

# Multiple lines of evidence in assessing ecotoxicological and human health risks of mine effluents and public perception - MineView

An Academy of Finland programme on primary mineral resources in the vicinity of Arctic, financing period: 9/2014—8/2018



The Pyhäsalmi Mine area with a process water reservoir in the front.

The metal mining industry in Finland has expanded in recent decades. Chemical pollution and changes in natural organic material and bacterial community structure can cause both direct and indirect threats to ecosystems and human health. The aim of the project is to clarify the ecotoxicological effects of metal loads to downstream water bodies, the causes and risks of changes in microbiology, the long-term impacts to aquatic ecosystems and human health. Waterways affected by multimetal mining will be sampled and evaluated for ecotoxicity on site or at the laboratory. Transport and fate of metals will be simulated dynamically in the typically complex river-lake networks. Risk perception by the local community of a pollution threat to the receiving water bodies will be assessed to boost value judgments in the forthcoming impact assessments of new mining claims. Cost-effective tools for precise assessment will be validated and piloted. We have responded to the clear demand to clarify the acute and long-term unwanted impacts of metals and salting to aquatic ecosystems and human health, and risk perception by the local community.



The Talvivaara Mine primary bioleaching heaps in the front and process water reservoirs behind.

## To respond to the demand situation we will focus on:

- Using multiple lines of evidence in integrating ecotoxicological and human health hazardous effects in the assessment of risks
- Simulating transport and fate of metals dynamically in the typically complex river-lake networks in Finland
- Piloting cost-effective tools for precise and fast ecotoxicological risk assessments
- Inspecting the direct and indirect causes and risks of changes in microbiology of the receiving water bodies
- Yielding detailed information on the short- and long-term multistress effects arising from concurrent multimetal, salting and acidity causing effluents
- Inspecting risk perception by the local community of a pollution threat to the receiving water bodies
- Boosting value judgment precisions in the forthcoming impact assessments of any new mining claims

## Tools, bioindicators & beneficiary

Our results will benefit monitoring effort of businesses and officials by reducing costs or enabling wider monitoring scheme while producing more reliable results in temporally varying discharge conditions. We will focus on the:

- Development of the national scale nutrient transport model VEMALA to simulate transport and fate of various metal elements in river-lake networks
- Application of the biotic ligand model validated for boreal conditions for precise site-specific toxicity and EQS calculations
- Biosensing multistress and cocktail effects by animal behavioural responses *in situ* and at the lab scale
- Hyperspectral imaging for fast detection of freshwater invertebrates exposure to metals



Lake Kivijärvi winter sampling.

## ***Consortium home base***

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Lake Kivijärvi water samples.



Lake Nuasjärvi sediment core.



Measuring invertebrate behavior in River Kohisevanpuro.



Concentrating water sample into sterile cartridge in Lake Kiantajärvi.



Sampling incubated trout and whitefish eggs in River Välijoki.