BrineRIS

Brines of RIS countries as a source of Critical Raw Materials and energy supply

EIT RM KAVA 8 Project

D1 Matchmaking & Networking

D1.4 M&N Regional Innovation Schemes

RIS Capacity Building

(2022-2024)

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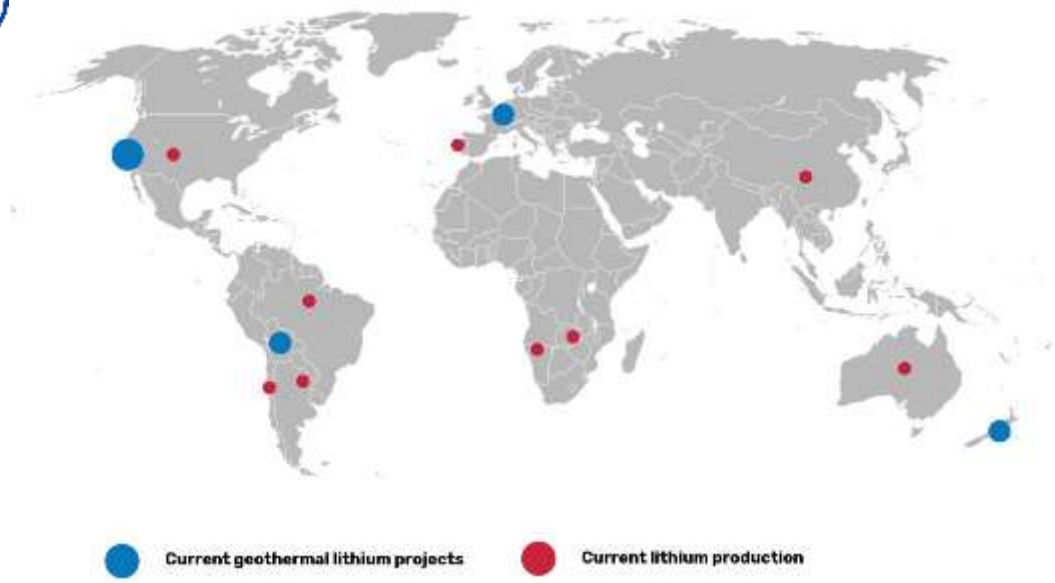
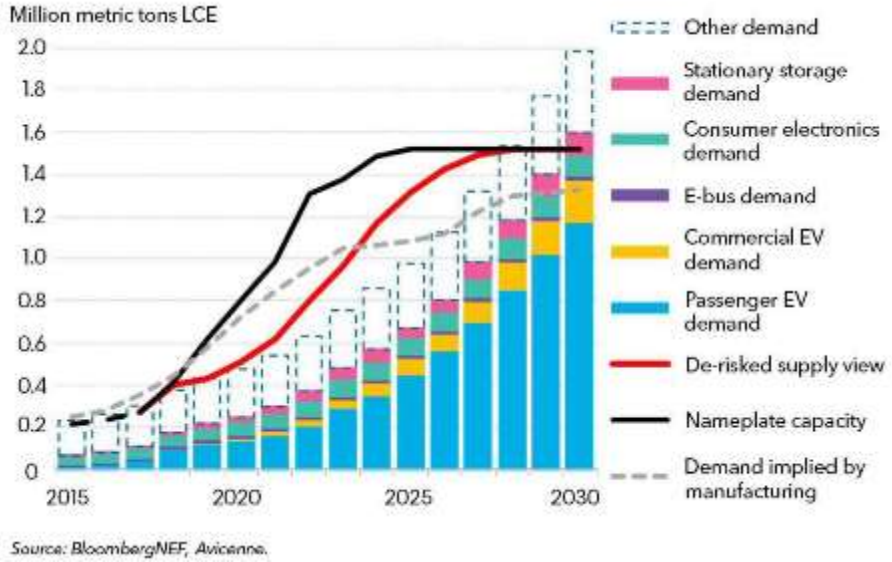
BACKGROUND

Low domestic Lithium production in Europe



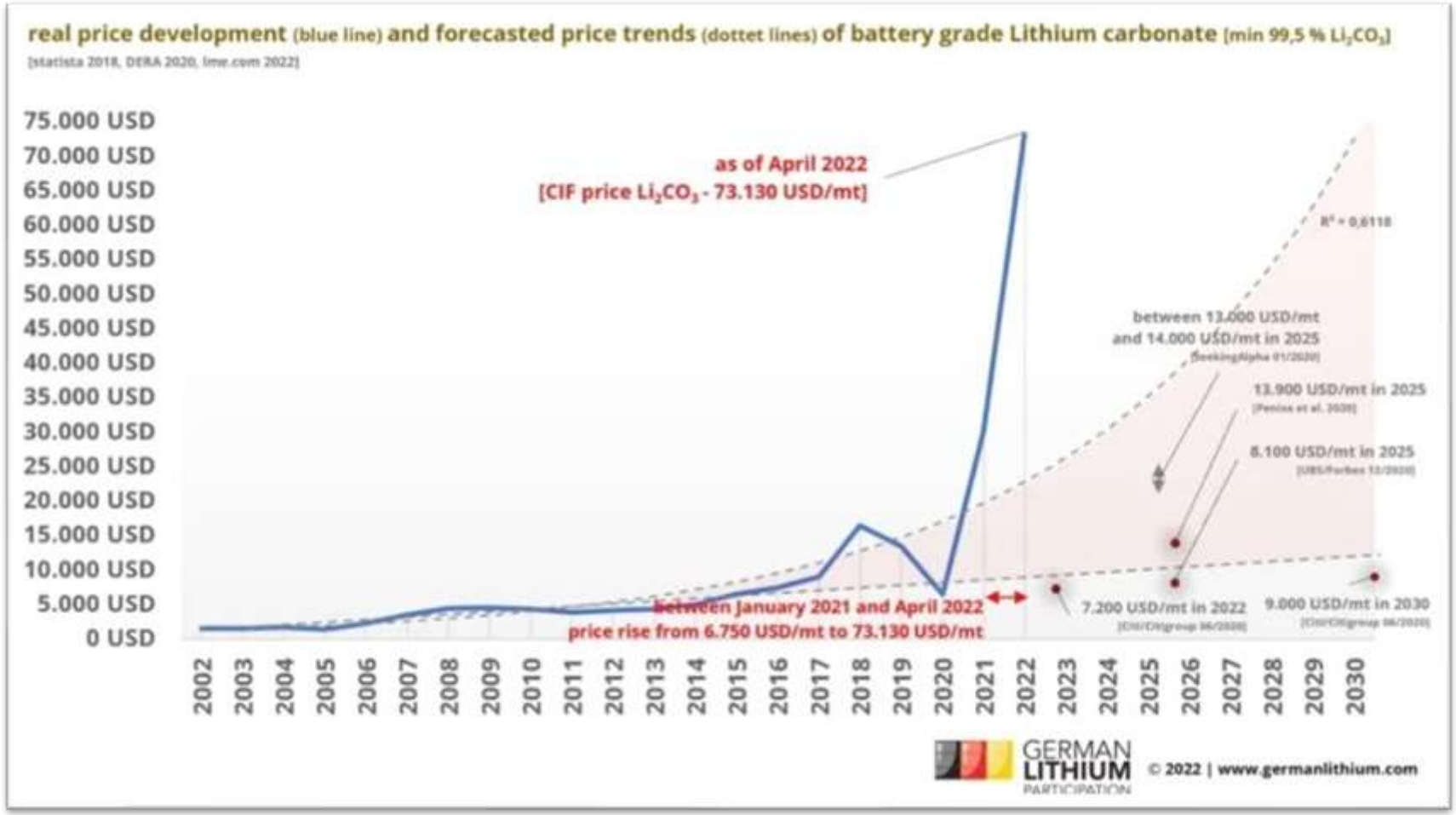
Source: Geothermal Lithium in Europe - An industrial strategy for the geothermal lithium battery value-chain (2020)

Increasing Lithium demand in Europe



Source: BloombergNEF, Avicenne.

Published in September 2021 list of critical raw materials contains 30 materials among which lithium, titanium, and strontium are added to the list for the first time. The list includes the materials that are of high economic importance and present the highest supply risk for the EU.



Increasing price makes unconventional metals / lithium resources and emerging technologies more attractive

TO ANSWER THE QUESTIONS

- DO WE HAVE PERSPECTIVE RESOURCES FOR METALS RECOVERY FROM BRINES IN SIX RIS-COUNTRIES (Portugal, Spain, Poland, Slovakia, Czech Republic, Hungary)?
- WHERE THESE RESOURCES ARE LOCATED?
- ARE THESE RESOURCES ACCESSIBLE?
- WHAT ARE THE CONSTRAINTS (formal, environmental, technical, economic, social, etc.)?
- WHAT AND HOW CAN WE RECOVER FROM PERSPECTIVE SITES?
- HOW TO MINIMIZE CARBON AND WATER FOOTPRINT OF THE RECOVERY?

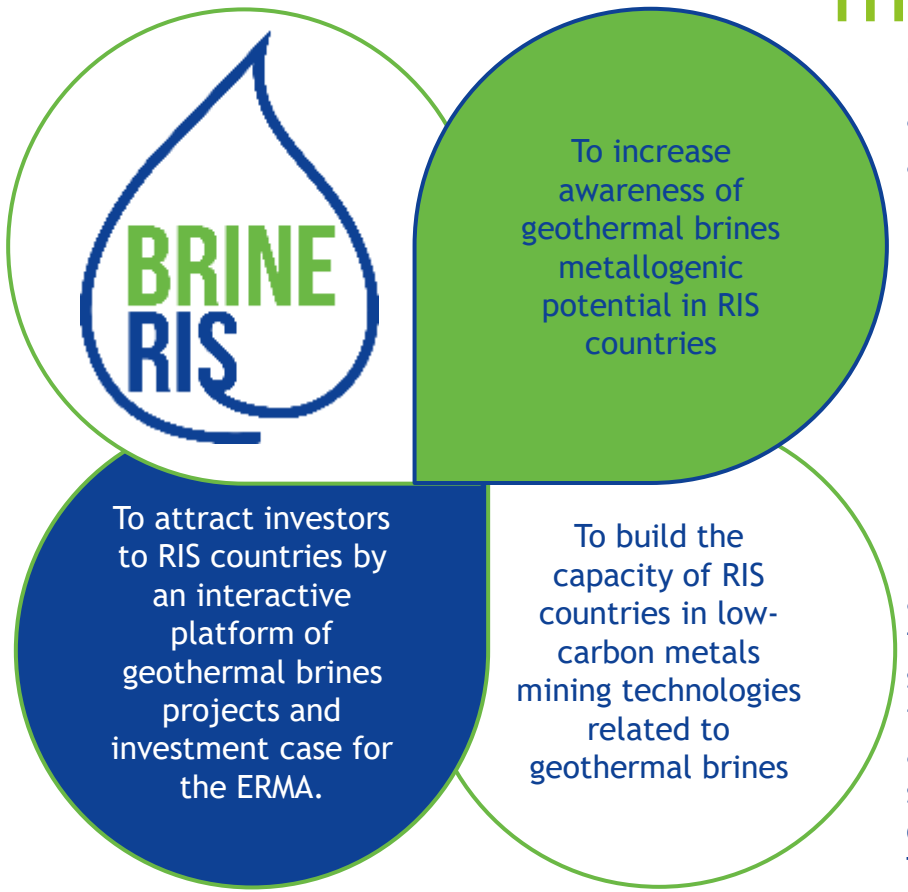
PARTNERS

- Politechnika Wrocławska (Wroclaw University of Science and Technology, WUST) [Poland, CLC East Core Partner] - LEADER
- Agencia Estatal Consejo Superior de Investigaciones Cientificas M.P., CSIC (Spanish National Research Council) [Spain, CLC South Core Partner]
- European Lithium Institute eLi [Belgium/Germany, CLC Central, Associated Third Party]
- Geologian tutkimuskeskus, GTK (Geological Survey of Finland) [Finland, CLC Baltic Core Partner]
- Ghent University [Belgium, CLC West Core Partner]
- Redstone Exploration Services Sp. z o.o. [Poland, CLC East Project Partner]
- Technische Universität Bergakademie Freiberg (TUBAF) [Germany, CLC East Core Partner]
- University of Miskolc [Hungary, CLC East Core Partner]

<u>TASK PARTNERS:</u>

- Polish Geological Institute - National Research Institute, Poland
- Czech Geological Survey, Czech Republic
- State Geological Institute of Dionyz Stur, Slovakia
- Rotaqua, Hungary

OBJECTIVES AND SCOPE



mapping

by mapping brines resources and estimating the abundance of CRM and other useful elements with specific attention to lithium. This activity will cover six RIS countries - Poland, Hungary, Czech Republic, Slovakia, Spain and Portugal. Thus it will contribute to the KIC targets related to securing raw materials supply from within Europe and maintaining a strong EIT RM's foothold in RIS countries.

training

testing

by sharing experience in developing innovative recovery solutions and knowledge exchange with key players in geothermal recovery from non-RIS countries. Through the education and training of students and specialists from RIS countries, BrineRIS will increase the competitiveness and innovativeness of the RIS workforce. These activities will be directed not only to partners' countries but also to stakeholders from other RIS regions (Baltic, Balkans, Ukraine) offering them free participation to widen the impact of the project. This objective will support the achievement of the KIC's target in developing new tools for ethical sourcing of raw materials, as well as upskilling the workforce in the mining sector together with delivering entrepreneurship oriented young professionals to the industry and local innovation ecosystems, fully integrating the Knowledge Triangle (KT).

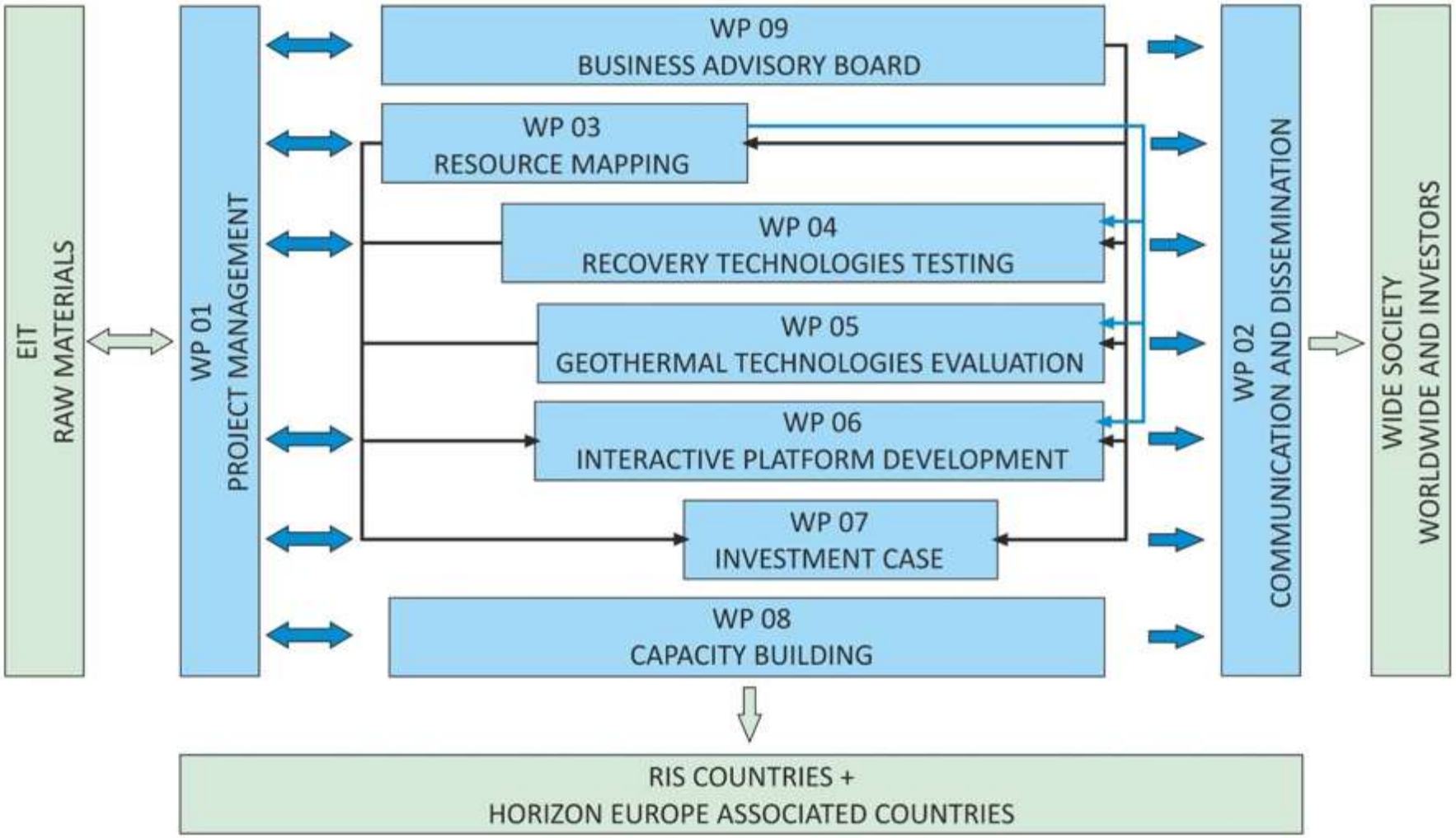
developing

valuation

investing

That way we increase the geographical coverage of the project to worldwide stakeholders. This aim will be supported by close cooperation with the Business Advisory Board (BAB) and will contribute to the KIC's target in establishing industry alliances as a key mechanism towards the sustainable and secure supply of raw materials.

WORK PACKAGES



FOUR PROJECT DEVELOPMENT PATHS

MAPPING

First, the participants intend to collect all available information on the occurrence and composition of brines - especially on their lithium content, as there is currently no single place where data (available for entrepreneurs) on geothermal brines are collected.

TESTING

The project's first step will be a sampling campaign organized by the RIS partners. This part will be followed by technological testing and modeling at Ghent University and GTK in cooperation with WUST.

CAPACITY BUILDING

Open workshops on the potential of geothermal brine, scientists' study visits, and a summer school for students in Karlsruhe organized by Vulcan Energy Subsurface Solutions GmbH are planned.

INVESTING

ERMA

The project will also create a portal for those interested in investing in brine installations - with access to the information and analysis prepared within **BrineRIS**. ERMA Investment Case will be also submitted.

TECHNOLOGY

A significant step in the project will be to analyze the CRM and lithium recovery rate of selected brines with three direct lithium extraction (DLE) technologies:

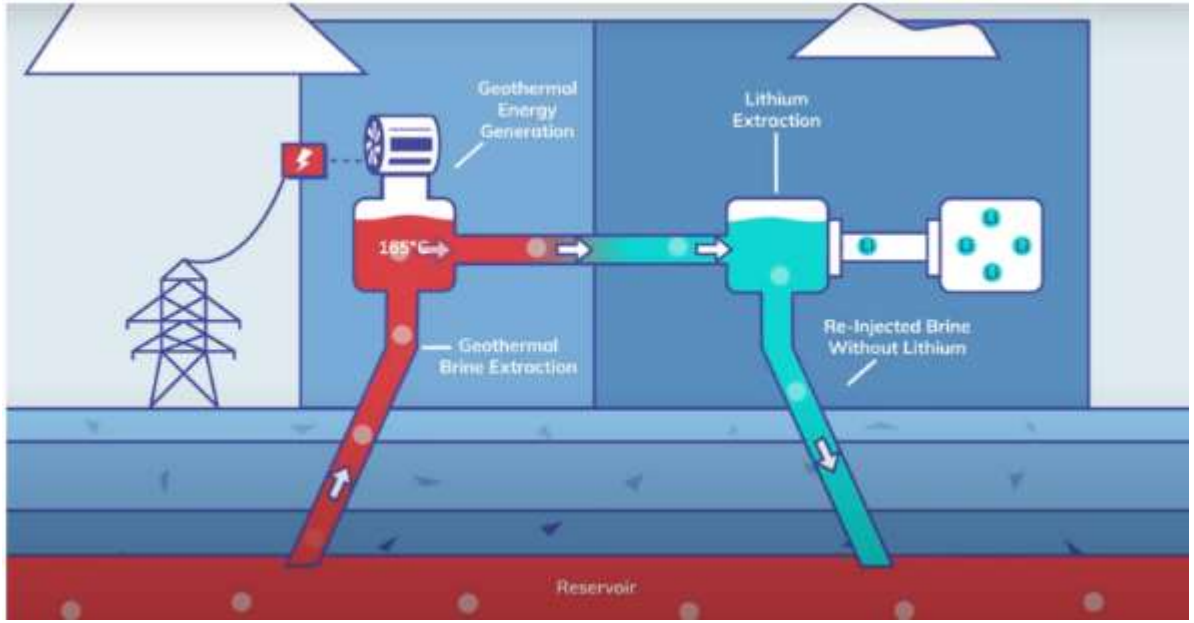
- **Electrochemical process for Li extraction** from high salinity water. The technologies will be applied ex-situ on two different sources from one RIS country. The first step will be the concentration of Li in solutions free of other cations, for which capacitive deionization (CDI) will be used to concentrate Li to a level of 500 ppm. For higher lithium concentrations, membrane electrolysis (ME) will be used. In the second step, solutions concentrated by the CDI process (500 ppm Li) will be treated with ME to recover Li as Li_2CO_3. The ME process will be designed by Ghent University.

- **The adsorption method** will be handled by the Geological Survey of Finland (GTK). This process allows selective separation of lithium by adsorption in hydrochloric acid solution. The advantage of this technology is that lithium sorbents used in the direct extraction of lithium from brines can be used as cathode materials in lithium-ion batteries.

- **Solvent extraction**, which is also developed by GTK in cooperation with WUST. It is one of the most developed methods of separating metals from aqueous solutions. In this technology, metals extracted into the organic non-polar phase are usually recovered using an aqueous removal medium.

Metals and Energy / Heat production

Developed technologies are energy-consuming. Therefore, TUBAF will analyze brines with very high temperatures to assess zero-emission electricity production for the recovery process.
On the other hand, brines that are colder (around 40 or 60 degrees C) and unsuitable for generating electricity may be valuable for producing heat. That is why the TUBAF scientists will classify those brines from which the heat could be used to improve the technological process itself, e.g., heat cooler water, and improve the efficiency of the tested technologies, reducing their costs.



source: https://www.unav.edu/web/global-affairs/the-battery-race-surfacing-geothermal-lithium-trapped-below-therhine-river

SUMMARY

BrineRIS project aims to:

- build RIS countries' capacity on carbon-neutral critical raw materials (CRM) recovery from geothermal brines

- decrease the dependency of Europe on imported metals for battery production by identifying prospective deposits of brine and testing emerging recovery technologies

Collaborate with us! To build the community and sustain the project!

BRINE RIS

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