

Ensuring a sustainable raw material supply through research and education

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MINING AND MINERALS VALUE CHAIN

AT LULEÅ UNIVERSITY OF TECHNOLOGY



DISCOVERING

ORE GEOLOGY
EXPLORATION GEOPHYSICS



OPERATING

MINING AND ROCK
ENGINEERING



CONCENTRATING

MINERAL PROCESSING
PROCESS METALLURGY



CLOSING

APPLIED GEOCHEMISTRY
SOIL MECHANICS



PROCESS IT
ROBOTICS AND AI
OPERATION AND MAINTENANCE ENGINEERING
INDUSTRIAL PRODUCTION ENVIRONMENT
HUMAN WORK SCIENCES
ECONOMICS
LAW

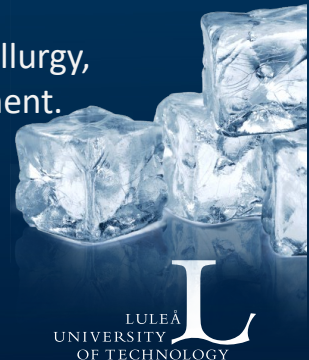


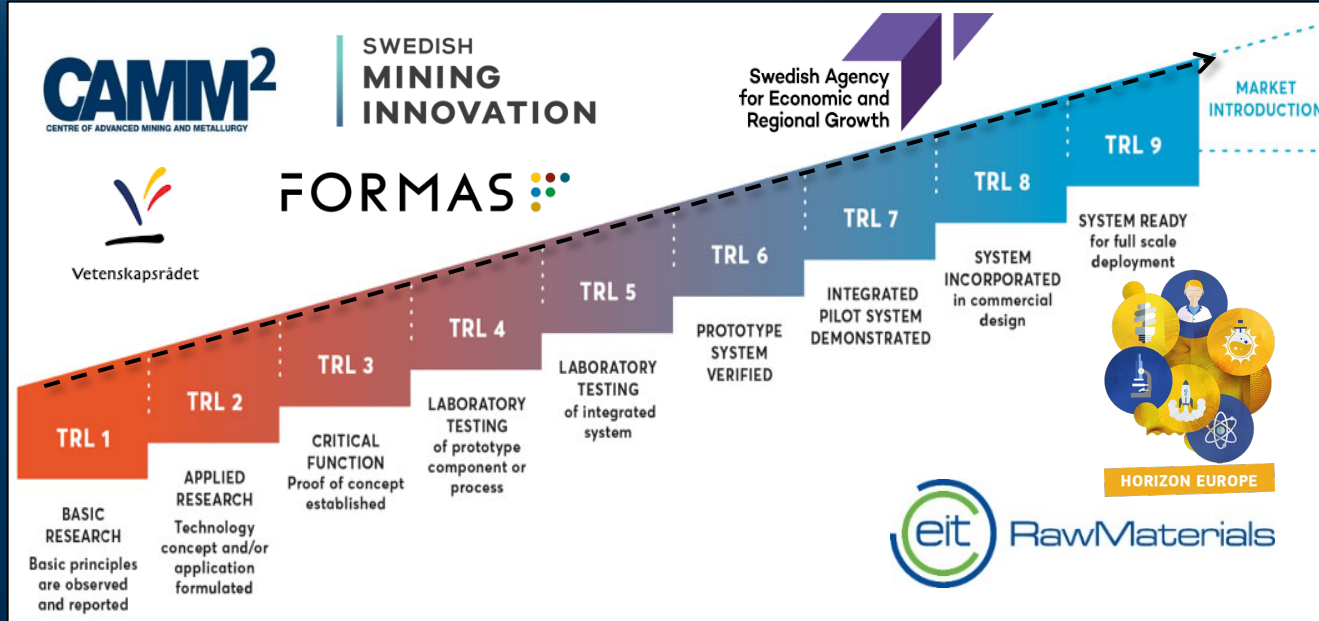
LULEÅ
UNIVERSITY
OF TECHNOLOGY

Mining research and education at Luleå University of Technology



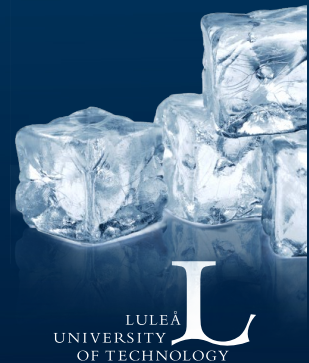
- In total c. 8 core research subjects, and another c. 30 subjects with mining-related research projects
- >20 full professors, c. 60 senior researchers, >70 PhD students (6-10 dissertations/year)
- 8 educational programs (3 Civ.Eng, 3 MSc, 2 BSc)
- Turnover ca. 350 MSEK/year in research, which is 20% of the LTU research budget
- CAMM² – Centre of Advanced Mining and Metallurgy, strategic investment from the Swedish government. Run by LTU, with SWERIM as partner. ~ 20 MSEK/year since 2010





SMI – national innovation program for the mining and metal producing industry, hosted by LTU. Strategic investment by Vinnova, Formas and the Swedish Energy Agency. Ca. 200 MSEK 2013-

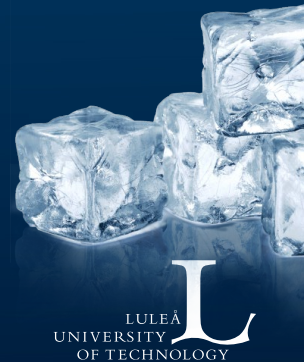
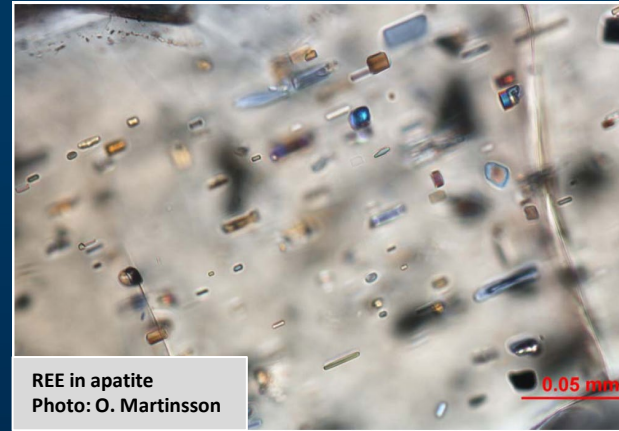
EIT Raw Materials – 2015-2022. NCLC in Luleå, the only CLC outside a major European city.



Need-driven “free” basic science along the raw material value chain



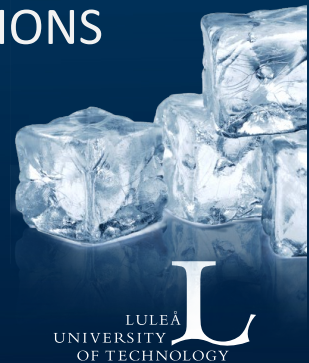
www.ltu.se/centres/camm, email: CAMM@ltu.se





NATURAL RESOURCES FOR SUSTAINABILITY TRANSITIONS

Northern Sweden's natural resources (ore, wood and water) are of central importance for realizing the societal transformation required to achieve the global sustainability goals



FOCUS

NATURAL RESOURCES & TECHNOLOGY

The SDGs presuppose technological development, e.g., electrification based on fossil-free energy

NATURAL RESOURCES & SOCIETY

The development must occur in a way that takes into account a number of different societal goals. Goal conflicts often arise, and it can be difficult to achieve the various dimensions of sustainability simultaneously

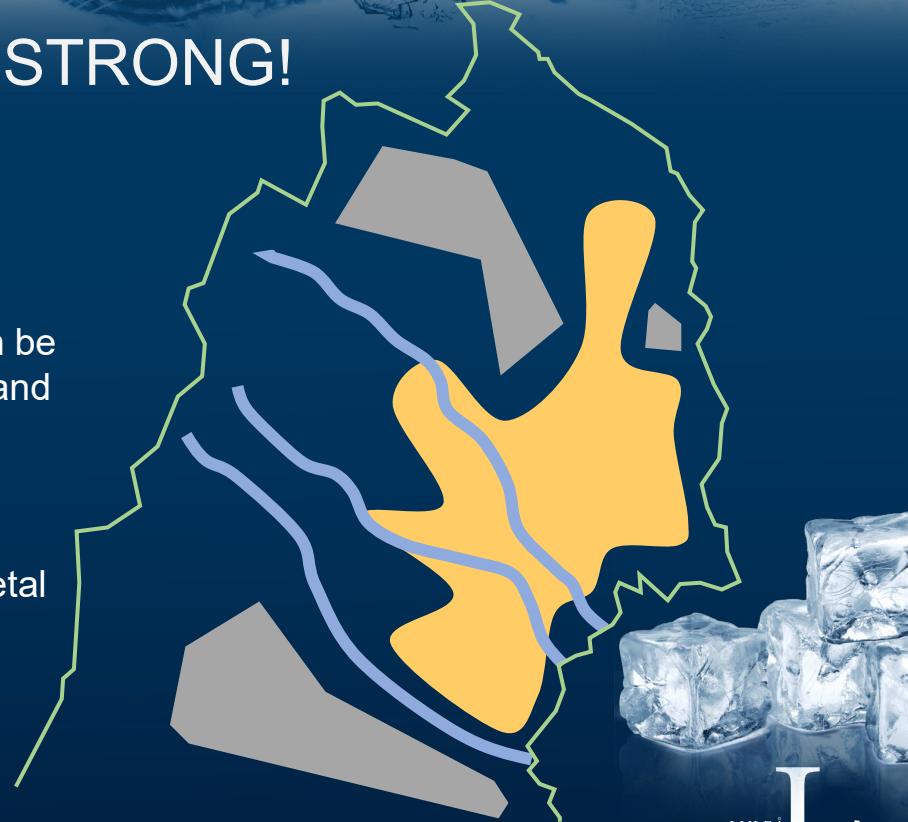


THE LINK TO THE REGION IS STRONG!

Northern Sweden is an important demonstrator for the sustainable (fossil-free) society, but....

... it is important that the green innovation systems can be strengthened and further developed through research and collaboration.

We want to contribute to the realization of the regional development strategy by facilitating a sustainable societal transformation while maintaining (and strengthening) competitiveness and trust among the population.



CHALLENGES IN COMMON

Transport/logistics
Social acceptance
Environmental technology
Digitalization, automation, AI-applications
Electrification
Innovation- and industrial policy
Energy optimization, long-term energy supply
Production optimization and resource efficiency
Quality control and measurement technology
Process development and process monitoring
Permit- and environmental legislation



CHALLENGES IN COMMON

Fusing Machine Learning and
Computer Vision Techniques for
Automatic Drill Core Analysis on
Visual and Compositional Data.

Dr. Foteini Liwicki

Towards fully Sustainable
Energy-storage devices

Prof. Xiaoyan Ji

H2SUN - hydrogen in industrial
processes and for transportation

Prof. Rikard Gebart

The dynamics of land use
tensions in the Swedish Arctic
– cooperation and conflict

Prof. Dag Avango

Extracting new gender theory to
promote a sustainable transformation
of natural resource industries.

Dr. Kristina Johansson



www.ltu.se/SUN





LTU

8 mining-related
educational
programs

Industry

Virtual Reality

Entrepreneurship

Artificial Intelligence

Sustainability

Automation

Innovation

Machine
learning

Arctic Tests
LTU Business

**Mineral resource
engineering**

Project-based international education along
the mining value chain. Planned start 2022



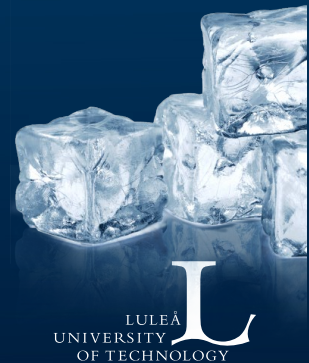
SMI– **strategic investment** by Vinnova, Formas and the Swedish Energy Agency.

CAMM² – **strategic investment** from the Swedish government, since 2010

EIT RAW MATERIALS – **strategic EU investment** in a Luleå-based hub on raw materials

SUN– **strategic investment** by LTU

Mining industry – there is a **long tradition** of collaboration between LTU and the mining industry



Thank you!
