



Water treatment in Geological Survey of Finland

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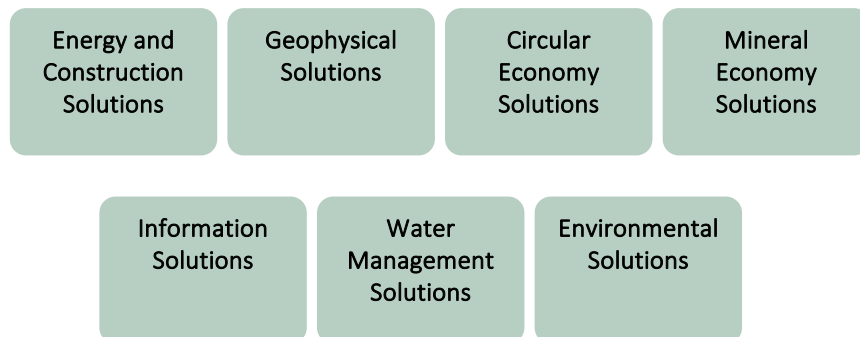
8.07.2022

About Geological Survey of Finland

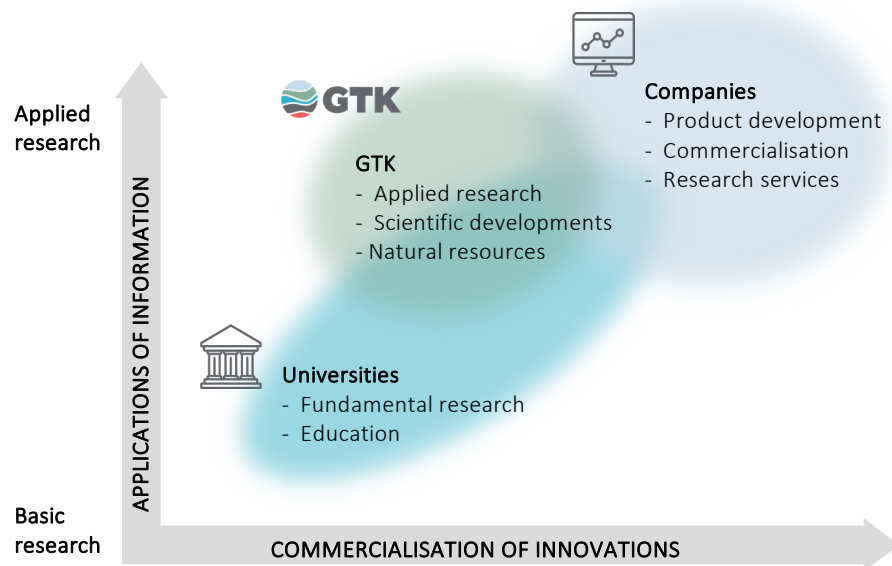
GTK is an internationally oriented geoscience research agency operating under the Ministry of Economic Affairs and Employment in Finland

Organisation: **7 units**

Total personnel: **440**

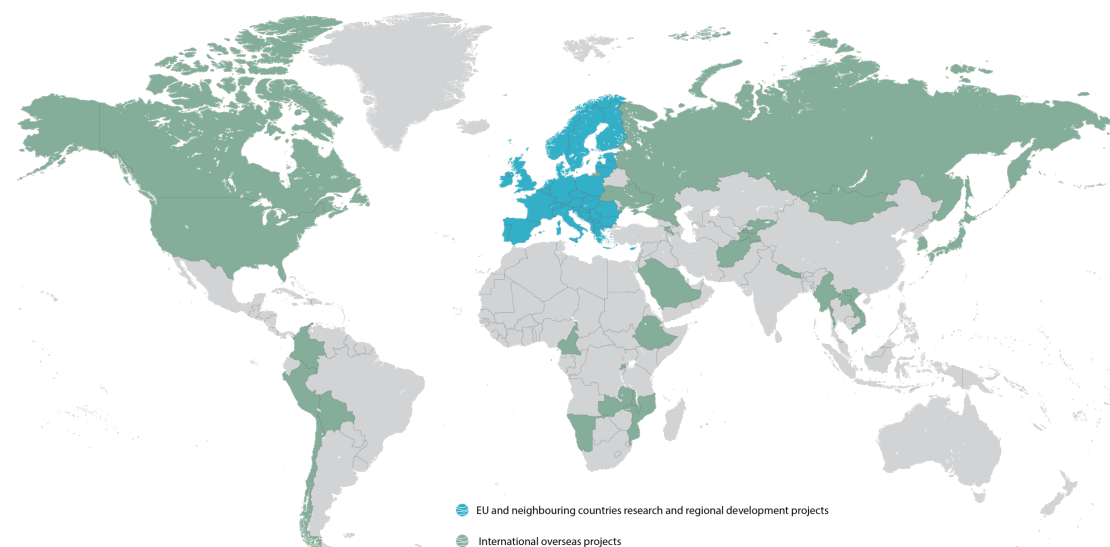


GTK in Research & Innovation sector



International projects

Co-funded, commercial, World Bank, capacity building





CLIMATE CHANGE
WATER

URBANIZATION
ELECTRIC TRAFFIC

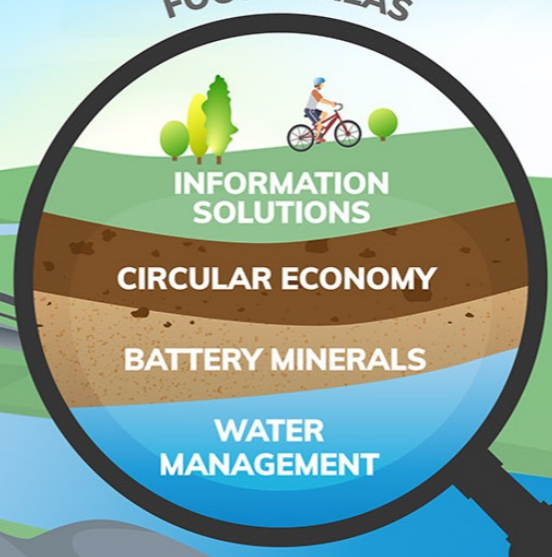
ENERGY DISRUPTION
CARBON NEUTRAL SOCIETY

ECOSYSTEMS
MATERIALS AND
CIRCULAR ECONOMY

FINLAND'S VIRTUAL CONCEPT

**PURPOSE:
FOR EARTH
AND FOR US**

FOCUS AREAS



Solutions to accelerate the transition to sustainable and carbon-neutral world

VALUES

**BRAVELY CURIOUS
AND INNOVATIVE**

MORE TOGETHER

**APPRECIATIVE
AND RESPONSIBLE**

Mineral processing pilot plant & laboratories

GTK Mintec, Outokumpu



Facilities

- Total area 5 500 m²
- Crushing plant, homogenization area, concentrator plant
- Pilot plant
- Bench scale process laboratory
- Mineralogical laboratory
- Storages for samples and equipment, 1 200 m²
- Tailings area, 1.5 ha

Capacity

- Test runs typically 50–500 tones and feeding capacity approximately 0.2–5 t/h
- 24/7 and fully customizable process
- 8 to 12 pilot scale studies per year
- Around 80-100 projects per year

GTK Mintec

Services for the entire mineral production process: (i) Process mineralogy / Geometallurgy, (ii) Bench-scale laboratory, (iii) Pilot plant, (iv) Mini pilot

The services we provide:

- Mineralogical / geometallurgical research
- Bench-scale laboratory testing
- Continuous 24/7 mini-pilot test runs (feeding capacity up to 50 kg/h)
- Continuous 24/7 pilot-scale test runs
- Fully customizable according to the needs

Scope

- Unit operation testing in the pilot plant (e.g., milling)
- Full process testing in the pilot plant
- Commercial potential of a mineral deposit

Circular economy

- Side streams, re-mining waste, water management - treatment, reuse, recovery





Present tailings area 1.5 ha

Present dry area (0.5 ha)

Possible extension

Tailings facility

Creating a collaboration platform

Research infrastructure for water treatment and recovery

- Water Chemistry Laboratory in Kuopio
- Water Pilot in Outokumpu

Technology supplies, research centres, universities, etc.

- Jointly funded projects
- Commercial projects
- Innovations, publications
- Wide range of research topics in recovery and water/wastewater treatment technologies

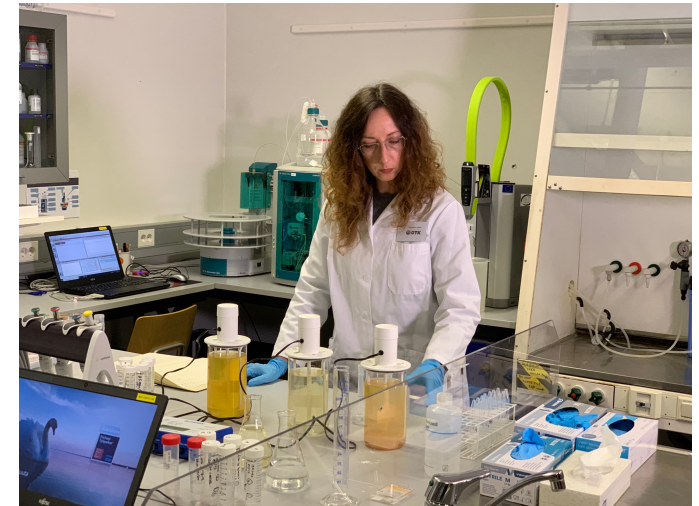


Academy of Finland project SEXUM



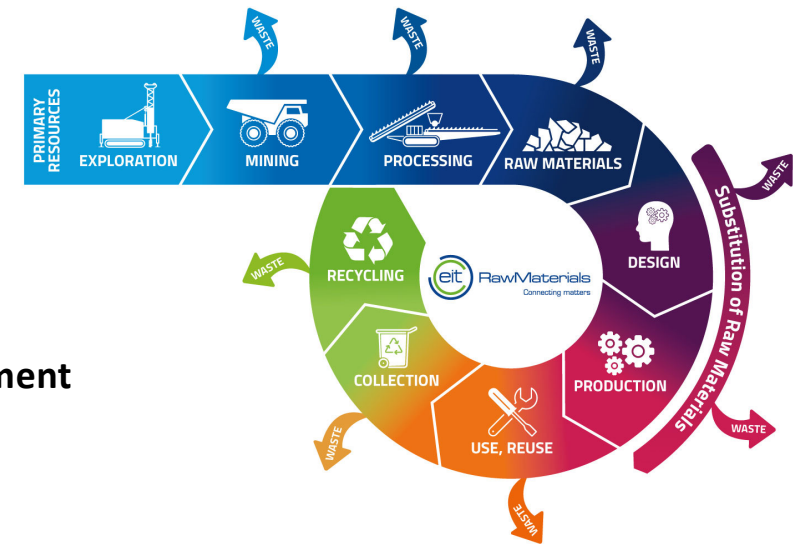
Advanced Technologies for Sustainable Exploitation of Uranium-Bearing Mineral Resources

- **Timetable:** 2015 –2019
- **Consortium:** University of Eastern Finland - lider, Geological Survey of Finland
University of Tampere
- **Objectives:** 1) characterization of uraniferous polymetallic mineral deposits, 2) process development to manage uranium during mineral processing, and 3) **methodology development for uranium removal from waste and side streams.**



WP: Development of novel methods and materials for uranium removal from mine effluents – lab-scale studies

EIT Raw Materials upscaling project Morecovery



Modular Recovery Process Services for Hydrometallurgy and Water Treatment

- **Timetable:** 1.1.2019 – 31.12.2021
- **Consortium:** Finland - Geological Survey of Finland – leader, Savonia University of Applied Sciences, University of Eastern Finland, Finnish Mineral Group, Keliber, Spain - Spanish National Research Council, University of Huelva, Sweden - LTU Business
- **Objective:** Enhancing sustainability in the raw materials sector and contributing to secure the raw materials supply of strategically important elements through creating a **modular recovery process service package for hydrometallurgy and water treatment**, and thus support the concept of circular economy

Supported by





Investigation of potential secondary sources of valuable metals and minerals in Finland (GTK)

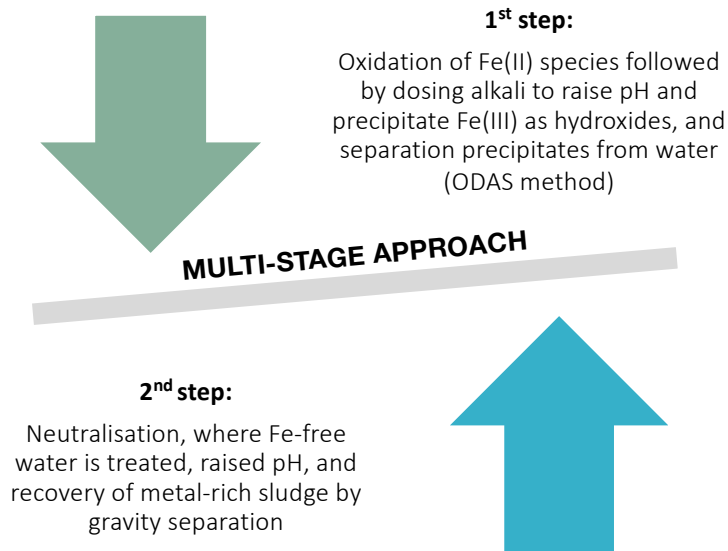
- Closed or active mines representing different ores
- Sampling, depending on the mine site: waste rock and tailings samples, drainage water, water treatment precipitates, gypsum



Inventory of AMD sources of the Iberian Pyrite Belt in Spain (UHU)

- Identification of the different acid mine drainage (AMD) sources along the Iberian Pyrite Belt (IPB), each source was sampled
- A total of 128 various AMD sources identified and analysed for the REEs concentration

Development of recovery methods of selected CRMs from drainage water and AMD in the laboratory scale



Process upscaling and designing pilot-scale installation - modular containerised system, continuous process with a nominal capacity of 1 m³/h



Universidad de Huelva



UNIVERSITY OF EASTERN FINLAND



SAVONIA

University of Applied Sciences

Pilot-scale campaign - treatment of drainage mine water and recovery of Ni and Co

Hitura mine, Finland, 2020

Technology demonstrated in operational mine environment (TRL 7)



Pilot-scale campaign - treatment of acid mine drainage and recovery of REEs

Kuopio, Finland, 2021

Technology validated in relevant environment (TRL 5)



Business



Water treatment and recovery service commercialized and introduced to the market in 2022

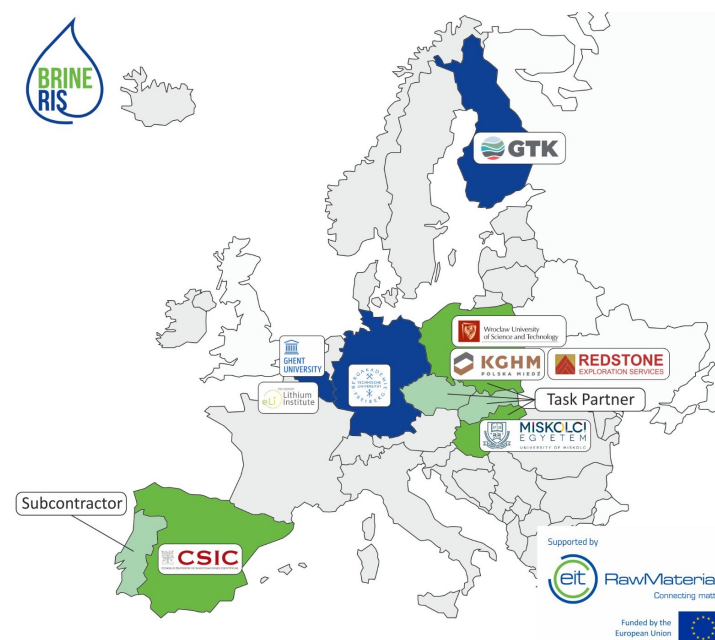
Commercialising partners in upscaling EIT RM Morecovery project:



EIT Raw Materials project BrineRIS

Brines of RIS Countries as a Source of CRM and Energy Supply

- **Timetable:** 1.1.2022 – 31.12.2024
- **Consortium:** Poland - Wrocław University of Science and Technology - leader, Redstone Exploration, KGHM Polish Copper, Spain -Spanish National Research Council, Hungary - University of Miskolc, Finland - Geological Survey of Finland, Germany - Technische Universität Bergakademie Freiberg, European Lithium Institute, Belgium - Ghent University
- **Objectives:** Building RIS countries' capacity on **carbon-neutral critical raw materials recovery from geothermal brines**. BrineRIS will identify prospective deposits of brine and **test emerging recovery technologies for Li**. By developing an interactive platform and investment case study, BrineRIS will attract investors to RIS regions participating in the project.



EIT Raw Materials project BrineRIS



- Development of **pre-treatment step** for highly saline brines
- Recovery of Li through the **adsorption/ion exchange**-based processes using inorganic adsorbents, selective resins in batch and continuous mode
- Development of the Li stripping method for spent adsorbents/resins
- Li extraction in **solvent extraction** systems with different extractants



Involvement in academic-type activities

- **Trainees** BSc and MSc level for summer time (30-40 students per year, for 2-3 months)
- **Joint BSc, MSc, PhD thesis** with universities
- **Supervision and co-supervision** BSc, MSc, PhD students
- **Hosting** researchers and scientists in different stages of their careers, from academia, industrial, governmental sectors, etc.



EIT Raw Materials Academy project MEITIM

Master in Entrepreneurship, Innovation and Technology Integration in Mining

- **Timetable:** 1.1.2020 – 31.12.2023
- **Consortium:** Spain - Technical University of Madrid - leader, Spanish National Research Council, Atlantic Copper, Poland - Wrocław University of Science and Technology, Finland - Lappeenranta-Lahti University of Technology, Geological Survey of Finland, Metso Outotec, Finnish Mineral Group, Germany - European Lithium Institute, EIT Raw Materials
- **Objective:** Development of a **completely new 120 ECTS EIT Label MSc program** to educate a new generation of technologists and entrepreneurs that understand the whole raw materials value chain and have the ability to integrate innovations and new technologies into new innovative and feasible business solutions with high impact and added value in the industry.

Supported by



Areas for cooperation – R&D projects and education

Water reuse and closing the loops

Laboratory and pilot scale studies

BSc, MSc, PhD joint thesis, training

Salinity, acidity, heavy, toxic metals

Whole spectrum of organic and inorganic contamination



Recovery of critical raw materials, nutrients and other valuables

Water/wastewater treatment - physico-chemical methods - conventional, advanced, and electrochemical treatment



www.gtk.fi

Thank you!

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