ITERAMS

GreenDelta

6th INTERNATIONAL SOCIAL LCA CONFERENCE

People and Places for Partnership - Pescara 2018

COMPLEMENTARITY OF SOCIAL AND ENVIRONMENTAL INDICATORS IN ASSESSING THE SUSTAINABILITY OF THE MINING INDUSTRY

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2 INDEPENDENT

SOCIETY

asks for

Resources

Social responsibility

Environmental protection

Legislation framework

With a pressure on

MINING INDUSTRY

COMPLEMENTARITY AND OVERLAPPING

Overlapping: environmental and social indicators and risks may investigate the same area of concern, problem

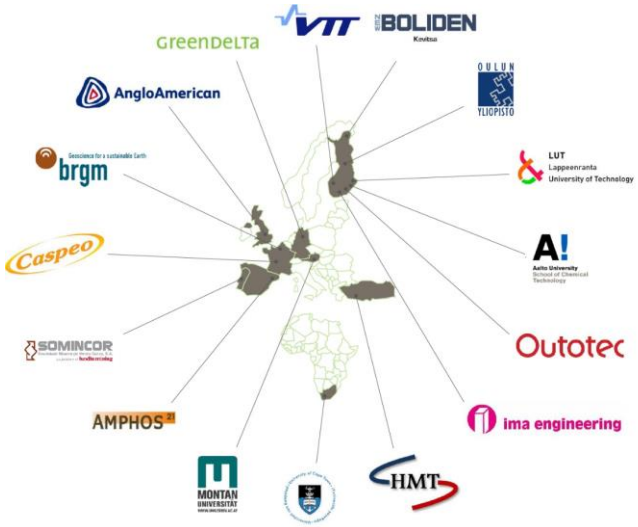
BUT

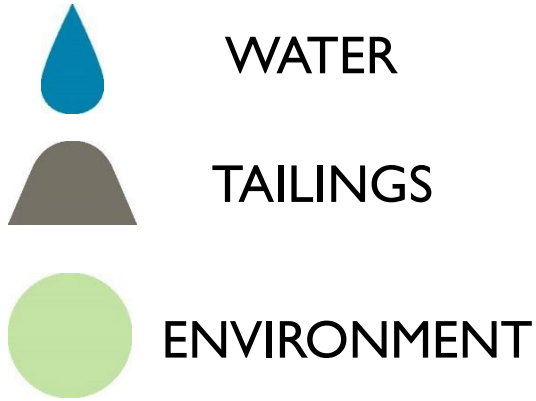
they may express different consequences, characters, stakeholders

Complementarity: e- and s-LCA influence eachother by triggering and reinforcing risks and impacts

INTEGRATED MINERAL TECHNOLOGIES FOR MORE SUSTAINABLE RAW MATERIAL SUPPLY

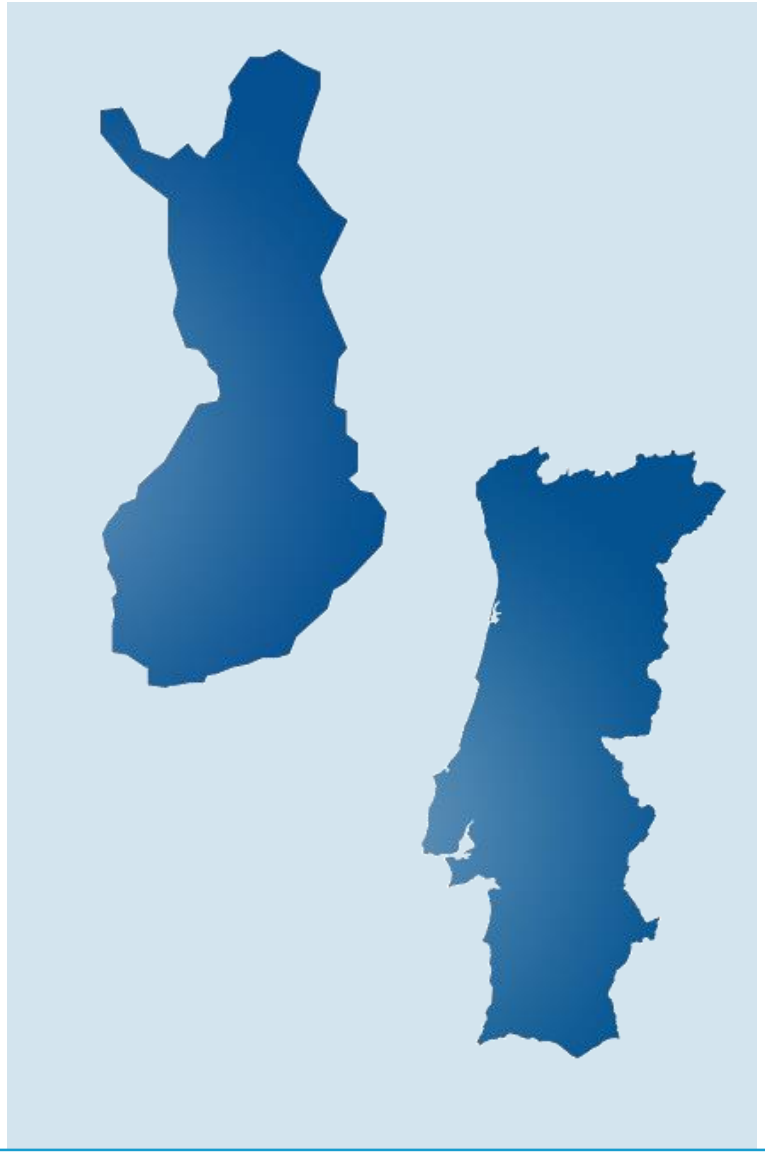
- H2020 issue "Sustainable selective low impact mining"
- 3 years: 1.6.2017 – 31.5.2020
- 7.9 M€ budget
- 16 partners





E- AND S-LCA SCREENING APPROACH

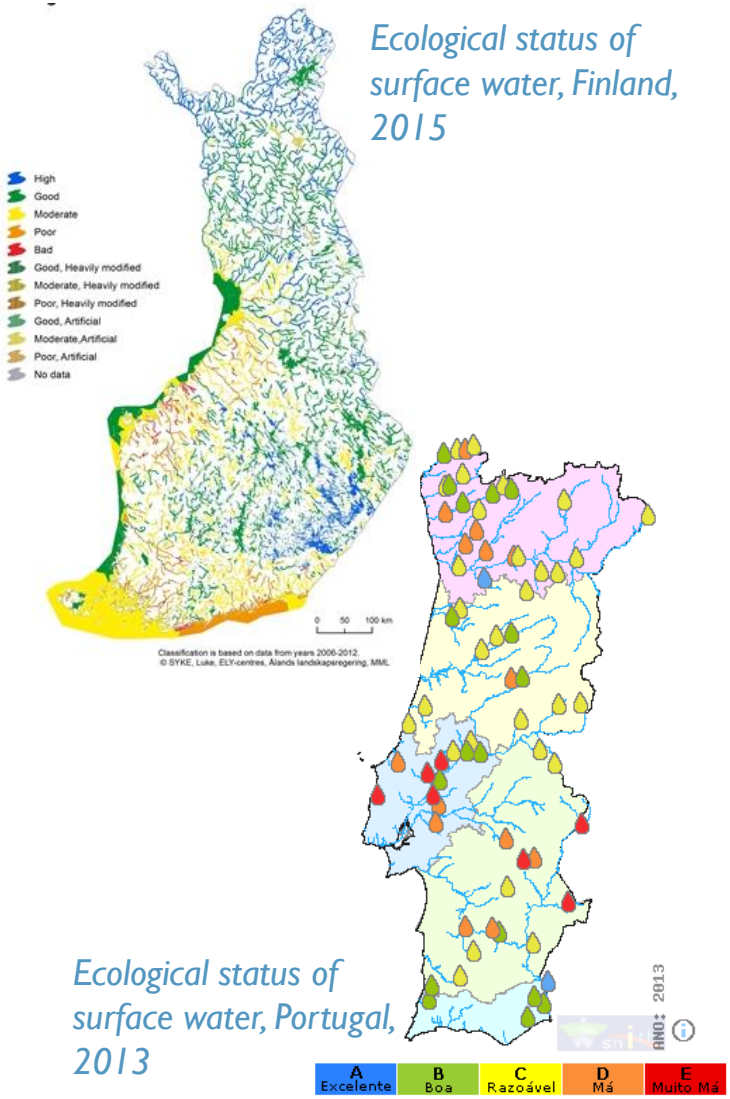
- **Country** selection: Finland, Portugal
- **Database** selection: sLCA-> PSILCA; eLCA-> ecoinvent, EXIOBASE
- **Methods** selection: ILCD 2011 Midpoint+, ReCiPe, Boulay et al. (2011), CML-IA baseline, EXIOBASE built-in LCIAM, Social impacts weighting method in PSILCA
- **Process** selection: PSILCA-> Metal ores; ecoinvent-> copper mine operation, copper production, primary; EXIOBASE -> copper ores and concentrates



E- AND S-LCA SCREENING APPROACH

Context of the mining activity

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



Ecological status of surface water, Finland, 2015

Ecological status of surface water, Portugal, 2013

RESULTS: A COMPLEMENTARY VIEW ON THE TOPIC

- A number of indicators emerged as important to describe potential impacts both on society and environment

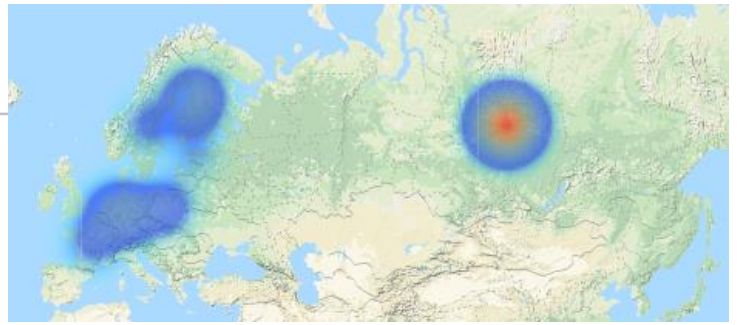
Social screening (PSILCA)		
Category	**Subcategory**	**Indicator**
Local community	Access to material resources	Level of industrial water use (related to total withdrawal or to actual renewable resources)
		Extraction of industrial and construction minerals
		Extraction of ores
		Certified environmental management systems (CEMs)
	Safe and healthy living conditions	Pollution level of the country
		Contribution of the sector to environmental load
		Contribution of the sector to environmental load, CO2-equiv, I-GHG-CO2eTOTAL_agg
Environmental screening		
Database	**Assessment method**	**Category**
ecoinvent	ILCD	Resource depletion - water
		Resource depletion – mineral, fossils and renewables
	ILCD, CML baseline, ReCiPe	Climate change
		Human toxicity
	ReCiPe	Water depletion
		Metal depletion
EXIOBASE	EXIOBASE	Water Consumption Blue
		Water Withdrawal Blue

ACCESS TO MATERIAL RESOURCES: WATER, FINLAND

- Metal ores, Finland, PSILCA

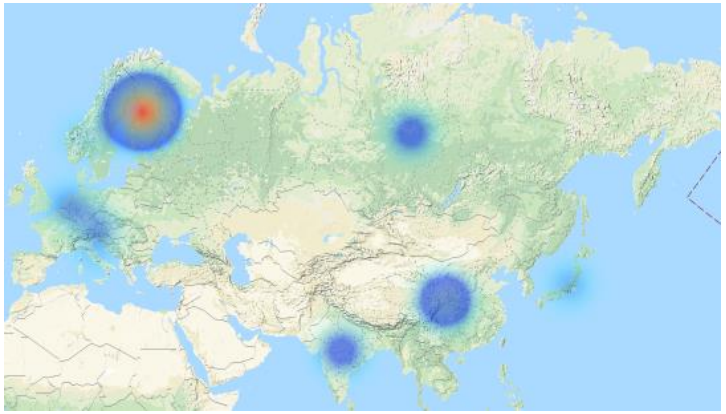
Impact category: Industrial water depletion

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
00.11%	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying - EE
00.11%	Basic ferrous metals - DE



- Copper ores and concentrates, Finland, EXIOBASE

Name	Category
Water Withdrawal Blue - Total	
P Electricity by gas - RU	EXIOBASE / Russian Federation
P Electricity by nuclear - RU	EXIOBASE / Russian Federation
P Electricity by petroleum and other oil derivatives - EE	EXIOBASE / Estonia
P Electricity by biomass and waste - FI	EXIOBASE / Finland
P Plastics, basic - FI	EXIOBASE / Finland
P Paper and paper products - FI	EXIOBASE / Finland
Water Withdrawal Blue - Manufacturing	
P Plastics, basic - FI	EXIOBASE / Finland
P Paper and paper products - FI	EXIOBASE / Finland
P Chemicals nec - FI	EXIOBASE / Finland
P P- and other fertiliser - FI	EXIOBASE / Finland
Water Consumption Blue - Manufacturing	
P Plastics, basic - FI	EXIOBASE / Finland
P Paper and paper products - FI	EXIOBASE / Finland
P Chemicals nec - FI	EXIOBASE / Finland

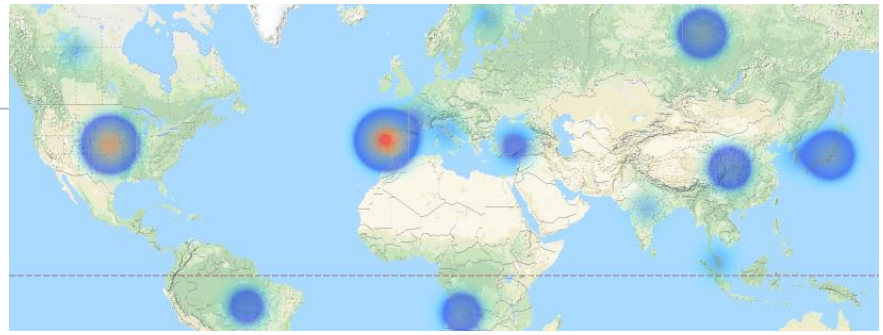


Impact localization: Water withdrawal - Manufacturing

SAFE AND HEALTHY LIVING: ENV. LOAD, PORTUGAL

Metal ores, Portugal, PSILCA

Impact category: Contribution to environmental load



Contribution	Process
100.00%	Metal ores - PT
30.69%	Manufacture of basic metals - PT
07.91%	Manufacture of basic metals - FI
07.70%	Pig iron - JP
06.68%	Basic ferrous metals - DE
05.84%	Basic non-ferrous metals - DE
05.20%	Nonferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying - US
04.23%	Re-export - DE
03.60%	Other non-ferrous metals - JP

Copper mine operation, RER, ecoinvent

Impact category: Particulate matter - ILCD 2011 Midpoint+

Contribution	Process
100.00%	copper mine operation, sulfide ore | copper concentrate, sulfide ore | Cutoff, U - RER
13.98%	market for blasting | blasting | Cutoff, U - GLO
06.61%	market for steel, chromium steel 18/8, hot rolled | steel, chromium steel 18/8, hot rolled | Cutoff, U - GLO
01.75%	market group for electricity, medium voltage | electricity, medium voltage | Cutoff, U - RER
01.27%	market for chemicals, inorganic | chemical, inorganic | Cutoff, U - GLO

Impact category: Climate change - ILCD 2011 Midpoint+

Contribution	Process
100.00%	copper mine operation, sulfide ore | copper concentrate, sulfide ore | Cutoff, U - RER
28.84%	market for blasting | blasting | Cutoff, U - GLO
24.47%	market for steel, chromium steel 18/8, hot rolled | steel, chromium steel 18/8, hot rolled | Cutoff, U - GLO
24.43%	market group for electricity, medium voltage | electricity, medium voltage | Cutoff, U - RER
08.53%	market for chemicals, inorganic | chemical, inorganic | Cutoff, U - GLO
03.96%	market for mine infrastructure, open cast, non-ferrous metal | mine infrastructure, open cast, non-ferrous metal | Cutoff, U - GLO
02.24%	market for chemical, organic | chemical, organic | Cutoff, U - GLO

TOXICITY CATEGORIES

- Copper production, primary, RER, ecoinvent

Normalization set "EU 27 ILCD Midpoint+, 2010"

Normalization

Impact category
Freshwater ecotoxicity - ILCD 2011 Midpoint+
Human toxicity, non-cancer effects - ILCD 2011 Midpoint+
Human toxicity, cancer effects - ILCD 2011 Midpoint+
Freshwater eutrophication - ILCD 2011 Midpoint+
Mineral, fossil & ren resource depletion - ILCD 2011 Midpoint+
Particulate matter - ILCD 2011 Midpoint+
Photochemical ozone formation - ILCD 2011 Midpoint+
Terrestrial eutrophication - ILCD 2011 Midpoint+
Marine eutrophication - ILCD 2011 Midpoint+
Acidification - ILCD 2011 Midpoint+
Land use - ILCD 2011 Midpoint+
Climate change - ILCD 2011 Midpoint+
Water resource depletion - ILCD 2011 Midpoint+
Ionizing radiation HH - ILCD 2011 Midpoint+
Ozone depletion - ILCD 2011 Midpoint+
Ionizing radiation E (interim) - ILCD 2011 Midpoint+

Impact category: Freshwater ecotoxicity - ILCD 2011 Midpoint+

Contribution	Process
100.00%	copper production, primary | copper | Cutoff, U - RER
97.12%	copper mine operation, sulfide ore | copper concentrate, sulfide ore | Cutoff, U - RER
95.62%	market for sulfidic tailing, off-site | sulfidic tailing, off-site | Cutoff, U - GLO
95.62%	treatment of sulfidic tailing, off-site | sulfidic tailing, off-site | Cutoff, U - GLO
00.48%	market for steel, chromium steel 18/8, hot rolled | steel, chromium steel 18/8, hot rolled | Cutoff, U - GLO

Impact category: Human toxicity, non-cancer effects - ILCD 2011 Midpoint+

Contribution	Process
100.00%	copper production, primary | copper | Cutoff, U - RER
87.88%	copper mine operation, sulfide ore | copper concentrate, sulfide ore | Cutoff, U - RER
86.10%	market for sulfidic tailing, off-site | sulfidic tailing, off-site | Cutoff, U - GLO
86.10%	treatment of sulfidic tailing, off-site | sulfidic tailing, off-site | Cutoff, U - GLO
00.33%	market for mine infrastructure, open cast, non-ferrous metal | mine infrastructure, open cast, non-ferrous metal | Cutoff, U - GLO

Impact category: Human toxicity, cancer effects - ILCD 2011 Midpoint+

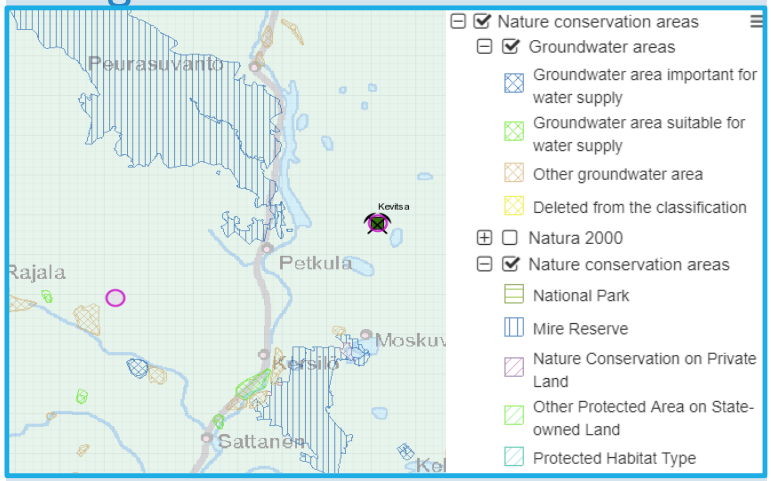
Contribution	Process
100.00%	copper production, primary | copper | Cutoff, U - RER
94.42%	copper mine operation, sulfide ore | copper concentrate, sulfide ore | Cutoff, U - RER
80.94%	market for sulfidic tailing, off-site | sulfidic tailing, off-site | Cutoff, U - GLO
80.94%	treatment of sulfidic tailing, off-site | sulfidic tailing, off-site | Cutoff, U - GLO
08.95%	market for steel, chromium steel 18/8, hot rolled | steel, chromium steel 18/8, hot rolled | Cutoff, U - GLO

ENVIRONMENTAL AND SOCIAL INTERDEPENDENCE

Resource depletion (water, minerals)	Toxicity (water, human)	Env. load (pollution, GHG, PM)

- Destruction of local economies
- Poverty
- Resettlement
- Local conflicts
- Health problems
- Poor water quality
- Destruction of ecosystems
- Environmental degradation
- Destruction of material resources

Background situations



Finland

-Nature tourism

-Reindeer farming

-Dam incidents

-Groundwater areas

Portugal

-Agriculture (cork, olives) and rearing

-Old, low income population

-Cultural heritage

-Groundwater areas

WHERE ARE THE LIMITATIONS

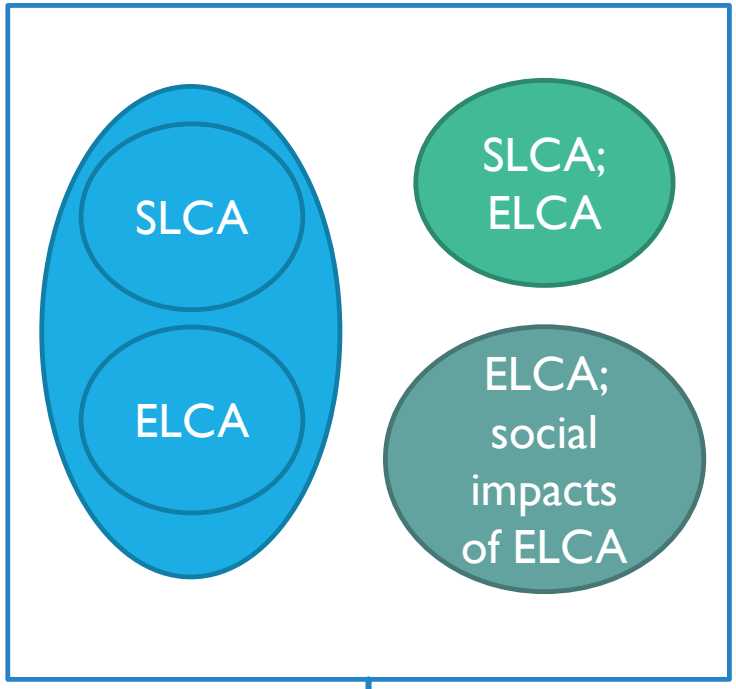
- Different sources for statistical data (gaps, assumptions, aggregation)
- Data quality (old data, technical conformance)
- Complementarity only identified at the level of indicators and risks
- Difficulty of gathering some background information
- No full or straight correspondence between social and environmental indicators

Name	R	C	T	G	F
Contribution to environmental load	2	2	2	1	1
Social responsibility along the supply chain	2	4	2	1	2
Public sector corruption	4	3	1	1	
Certified environmental management system	1	4	2	1	3
Minerals consumption	2	1	4	1	5
Industrial water depletion	2	2	5	1	5
Sanitation coverage	2	2	2	1	
Trade unionism	2	2	4	1	5
Safety measures	1	2	1	4	2
Non-fatal accidents	2	3	4	1	2
Active involvement of enterprises in corruption and bribery	2	2	2	2	3
Drinking water coverage	2	1	2	1	
Trafficking in persons	2	1	1	1	
Biomass consumption	2	1	4	1	5
Pollution	3	3	1	1	5
Fair Salary	2	2	2	1	1
Health expenditure	1	1	4	1	
Anti-competitive behaviour or violation of anti-trust and monopoly legislatio	2	2	5	1	2
Fatal accidents	2	2	5	1	2

Impact results, data quality - Metal ores, Finland, PSILCA

CONCLUSIONS AND FURTHER DEVELOPMENT

- Valuable input to the project
- Identification of important social and environmental issues in relation to background situations
- Environmental risks/impacts end up in risks/impacts on societal stakeholders



→NEXT:

- Extend complementarity to hotspots analysis (process level)
- Input for discussion

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Thank you!

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