



The Penouta Project: Strategic and Sustainable Mining



April 2017

OUTLINE

1. Mining plan and Project
2. Sustainable Mining
3. Environmental Studies
4. Restoration Plan
5. SMS Innovation

The Penouta Mine Project

The Penouta mine is located in Viana do Bolo, in the province of Orense (Spain).

The Penouta Mine was one of the most important tin mines in Spain. It had several owners and was definitely closed in 1985 without any restoration process.

The strip mining was done in the open-pit and without a selective way. Mineral wastes were deposited in dumps and tailings ponds, without any type of restoration. These residues present concentrations of metals, such as tin, tantalum and niobium, and important quantities of industrial minerals.



Moment of abandonment



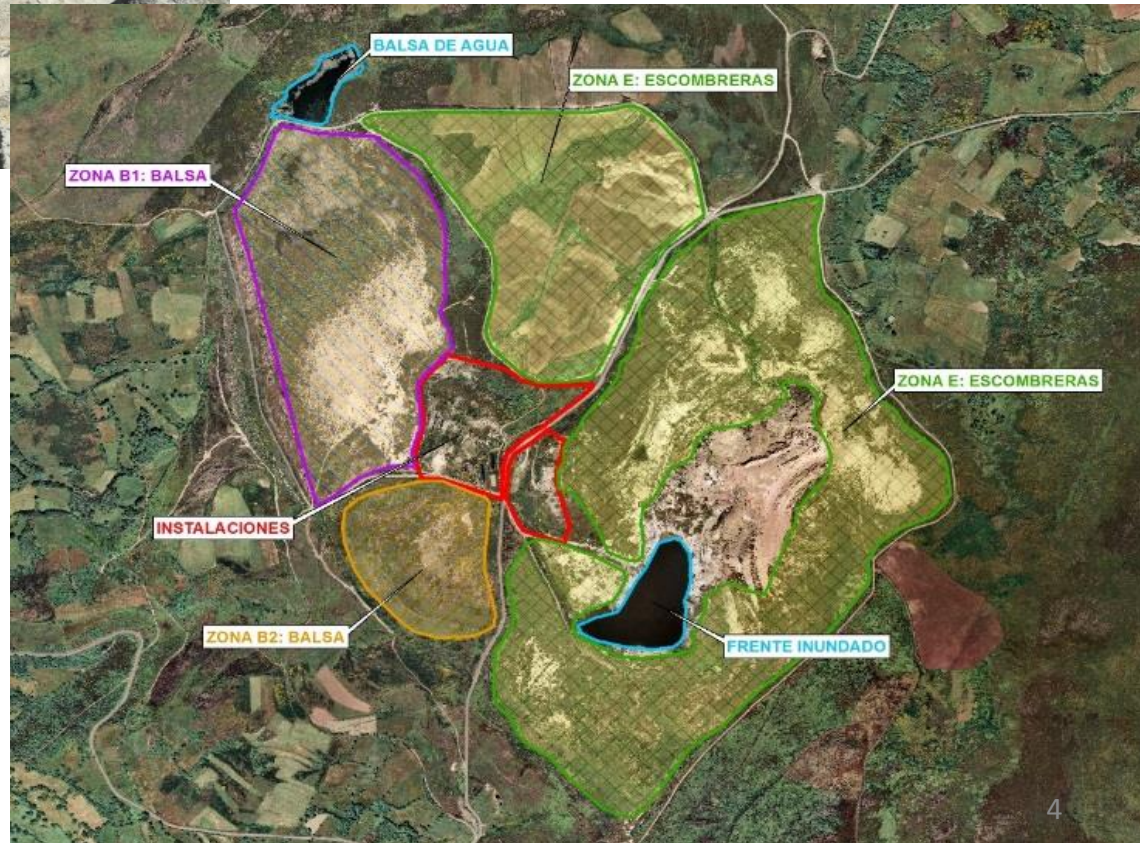
Current situation of dumps



Current situation of tailings ponds



Operating areas



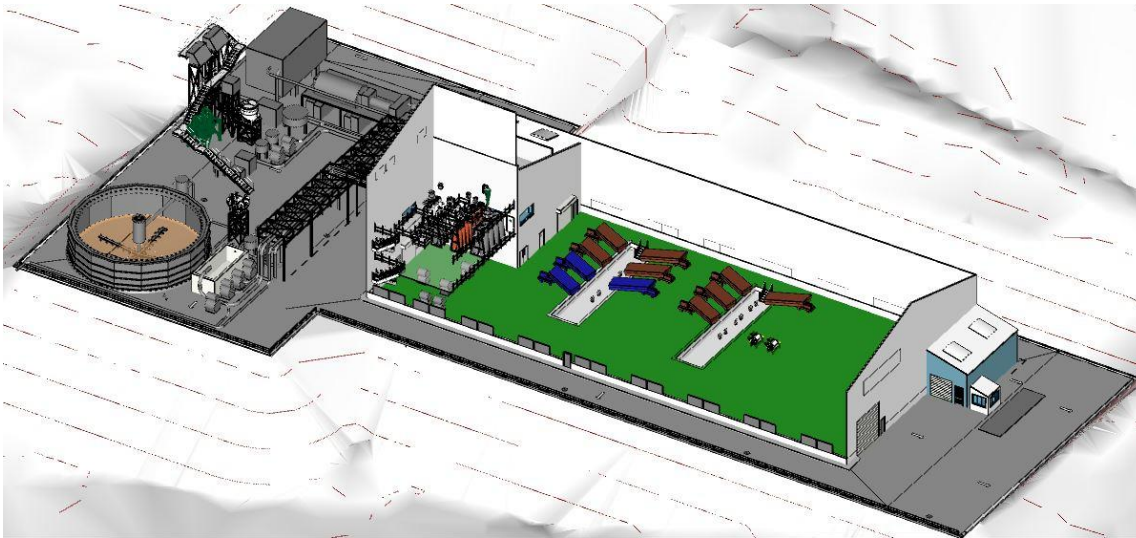
The Penouta Mine Project



Strategic Minerals Spain company obtained all mining and environmental licenses in 2014 for strip mining

Since that time Strategic Minerals Spain has carried out numerous studies of exploitation and engineering of detail, allowing the maximum use and valorization of these residues, in a effective and efficient process.

The benefit of these mining wastes will begin in 2017.

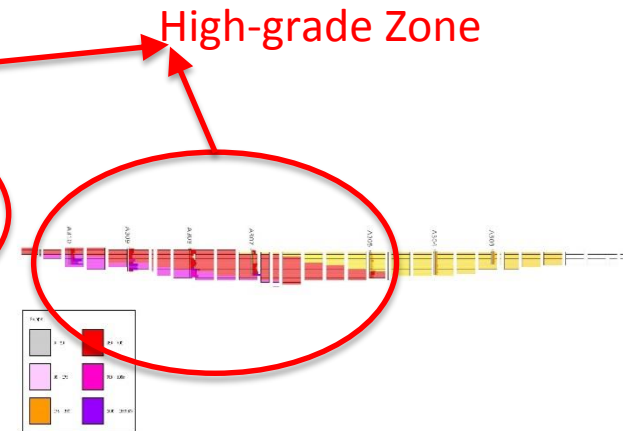
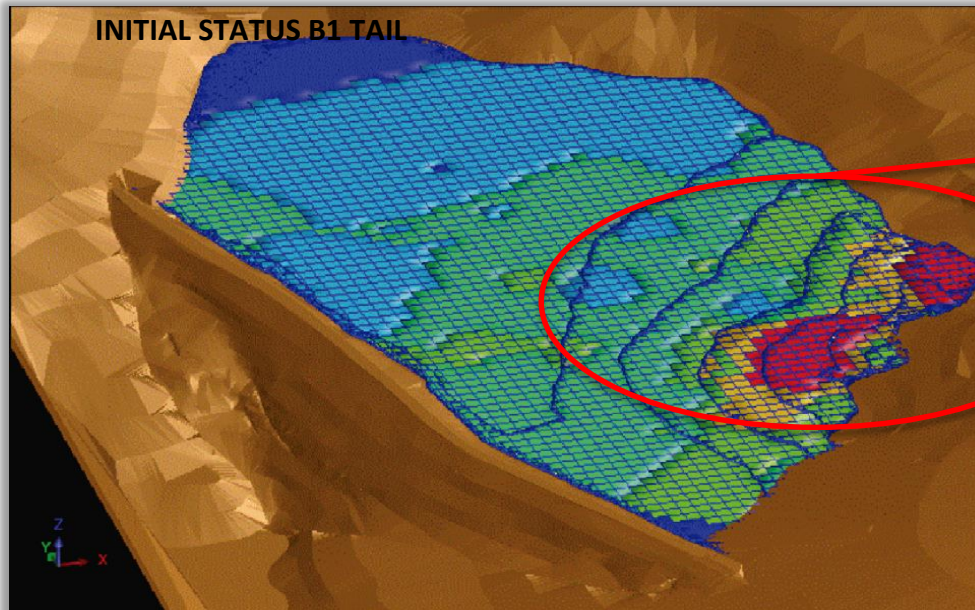


Process

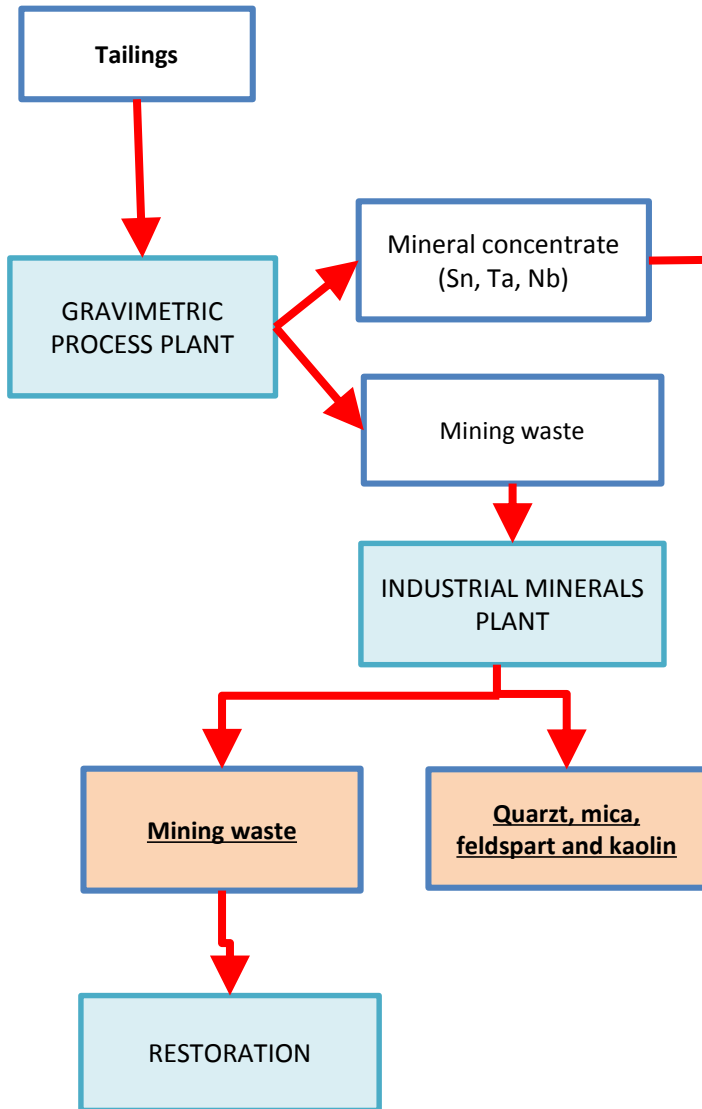


Current assembly of the plant

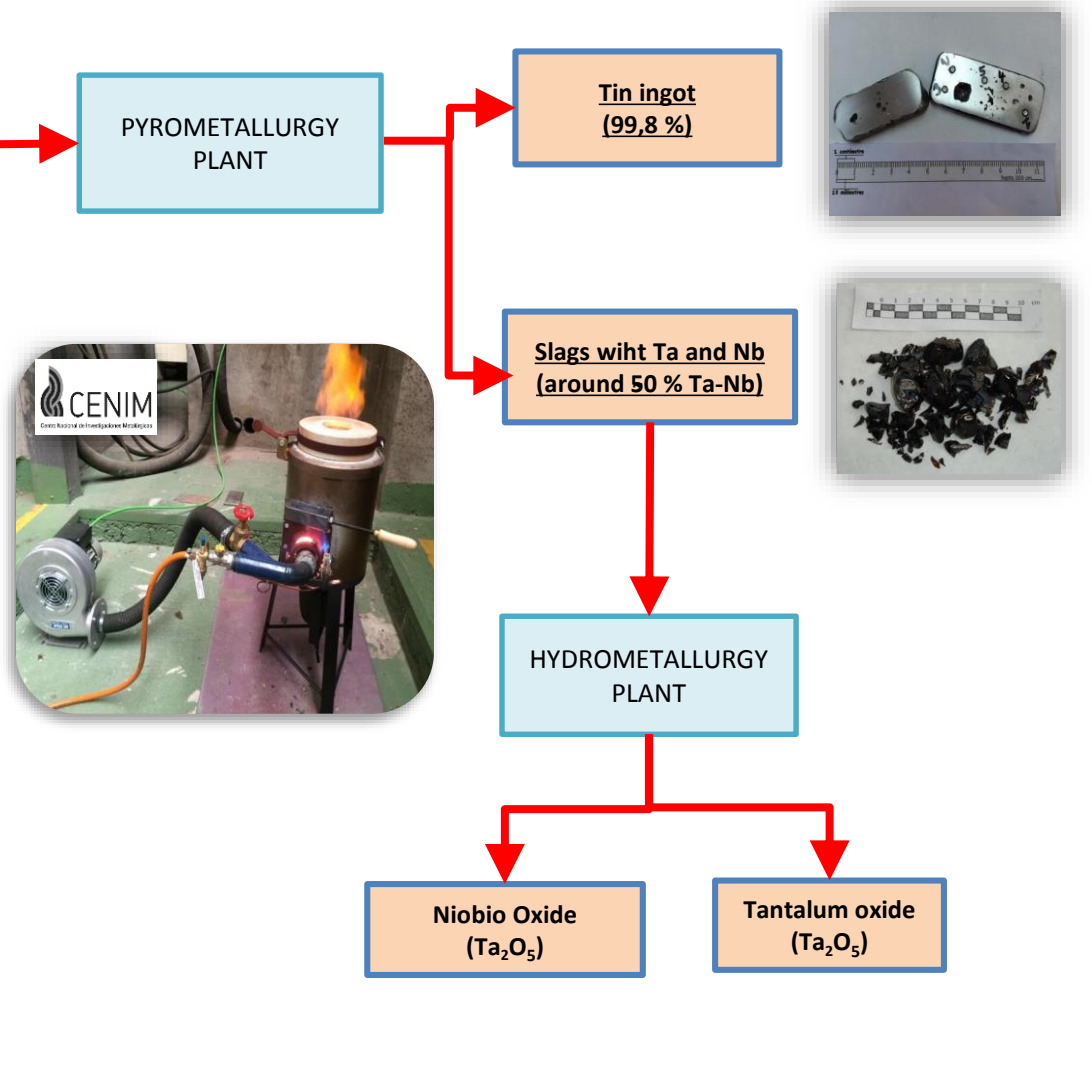
- In the short-term the tailing pond will be processed according to the different grade distribution.
- The mining works will be carried out by pumping.
- In the long-term tailing dumps will be treated.



Summary of the process



Currently in research...



Sustainable mining

WHY ?



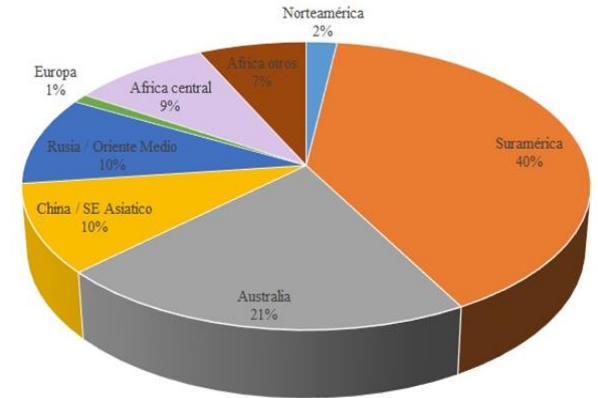
Economic viability in markets

The reopening of the Penouta Mine will have an great impact on Spanish and European markets

Strategic Minerals Spain will become an important mining producer of tin and tantalum in Spain and Europe

Strategic Minerals Spain is working in a conflict-free zone

It is a circular economy project



Social viability

We generate direct and indirect employment in a rural area in continuous economy and population decline.

We have great acceptance of the local environment

The Project can promote professional training



It is currently a degraded area

The Mine wasn't included in the protected area of Red Natura Peña Trevinca

The future restoration will improve the ecological quality.

A great challenge is to get the Mine to be part of Red Natura

The gravimetric process doesn't use chemical substances

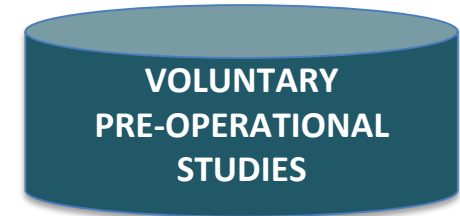
New environmental research techniques could be applied.



Importance of environmental studies

Apart from the environmental studies to obtain the licenses, SMS has carried out voluntary studies with following objectives:

- To improve environmental and social viability
- To improve operational control
- To reduce environmental impacts
- To improve restoration



It is a study of state zero or state of reference
It simulates a photograph of the environmental state



All this information was compiled in a report which was delivered to the Administration before starting mining works

Collaborations:

- Anibal Gil, Head of restoration in the As Pontes Mine, Endesa
- Universities of Galicia
- Environmental control companies



VOLUNTARY PRE-OPERATIONAL STUDIES in the Mine and in the environment

Vegetation and Fauna

Inventory of species of Flora and Fauna
Estimate of the biodiversity index



Air quality and noise

Noise simulations of future mining operation and noise measures
Placement of dust and particle sensors

Surface Water and Groundwater Quality

Internal and external water analysis
Hydromorphological study
Modelling of groundwater flow
Ecological study from biological indicators



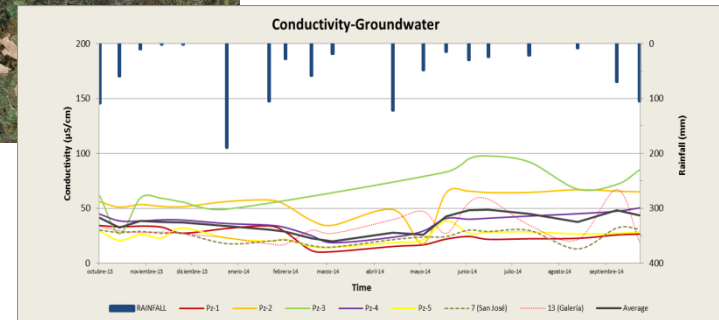
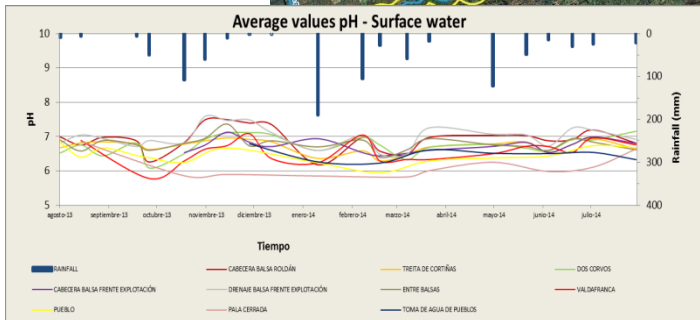
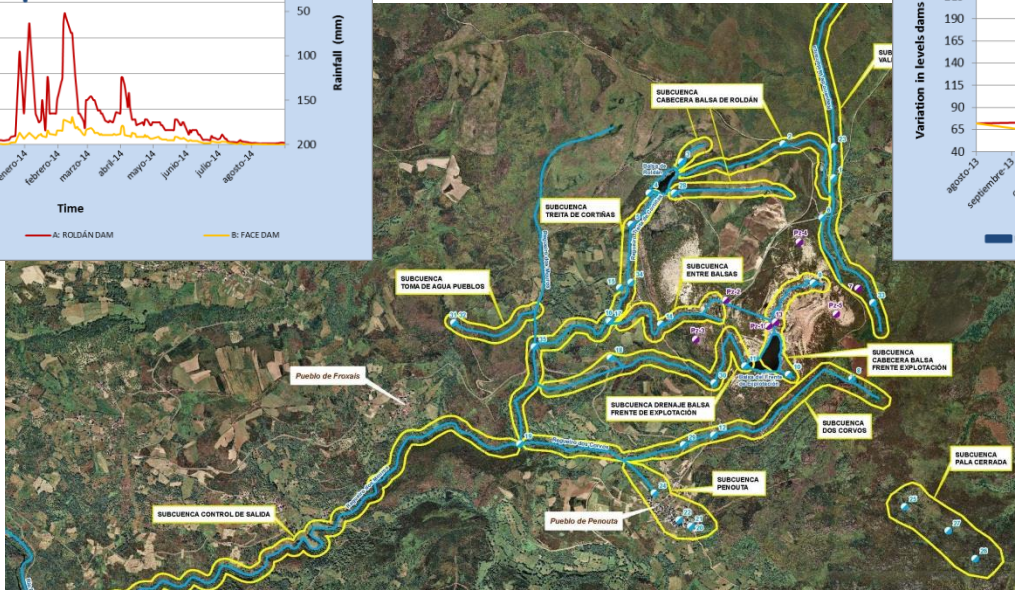
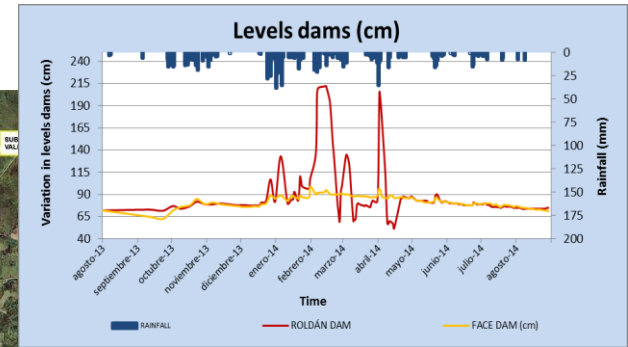
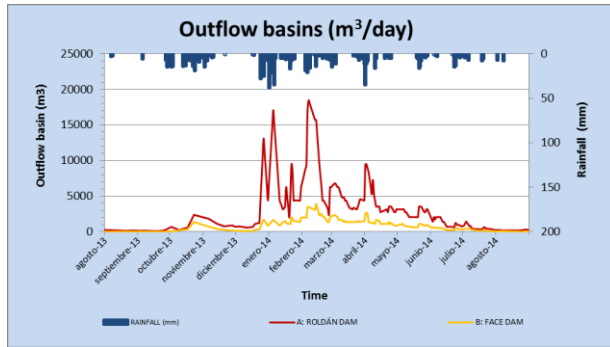
Soil

Soil sampling of the mine and its surroundings

Climate

Daily data collected from weather stations

Water sampling



Some examples

Study of wildlife

- Birdwatching
- Identification of animals footprints, traces, and excrements.
- Placement of insect traps
- Detection of amphibians and reptiles



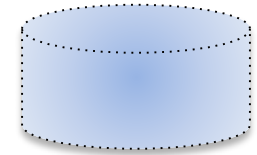
Soil study

- Analysis of existing drill hole and trench data
- New trenches
- Study of existing slopes
- Soil sampling in the mine
- Analysis of soil properties for mine restoration
- Distribution mapping of soil types

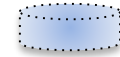


Operational control design

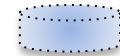
ALL STUDIES AND DATA COLLECTED IN THE PRE-OPERATIONAL PHASE WILL BE USED FOR CONTROL OF THE OPERATIONAL PHASE, CONTINUING RESTORATION, FINAL RESTORATION AND CLOSURE.



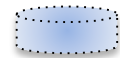
DESIGN OF ENVIRONMENTAL MONITORING INDICATORS



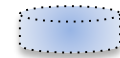
**DESIGN OF ENVIRONMENTAL EMERGENCY AND
MONITORING PLANS**



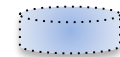
DESIGN OF DETAILED RESTORATION PLAN



DESIGN OF RDI PROJECTS



DESIGN OF MANAGEMENT SYSTEMS



About the Restoration Plan

We need to apply techniques for continuous restoration, final restoration and closure

Problems:

The absence of topsoil for later use

The long-term soil conservation

The final residues for the restoration have very low grain size and have no nutrients

The use of autochthonous plants species



We want to design a control plot to study the relationship among the different soils generated and the species to be used

We want to design a small plant nursey

Landscape restoration

Strategic Minerals Spain bets on innovation



OPTIMORE Project: H2020:

Increasing yield on Tungsten and Tantalum ore production by means of advanced and flexible control on crushing, milling and separation process



TALIZMAN Project: (requested 2017)

H2020 es SC5-14-2016-2017, for topic c) Sustainable metallurgical processes
High Performance Metallurgical Processes & Control Systems for the Recovery of Ta, Li, Zn Mn



OTHER PARTICIPATIONS

- **PhytoSUDOE:** participation as stakeholder. Project about phytoremediation
- **SMARTGROUND:** participation as case study. Project about to improve the availability and accessibility of data and information on Secondary Raw Materials (MPS) in the European Union



Possible future lines of environmental research

Soil studies

Native vegetation studies including protected species

Phytoremediation

Use technosoils

Studies of the environment and disclosure

Improve energy efficiency and saving the natural resources

Technological possibility to value waste from other sources



Thanks for your attention

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