Min-North

Development, Evaluation and Optimization of Measures to Reduce the Impact of Mining Activities on the Environment in Northern Regions
Min-North

- **Budget:** ≈ 1.6 M €

- **Partner research institutions**
  - Luleå University of Technology (LTU - leading)
  - University of Oulu (UO)
  - The Arctic University of Norway (UiT)
  - Geological Survey of Finland (GTK)

- Participation of mining industry, SMEs in Sweden, Finland and Norway
  - Agnico Eagle Finland Oy
  - Boliden Kevitsa Mining Oy
  - Radai Oy
  - Hannukainen Mining Oy
  - Outokumpu Mining Oy
  - Aquaminerals Finland Oy
  - Geoscaners AB
  - MRM Consult AB
  - Boliden Mineral AB
  - Golder Associates AB
Objectives

- Strengthen the competence and competitiveness of SMEs in Northern region in respect to environmental sampling and monitoring.

- Contribute to the development of pollution prevention and sustainable and effective water treatment and remediation measures taking under consideration climate and climate change.

- Contribute to the growth of environmental economy via the development, testing and implementation of methodologies and products for mining waste management and wastewater purification.
How we propose to achieve the objectives!

- Developing integrated geophysical and geochemical methods and create a methodology to determine contaminant pathways.

- Evaluating and developing low-cost bio-sorbent products for the retention of nitrogen and metals from mining waters as well as their application methodology.

- Investigate the influence of cold climate conditions on metal and nitrogen retention processes in wetlands purifying mining wastewaters and develop guidelines for the use of this water purification system.

- Developing and evaluating the effectiveness of dry cover materials and designs to prevent contaminant leaching from mining waste.
Project organization

- Project work has been allocated in 6 work packages (WP)
- Project administration and dissemination of results are managed in WP1 and WP6
- Research tasks, collaboration with mining industry, SME’s and other stakeholders were allocated in WP2-WP5
- WPs are lead by project partners
Long term behaviour of waste rocks piles and performance of cover structure

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WP2 OBJECTIVES

➢ Review monitoring options and methodology to evaluate the performance of cover structures for waste rock piles

➢ Preparation, construction and monitoring of cover structure performance in lysimeters

➢ Development of geophysical and geochemical methods to identify and model water flow from waste rock piles

➢ Measure thermal fluxes in waste rock piles aiming to estimate the rate of waste rock weathering

➢ Utilization of isotopes for tracking contaminant source and pathways
WP3

Development of integrated geophysical and geochemical methods for environmental studies in mine areas

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WP3 OBJECTIVES

- Improve our understanding of geochemical processes occurring within the tailings using Sr isotopes as a tracer.

- Characterize the sources and cycling of $\text{SO}_4$ and $\text{CO}_2$ within the tailings using S, O and C isotopes.

- Model sulphide oxidation rates within the tailings and to predict AMD formation.

- Increase our understanding of ground and surface water interactions and contaminant sources using S, C, Sr, O and H isotopes.

- Develop a spatial and temporal 4D groundwater model using geophysics and geochemistry.
WP4

Removal of metals and nitrogen from mining wastewaters in treatment wetlands and via utilization of locally available biomass as sorbent materials

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Anna-Kaisa Ronkanen
Harshita Gogoi
Felipe Campos
Tuomo Reinikka
Tuomo Pitkänen
Contribute to the development of cost-effective, innovative and sustainable solutions for the purification of mining wastewaters in Nordic regions by:

- Evaluating the suitability of locally available low-cost bio-sorbent materials (peat and sawdust) and the concept proving of application methods (pilot scale);

- Evaluating the influence of cold climate conditions on metal and nitrogen retention processes in peatland based wetlands purifying mining wastewaters and developing guidelines to improve purification efficiency.
WP5

Climate change linked to contaminant transport and performance of capping technique

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WP5 OBJECTIVES

- To investigate the leaching of contaminants and weathering of minerals from old sulphide tailings deposits;
- To evaluate the effectiveness of adding a layer of industrial by-products over deposited tailings (capping) in reducing contaminant leaching and mineral weathering;
- To assess the effect of changes in temperature and precipitation linked to climate change on mineral weathering rates and on the leaching of contaminants from tailings.