Conference Poster

A Parameterized model for assessing environmental impacts from tailings: a life cycle assessment approach

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A PARAMETERIZED MODEL FOR ASSESSING ENVIRONMENTAL IMPACTS FROM TAILINGS: A LIFE CYCLE ASSESSMENT APPROACH

ETH zürich

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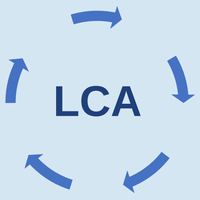
BACKGROUND

Problem: Various tailings site have specific emissions

- Interactions with environment may cause acid mine drainage
- The needs to create an environmental impacts predictor for tailings storage facilities, considering short- and long-term perspectives

Approach: Environmental assessment with site-specific factors

- Life cycle assessment (LCA) implementation in mining is limited
- Tailings life cycle inventory are somewhat generic in LCA databases
- Combining robust models (geochemical, hydrology) with LCA



Holistic **Standardized** **Transparency**

*"The compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its **life cycle**"*
ISO 14040/44

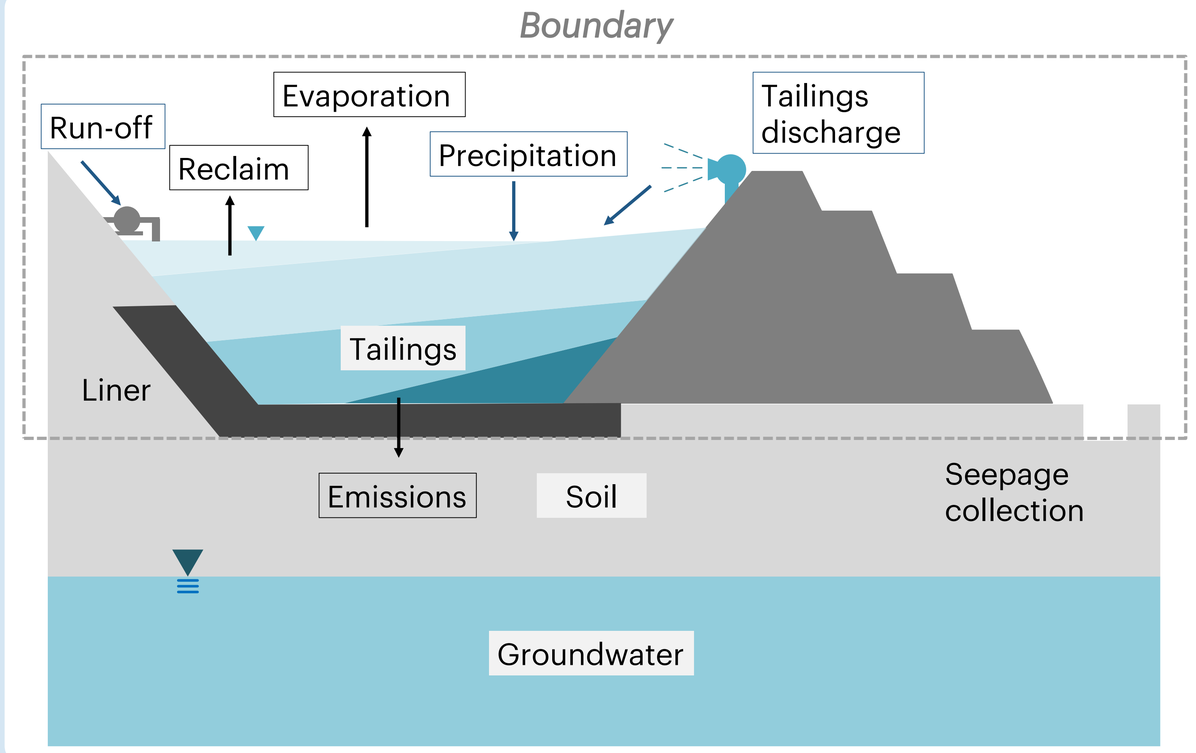
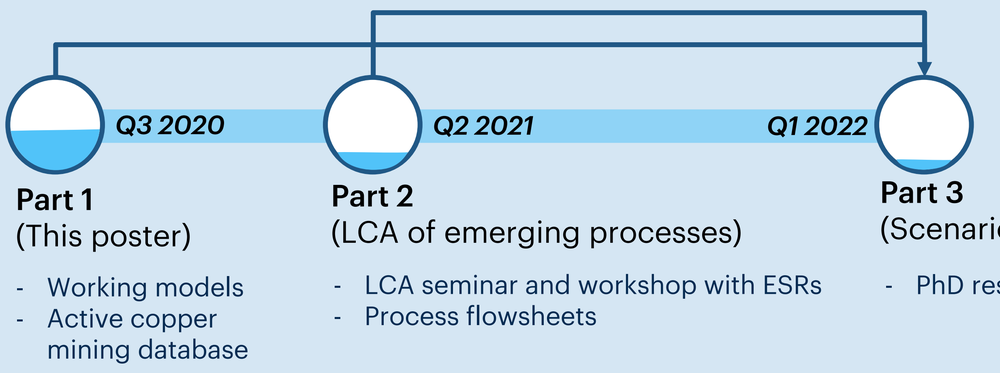


Figure 1. Schematic of conventional tailings disposal system

OBJECTIVES AND MILESTONES

- Building parameterized LCA of tailings storage facilities
- Assessing environmental impacts of conventional tailings management

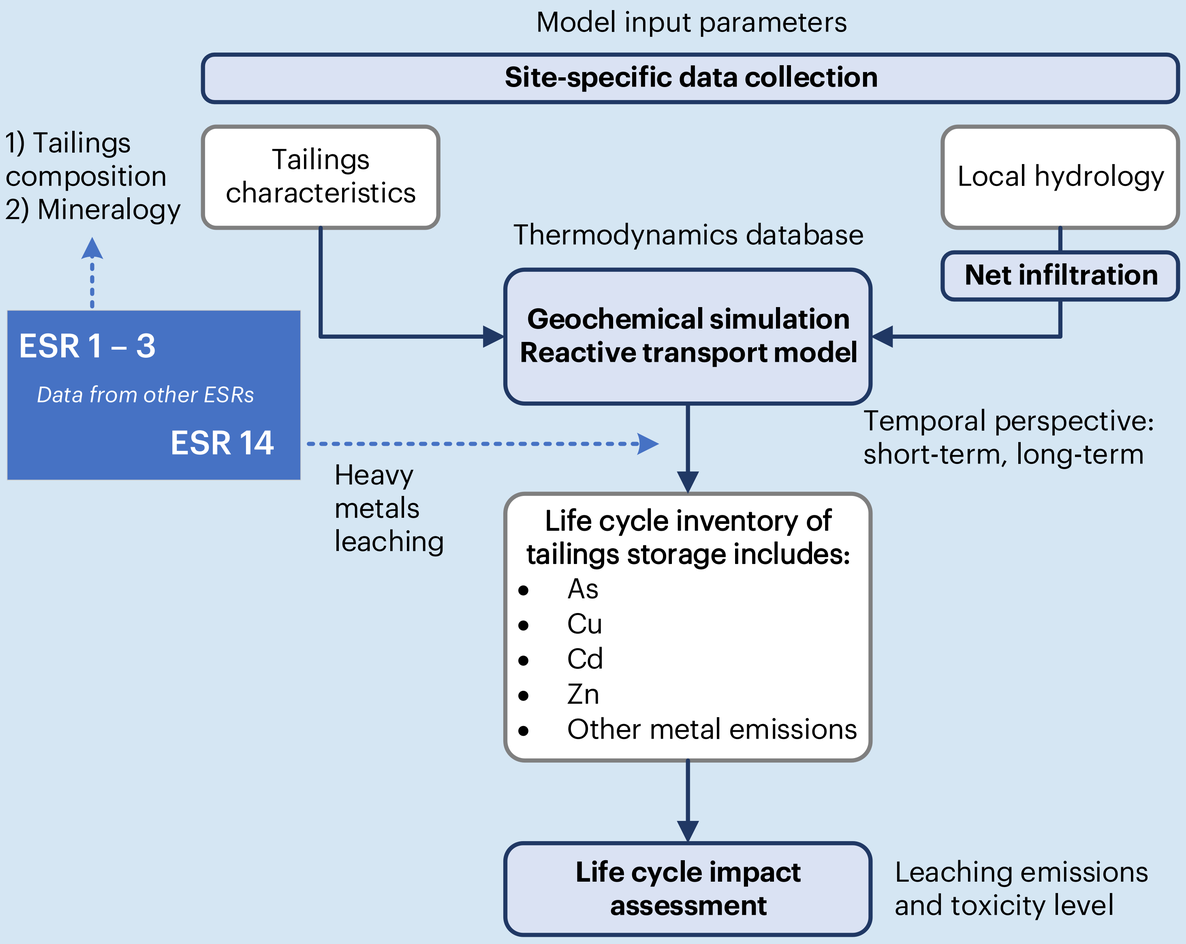


Part 1
(This poster)
- Working models
- Active copper mining database

Part 2
(LCA of emerging processes)
- LCA seminar and workshop with ESRs
- Process flowsheets

Part 3
(Scenario analysis)
- PhD research plan

METHODS



Data (sources):
- Site conditions
- Tailings mineralogy (ESRs)
- Leaching tests (ESR 14)
- Hydrology

Models incorporated:
- Geo chemical reactive transport
- Water balance
- Life cycle assessment
- Beneficiation (model extension)

PRELIMINARY RESULTS

Minerals buffering
Calcite, siderite, and other buffers control the mine drainage phenomenon

Washing out of minerals
The amount of leached heavy metals depends on initial condition and annual net infiltration rate

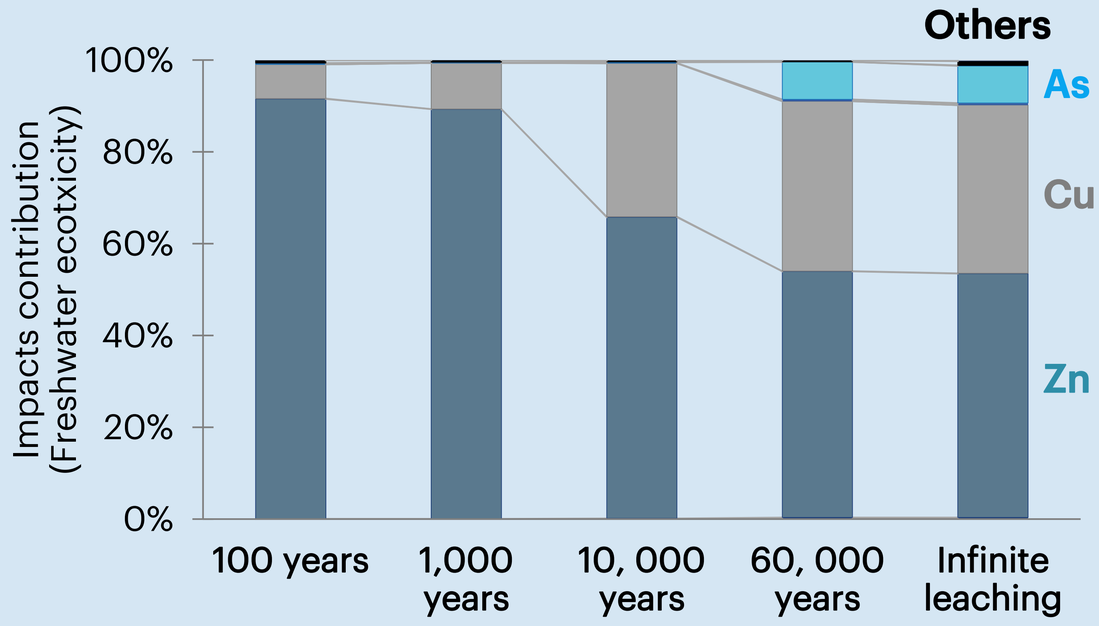


Figure 2. Contribution analysis of tailings storage environmental impacts at different time frames (Method: USEtox®)

CONCLUSION

- Integration of site-specific factors (geochemistry, rainwater infiltration) improves life cycle inventory modelling of tailings site
- Leaching of heavy metals depend highly on the mineralogy characteristics (buffering)
- Time horizon affects substantially how metals toxicity are quantified in life cycle impact assessment

NEXT STEPS

Beneficiation model construction
Industry data, technical reports

Data collection for LCA
WP 2 and WP 3

Sulfidic tailings database
Global assessment, market intelligence

Prospective assessment for emerging technologies

Part 2 of PhD work

MSCA-ETN SULTAN

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