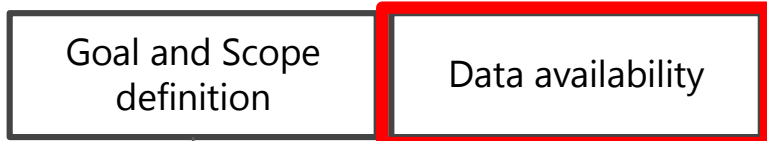
Objective: Significant improvement of social, economic and environmental impact assessment of Swiss production and consumption



Final outcome: Complete sustainability assessment of Swiss production and consumption

Methods

Supply risk describes the supply disruption potential for the utilized material(s).
Criticality = supply risk * vulnerability to supply disruption



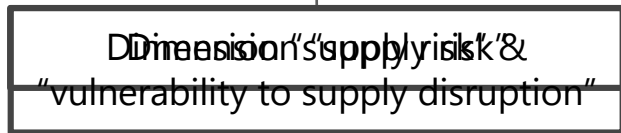
influence | influence



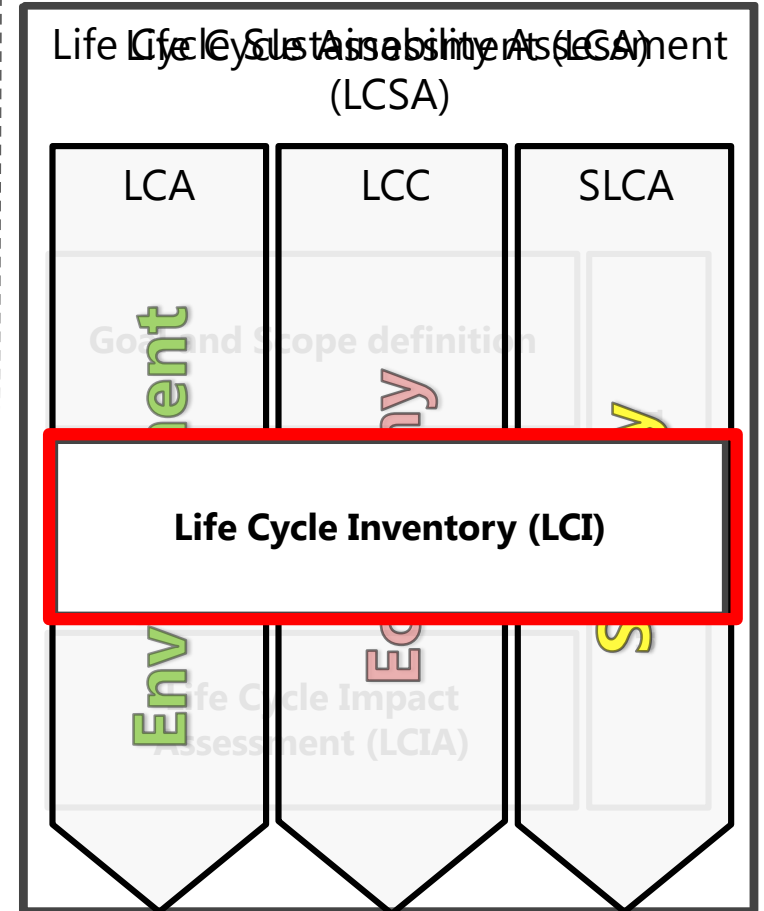
quantify



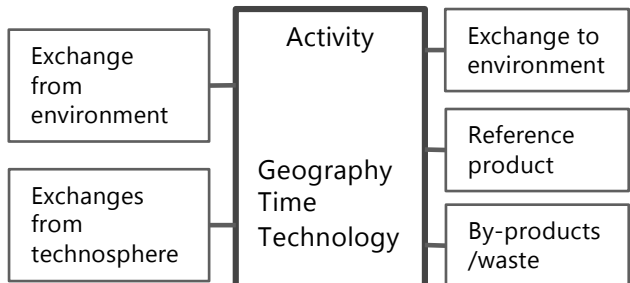
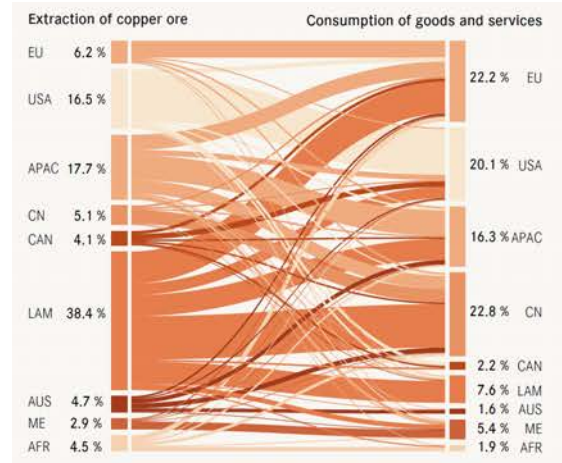
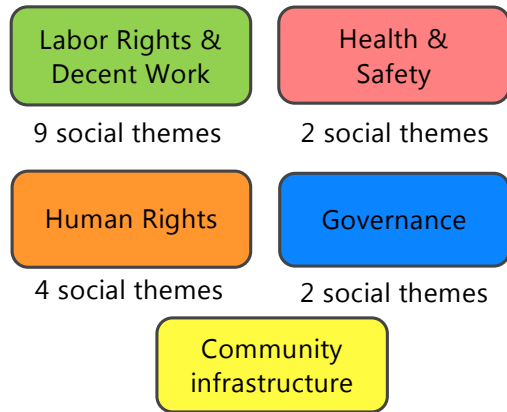
aggregated and weighted



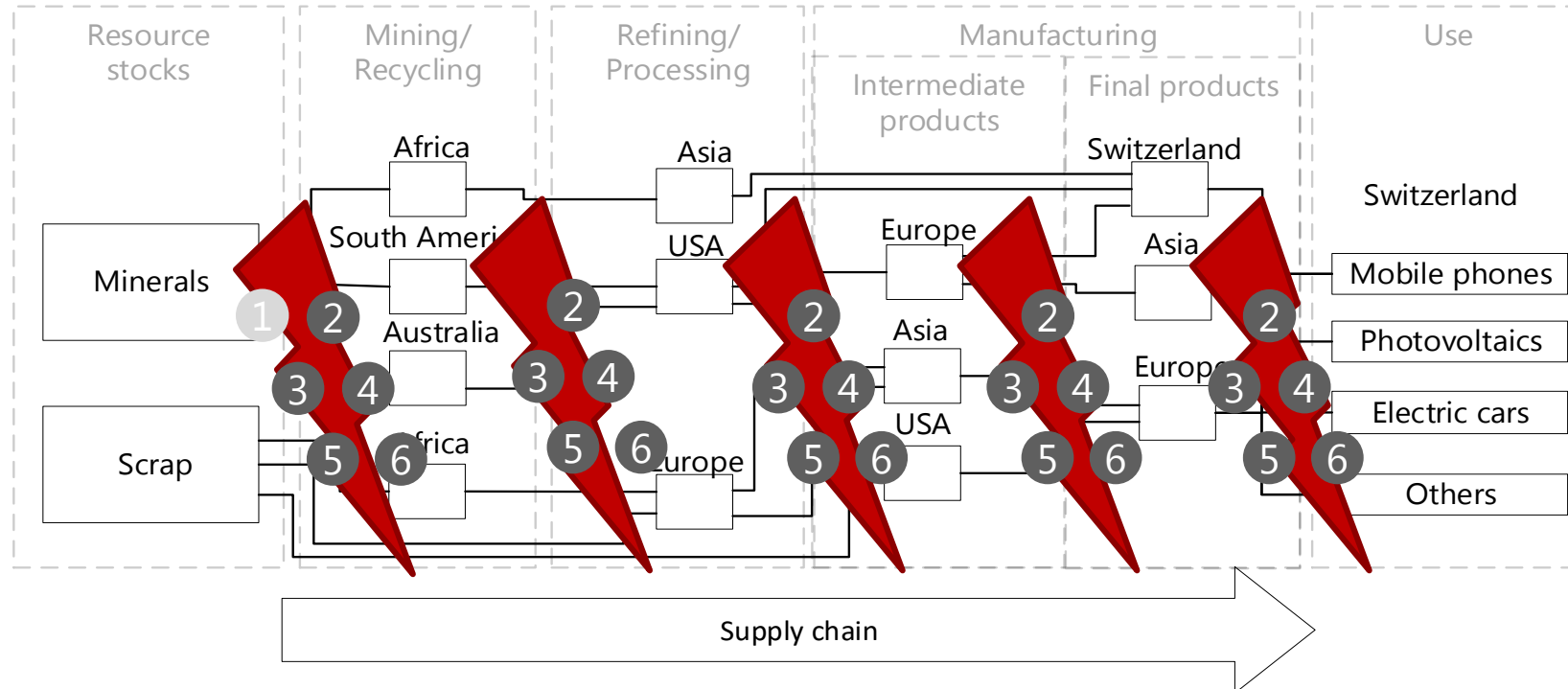
Review of **supply risk indicators** suitable for assessing supply risks along the **supply chain** within a **LCSA**



Methods

Database	ecoinvent	EXIOBASE	Social Hotspot Database																														
<p>Database characteristics</p>	<p>Process data</p> <ul style="list-style-type: none"> • 17,000 datasets • Market and transforming activities • Many different sectors • On global and/or country-specific level 	<p>Full trade matrices</p> <ul style="list-style-type: none"> • Supply and demand data • 43 countries + 5 RoW • 160 sectors and 200 product categories  <table border="1"> <caption>Extraction of copper ore vs Consumption of goods and services</caption> <thead> <tr> <th>Region</th> <th>Extraction of copper ore (%)</th> <th>Consumption of goods and services (%)</th> </tr> </thead> <tbody> <tr><td>EU</td><td>6.2 %</td><td>22.2 %</td></tr> <tr><td>USA</td><td>16.5 %</td><td>20.1 %</td></tr> <tr><td>APAC</td><td>17.7 %</td><td>16.3 %</td></tr> <tr><td>CN</td><td>5.1 %</td><td>22.8 %</td></tr> <tr><td>CAN</td><td>4.1 %</td><td>2.2 %</td></tr> <tr><td>LAM</td><td>38.4 %</td><td>7.6 %</td></tr> <tr><td>AUS</td><td>4.7 %</td><td>1.6 %</td></tr> <tr><td>ME</td><td>2.9 %</td><td>5.4 %</td></tr> <tr><td>AFR</td><td>4.5 %</td><td>1.9 %</td></tr> </tbody> </table>	Region	Extraction of copper ore (%)	Consumption of goods and services (%)	EU	6.2 %	22.2 %	USA	16.5 %	20.1 %	APAC	17.7 %	16.3 %	CN	5.1 %	22.8 %	CAN	4.1 %	2.2 %	LAM	38.4 %	7.6 %	AUS	4.7 %	1.6 %	ME	2.9 %	5.4 %	AFR	4.5 %	1.9 %	<p>5 social theme tables</p> <ul style="list-style-type: none"> • Raw secondary data (qualitative & quantitative) • 57 sectors • 113 countries  <ul style="list-style-type: none"> 9 social themes 2 social themes 4 social themes 2 social themes 5 social themes
Region	Extraction of copper ore (%)	Consumption of goods and services (%)																															
EU	6.2 %	22.2 %																															
USA	16.5 %	20.1 %																															
APAC	17.7 %	16.3 %																															
CN	5.1 %	22.8 %																															
CAN	4.1 %	2.2 %																															
LAM	38.4 %	7.6 %																															
AUS	4.7 %	1.6 %																															
ME	2.9 %	5.4 %																															
AFR	4.5 %	1.9 %																															

Results and Discussion



Examples of possible supply disruptions

Resource depletion	1	Monopolistic supply	3	Supply-demand imbalance	5
Policy disputes	2	Political conflicts	4	Trade restrictions	6

Results and Discussion

Supply risk indicator	Sub-indicator (examples)
Depletion time	Reserve-production ratio
Companion fraction	Co-production-total production ratio
Country supply diversity	Herfindahl-Hirschman Index
Company supply diversity	Herfindahl-Hirschman Index
Political stability	Worldwide Governance Index
Recycling potential	Scrap-demand ratio
Environmental/social regulation	Environmental Performance Index
Demand growth	Future demand-current supply ratio
Price volatility	Current to past price comparison
Substitutability	Substitutability Index
Trade restrictions	Enabling Trade Index
Import dependency	Import reliance-demand ratio





Data requirements for sub-indicators

- Supplying countries/companies
- National supply volumes
- National import and export volumes
- National secondary supply volumes
- Current national demand volumes
- Future/past national demand volumes
- Average global commodity prices
- Evaluation of national political stability
- Evaluation of potential supply restrictions by national environmental/social policies
- Evaluation of the product-specific availability and performance of material substitutes
- Evaluation of national-specific trade facilitation for existing trade relations

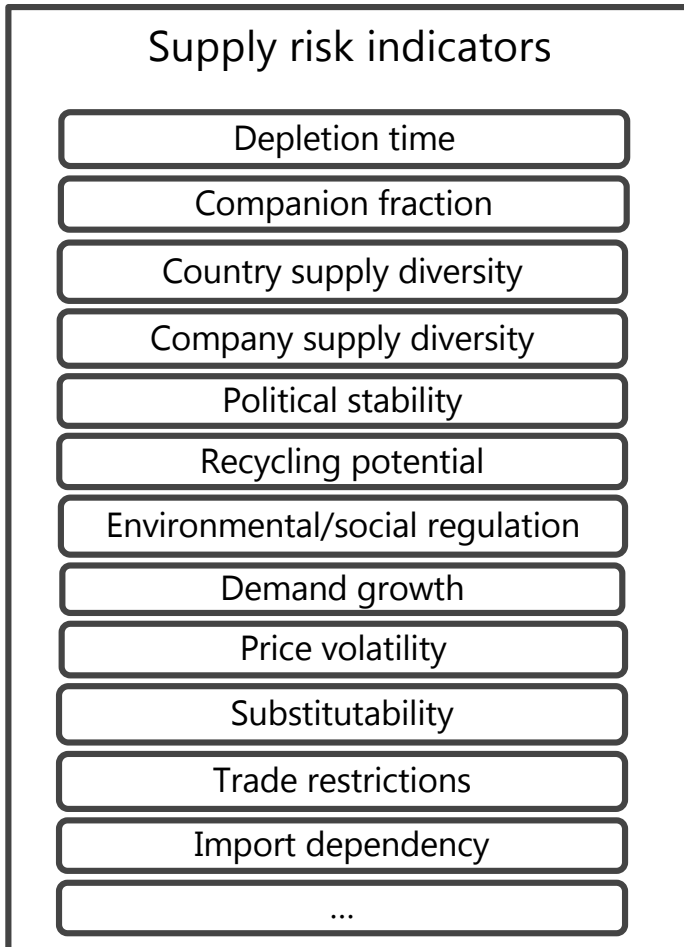
Results and Discussion

Resource stocks	Mining/ Recycling	Refining/ Processing	Manufacturing	
			Intermediate products	Final products
Depletion time				
Companion fraction				
Country supply diversity		Country supply diversity	Country supply diversity	Country supply diversity
Company supply diversity		Company supply diversity	Company supply diversity	Company supply diversity
Political stability		Political stability	Political stability	Political stability
Recycling potential		Recycling potential	Recycling potential	Recycling potential
Environmental/social regulation		Environmental/social regulation	Environmental/social regulation	Environmental/social regulation
Demand growth		Demand growth	Demand growth	Demand growth
Price volatility		Price volatility	Price volatility	Price volatility
Substitutability		Substitutability	Substitutability	Substitutability
Trade restrictions		Trade restrictions	Trade restrictions	Trade restrictions
Import dependency		Import dependency	Import dependency	Import dependency

Legend:

	-Good data quality and quantity -Indicator regularly applied
	-Little amount / low quality data -Indicator regularly applied
	-Little amount / low quality data -High data acquisition effort -Indicator marginally applied
	-Lack of data in currently used databases -Indicator not applied

Conclusion and Outlook

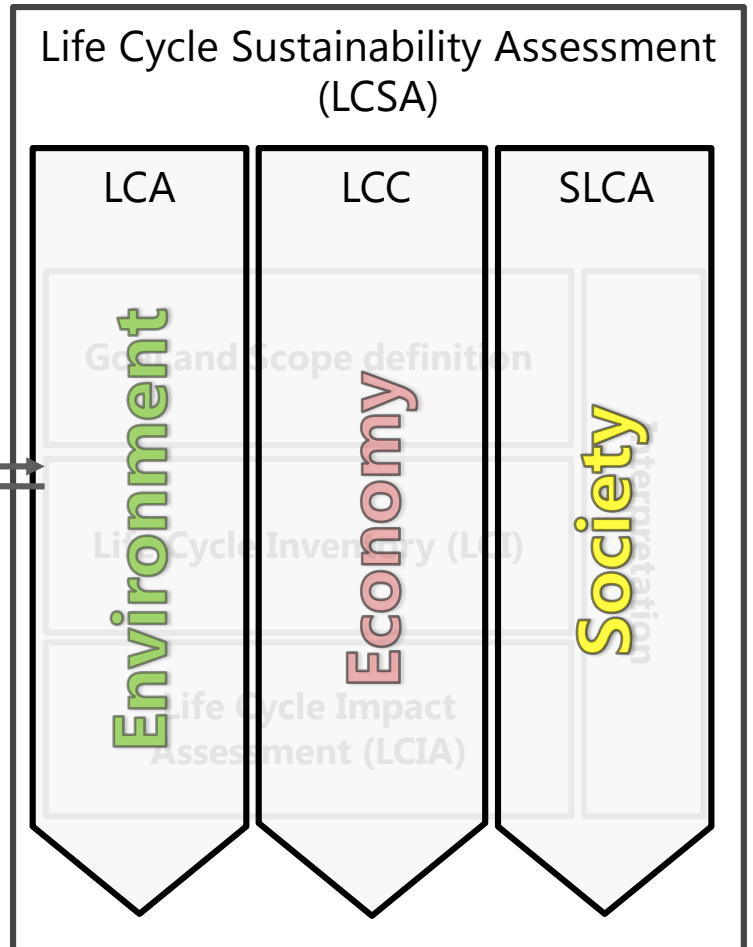


To conclude:

Data needs for assessing supply risks along the entire supply chain cannot be provided by databases currently used within criticality assessment.

Next step:

How well can commonly used supply risk indicators be quantified by databases used within LCA methodology, when assessing supply risks along the supply chain?



Questions?



Thank you for your attention!

Marcus Berr
marcus.berr@empa.ch
Advancing Life Cycle Assessment (ALCA) Group
Technology & Society Laboratory

Empa St. Gallen
Lerchenfeldstrasse 5,
9014 St. Gallen, Switzerland
<https://www.empa.ch/web/s506>