ITERAMS

Integrated mineral technologies for morensustainable raw material supply.

HOW TO CLOSE WATER LOOPS IN MINING?

Making a business case of water and safe tailings

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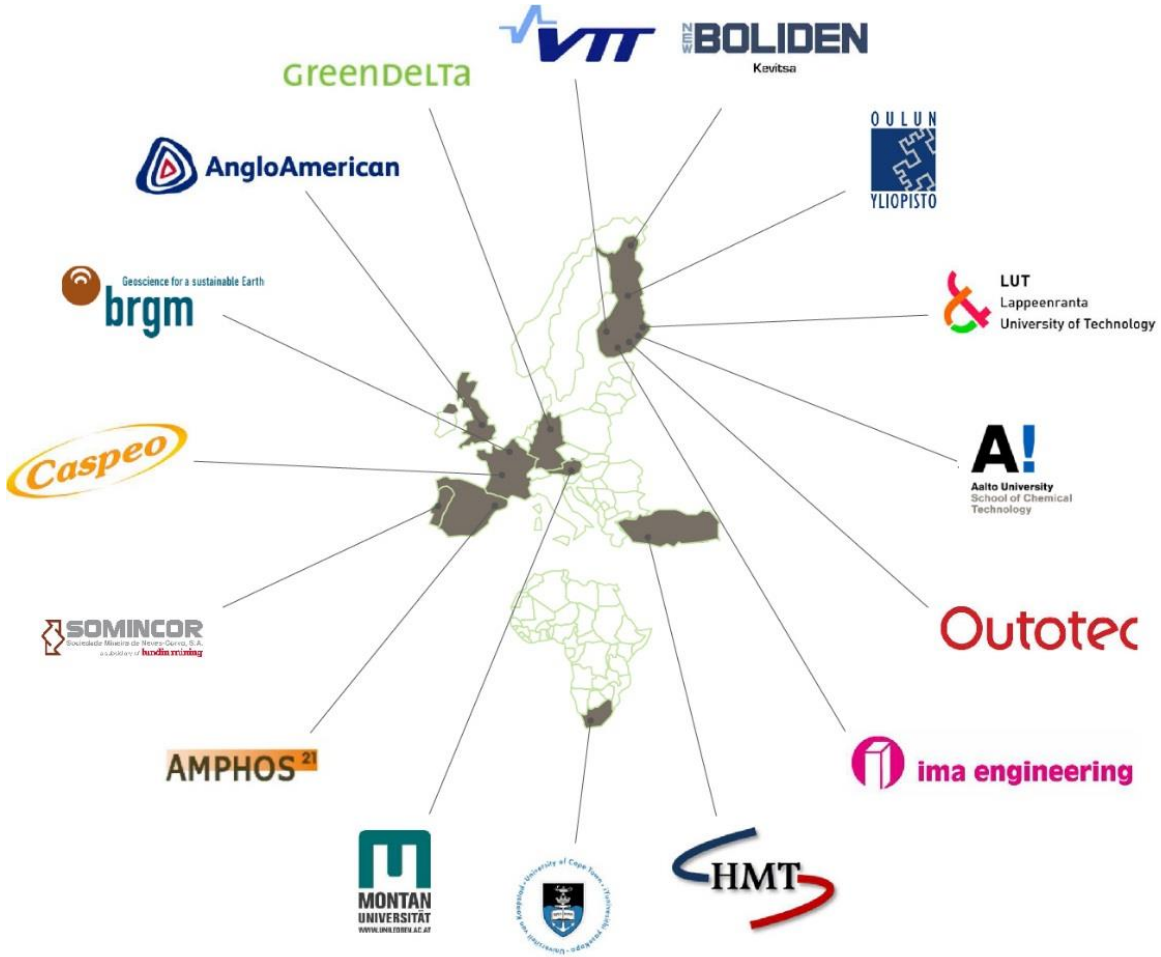
ITERAMS PROJECT

- Integrated Mineral Technologies for More Sustainable Raw Material Supply
- Addresses H2020 RIA “Sustainable selective low impact mining”
- 3.5 years: 1.6.2017 – 30.11.2020
- 7.9 M€ budget
- 16 partners
  - 9 industrial partners, 2 RTOs and 5 universities
  - From 7 EU Member States (Finland, France, Austria, Germany, United Kingdom, Spain and Portugal)
  - Additionally from Turkey and South Africa



NEW ROLE OF WATER AND WASTE IN MINING

- From water handling cost minimization

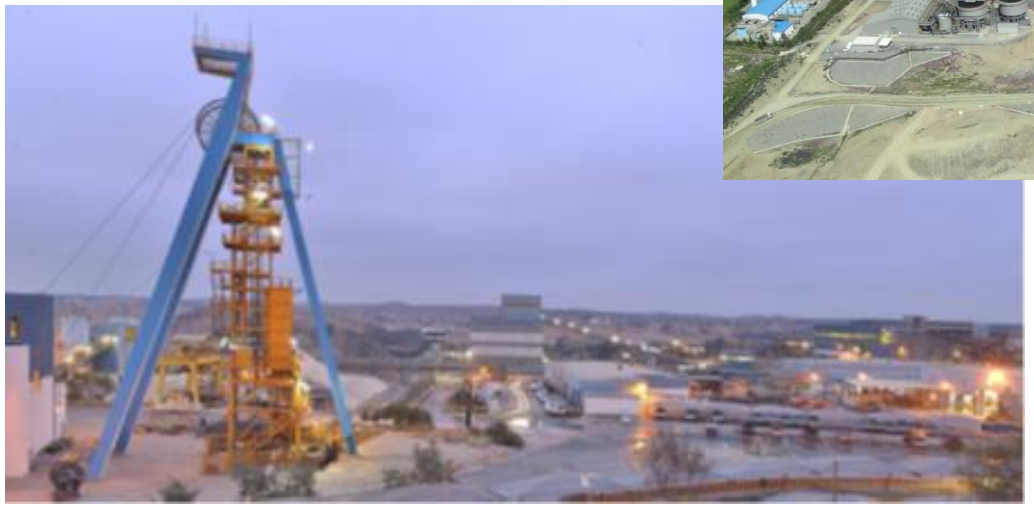
- to taking care of water properties and optimizing these properties for each process step. New water reuse concepts.

- From depositing waste rock and tailings

- to utilizing waste rock and tailings for added revenue as hardening mine fill or products. New ways of safe depositing of remaining tailings.

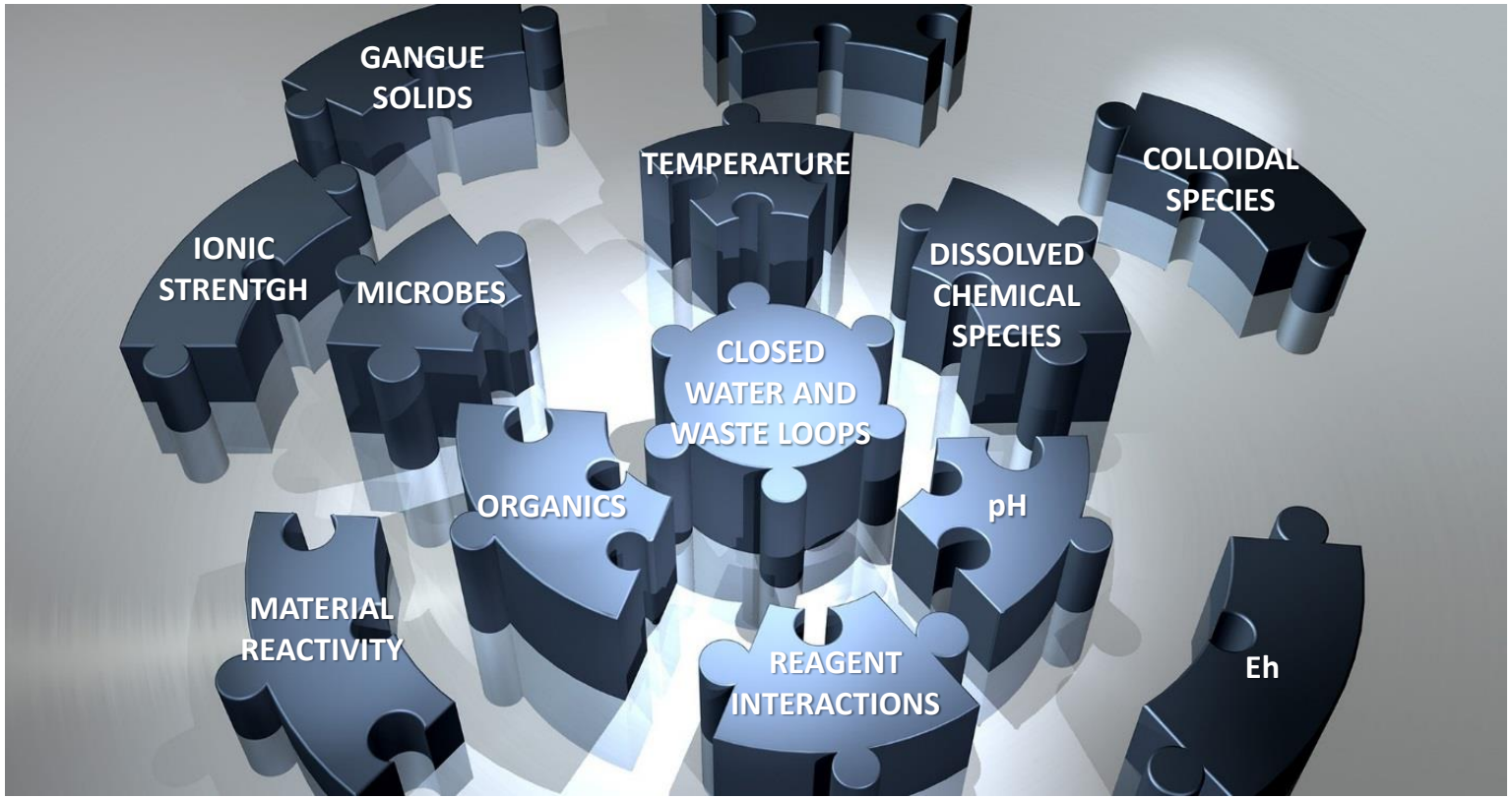
THREE CASE SITES: FINLAND, PORTUGAL, SOUTH AFRICA

- Different seasonal, hydrogeological and microbiological contexts
- Closed water loops
- Sensor development
- Ore sorting
- Geopolymer products
- Sustainability



UNDERSTANDING THE CHALLENGE

- Complete closure of water loops increases thermodynamical and kinetic unstability and process disturbance
  - ITERAMS created capabilities via laboratory experiments, modelling and validation at mine sites to tackle this complexicity



CLOSED WATER LOOPS – WATER TREATMENT

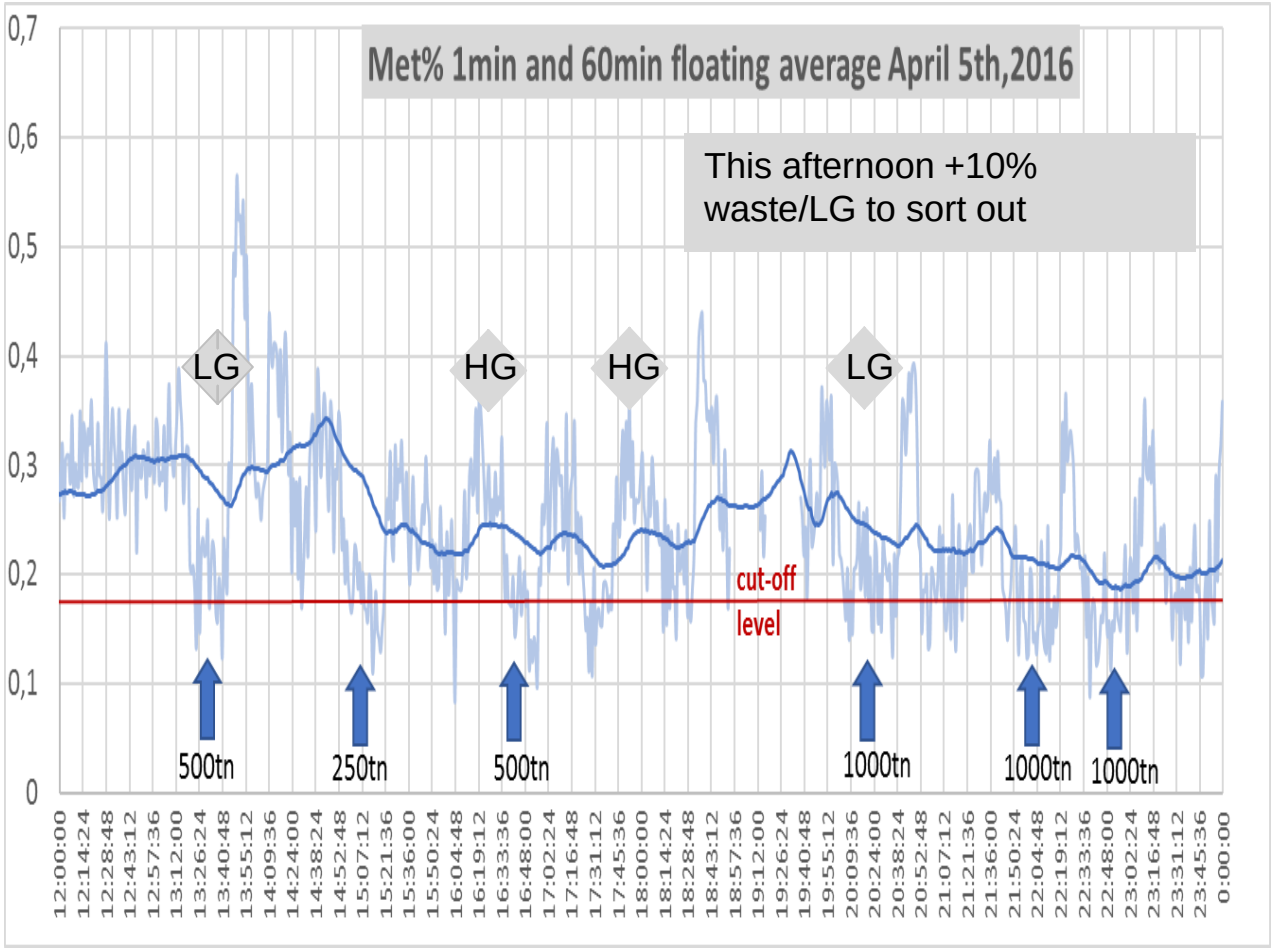
- Understanding the most critical parameters on flotation performance
- Fit for use water treatment
- Dissolved air flotation (DAF) and ion exchange resins (IX) most promising technologies for piloting
  - Both cleaned water to the acceptable level

CLOSED WATER LOOPS – ON-LINE SENSORS

- Measurement of contaminants in real-time, on-line and at reasonable cost
- Sensors developed for $S_2O_3^{2-}$, SO_4^{2-}, Ca^{2+}
- Piloted in-situ at mine site with four water streams having different chemical characteristics
  - The results were in correlation with lab measurements

ORE SORTING POTENTIAL

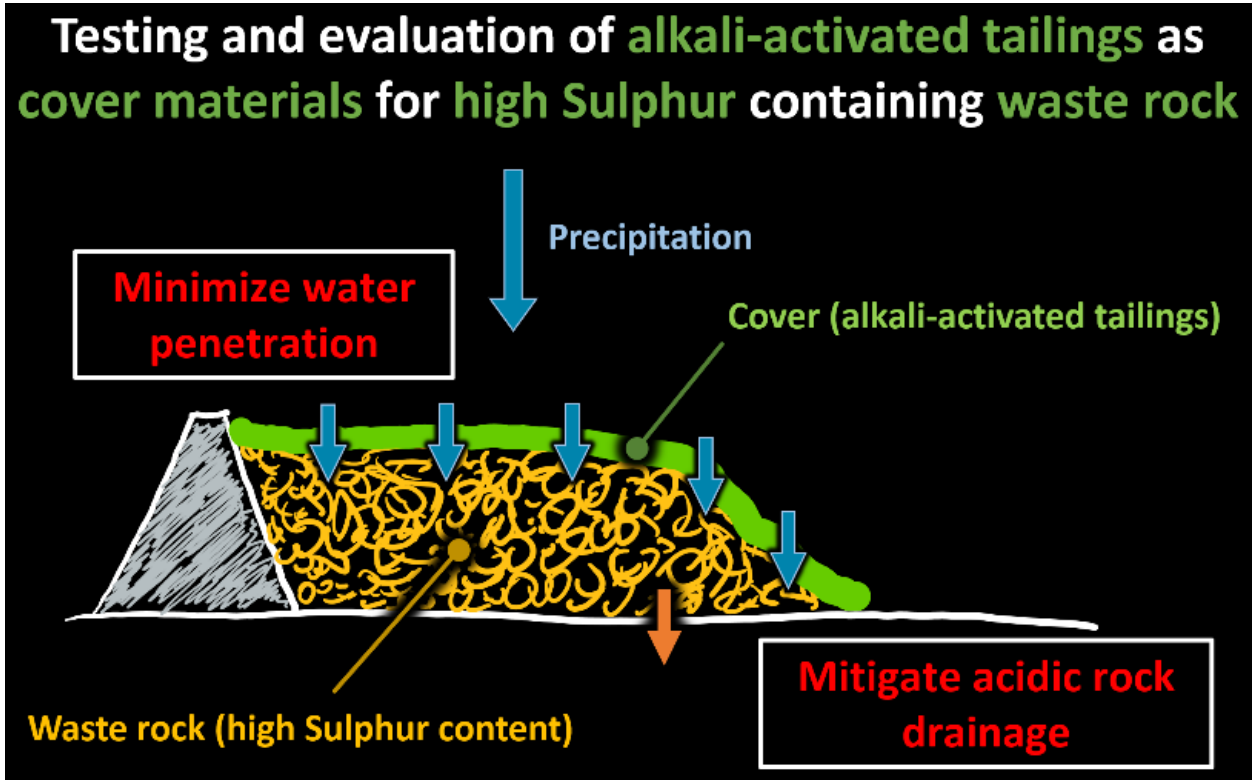
- Studying waste & low-grade ore sorting potential
- In this pilot, 10% of total feed should have been sorted out
- Resulted in full scale bulk ore sorting applications
- The biggest question is: **Why didn’t we do this earlier?**



GEOPOLYMERS OUT OF TAILINGS

- **Backfill materials**
  - **Strength** – 0,2 to 5 MPa
  - Rapid **strength development** for cut and fill operations – e.g. 2 MPa in 7 days
  - **Viscosity** of the backfill slurry – 20 to 30 Pa·s
    (up to 150 Pa·s for paste)
  - **Setting behaviour**

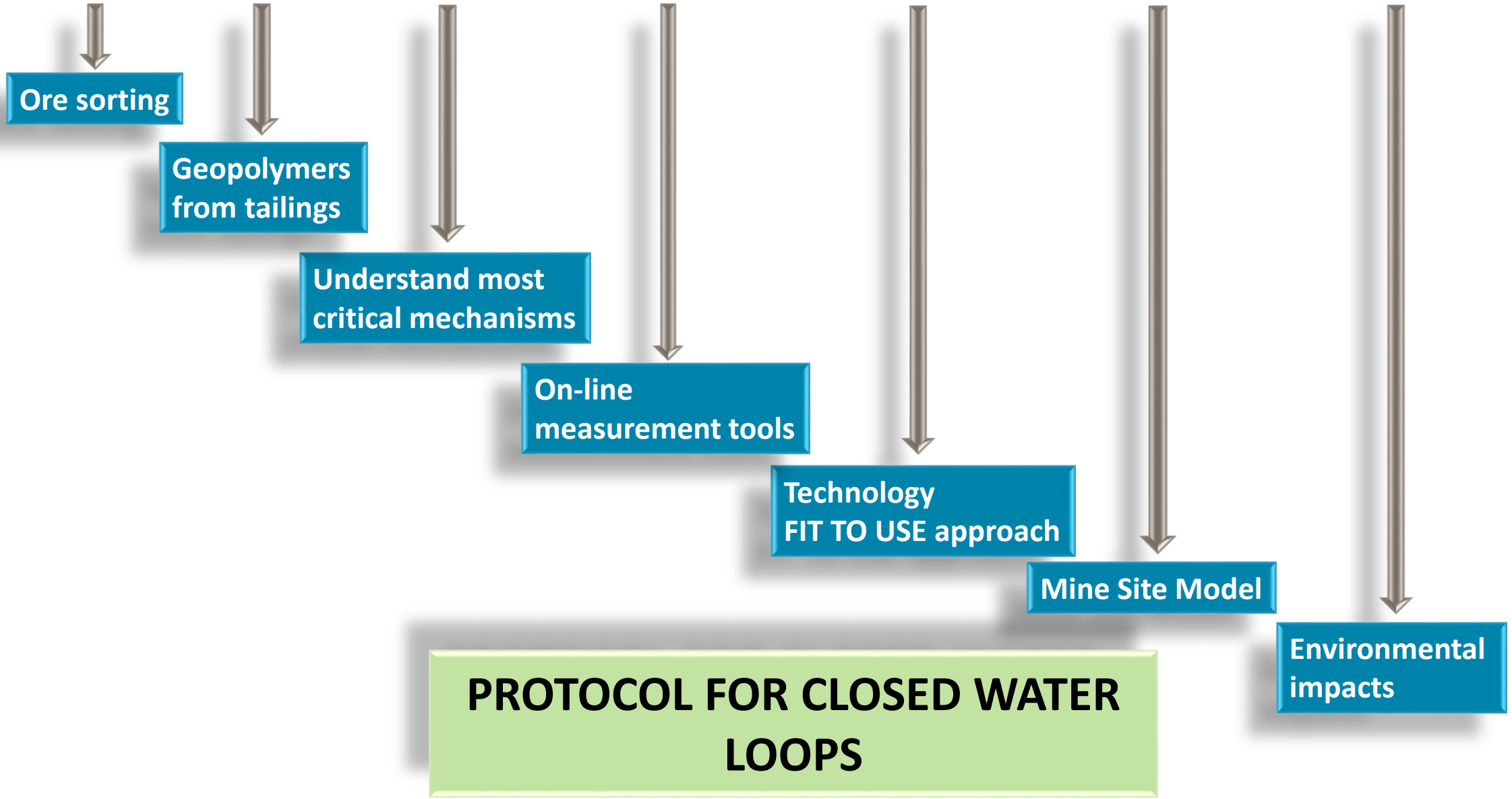
- **Covering layers** of surface deposits
  - **Properties** more **difficult to assess** – strongly depend on **tailings composition**, **environmental conditions** , and related questions
  - Assessment via **geochemical modelling**
  - Properties of interest: strength, water penetration, oxygen penetration, height and composition of the cover (layers)



GEOPOLYMERS OUT OF TAILINGS

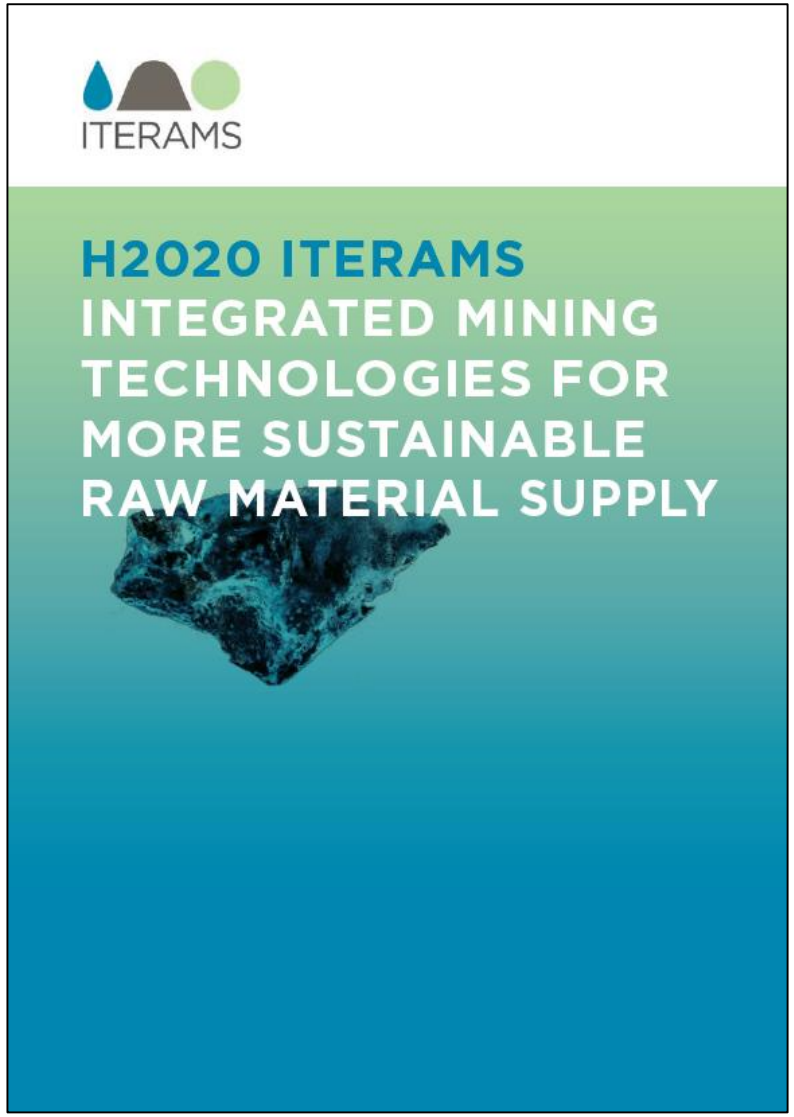
- Selected tailings have shown potential to be used in geopolymers and alkali-activated materials
- Long-term pilots throughout different seasons (freeze-thaw)

CONCLUSIONS



ITERAMS BOOK

- Summary of the most important findings of ITERAMS
- Will be published in internet tomorrow 11.12.2020
- www.iterams.eu



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REINVENTING THE ROLE OF WATER AND WASTE IN MINING

THANK YOU!

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