

UAVIATION

UNMANNED SYSTEMS DATA INTEGRATED WITH COPERNICUS
FOR SUSTAINABLE MINING
&
H2020 PROJECTS CLUSTERING



EU-Latin America Dialogue on Raw Materials

Diálogo UE-América Latina sobre materias primas

Diálogo UE-América Latina sobre Matérias-primas

Argentina, Buenos Aires

8-9|05 2017



UAVIATION

1. PROBLEM
2. OBJECTIVES
3. SOLUTION
4. COMPETITIVE ADVANTAGE
5. PARTNERS
6. UAV SUPPLIERS
7. FUNDING
8. INVESTMENT PROPOSAL

H2020 CLUSTERING

- REMGHIC
- SCALE
- H2020 2017

EXPLORATION

the first step for a successful mining operation is the location, evaluation and selection of sites with deposits of such quality and quantity that will render the whole mission economically viable and profitable.

OPERATIONS

To ensure **cost reduction** in Mining Operations and their sustainability, by allowing a **continuous monitoring** of operations and guidance to both machines and workers on the ground.

To allow fast **failure detection** of pipelines and machineries.

TAILING DAMS MONITORING

EARLY WARNING SYSTEM to be applied to Monitoring of Mining Tailing Dams to detect and predict landslide movements and provide Early Warning to evacuate downhill areas and ensure population safety.

To be applied to Open Pit Mines Operations to ensure workers safety.

TAILING VALORIZATION

MONITORING Monitoring of Mining Tailings inflow (quality and quantity)

VALORIZATION Analysis of Tailings contents in order to explore the possibility of Mineral Residues and By-Products Valorization as Raw Materials for other industrial applications



ECONOMIC

❑ **To set the standard for Sustainable Low-Cost Mining Exploration and Operations.**

❑ **To reduce the time for the completion of the first exploration stage by 25% by aerial investigation and satellite data exploitation.**
With active participation of public authorities and local landowner, minimising time dedicated to licencing and land use approval.

❑ **To minimise mine exploration costs, achieving up to 55% cost reduction compared to traditional surface exploration methods.**



TECHNOLOGICAL

❑ **To include Copernicus Earth Observation (EO), Unmanned Air Systems (UAS) and remote sensing into actual Mining Exploration & Operations.**

❑ **To integrate Copernicus EO and UAS as complementary Mining Data Collection tools**

❑ **To establish Methodology and related Software to implement Vertical Data Fusion of Copernicus and UAV-generated Data.**

❑ **To develop user-friendly ICT tools for the visualisation of the processed and consolidated geophysical, spectroscopic, analytical, thermal, radar and chemical data.**



SOCIETAL

❑ **To reduce the mining environmental impact, bringing mining exploration towards sustainable mining achieving CO₂ emissions reduction of up to 45 % compared to traditional exploration methods, such as fully piloted data collection and drilling technologies.**

❑ **To include the TSM (Towards Sustainable Mining) Protocol issued by MAC (Mining Association of Canada), as a reference for Civil Society inclusion in the Mining Explorations and Operations.**

HYPOTHESIS

UAVIA is based onto following hypothesis:

- 1.Full Mining Production value-chain need to be addressed;
- 2.Clean and Sustainable solutions are required and possible;
- 3.Technological challenges have been addressed by different sectors (e.g.: ATM for Mining Monitoring), making Technologies available, but not currently implemented in the Market;
- 4.Full Technology value-chain need to be addressed.

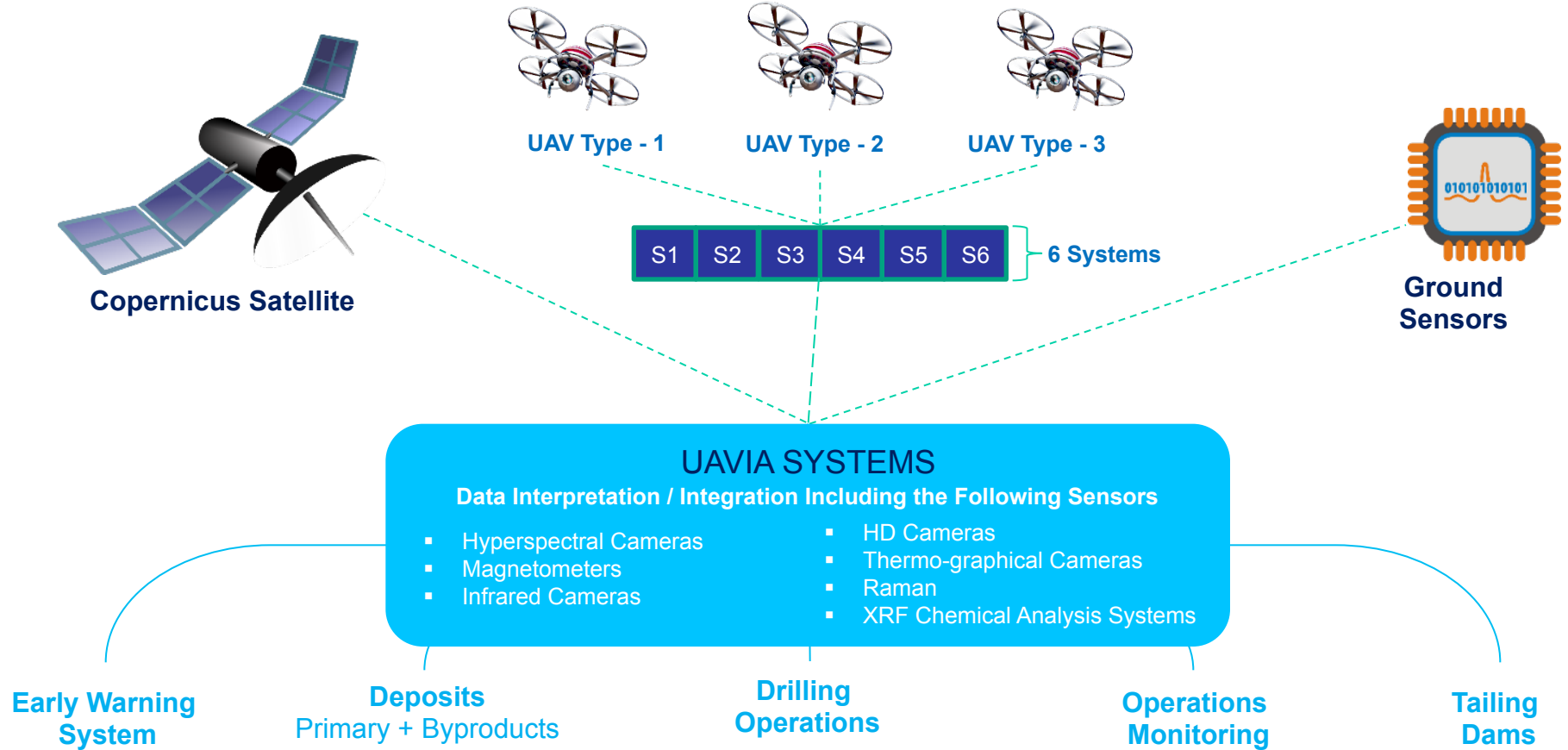
SOLUTION

Mining Exploration has been approached by UAVIA through 3 different level of Earth Observation: Satellites, Long endurance Drones (VTOL UAV) and close range drones.

UAVIA will integrate Data resulting from the Copernicus Earth Observation System and the Unmanned Flight Operations (Drones) of 3 different UAV Platforms with 6 different embarked systems, in order to provide an early warning system and to perform exploration of both primary and by-products deposit, reducing expensive drilling operations, reduce exploration time, address deposit with vast and small surfaces, detecting small concentrations, together with operations monitoring and tailing dams monitoring.

Sensors include: **Hyperspectral cameras, Magnetometers, Infrared Cameras, High Definition Camera, Thermo-graphical Cameras, Raman and XRF Chemical analysis Systems.**

For the first time, the spectroscopic data provided by both Copernicus and UAVs will be combined, analysed and evaluated, while the XRF measurements will provide a first semi-quantitative estimation of the chemical elements present at the surface, **complementing the spectroscopic surface analysis with actual on-site chemical measurements.**



Visualization Layer

- Export to 3rd party or use ours
- Use ours: ability to reprocess the data using visualization layer as interface
- **Can be web interface, mobile app, or central dashboard interfacing with multiple mobile apps**

Processing Layer

- Machine Learning (ML)
- NLP
- Math / Statistical Functions
- With ML, as usage increases, the platform “learns” and the quality of insight increases

Data Sources

(Structured & Unstructured)

Internal + External



MOMENTUM – The Foundation

- Drop-down UI
- Data aggregation
- Data joining
- 1-line interface API extension

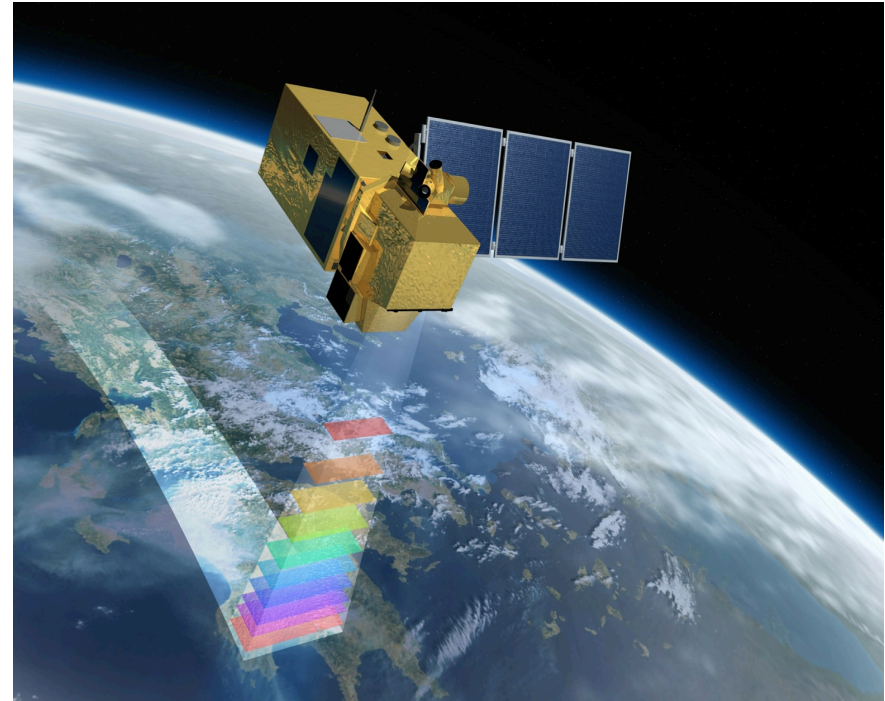
Parallel & Distributed Computing

- Increase processing speed or power as needed on-demand
- Save money
- Save time

Even though during the past few years projects using UAVs for mining purposes have been deployed, developed and financed by mining companies, public authorities as well as the EU, nevertheless the outcomes of these projects pointed out significant shortcomings that hinder the successful, wider application of drones for mining exploration activities.

UAVIA competitive advantage and guarantee of success reside in several factors, including:

- the use of UAV with sufficient endurance to perform 24/7 operations in 2 shifts,
- the integration with Copernicus systems to reduce operational costs
- role played by Uaviation, a UAV Operator, that does not rely on the frustrated dream of covering the entire value-chain for the operations, but rather counts on a strong group of partners with specific and deep experience in every technological step, from sensors to integration, from data collection to data fusion and interpretation and finally to the selection of the most appropriate UAV for the specific mission.



| TECHNOLOGICAL PARTNERS | |
|----------------------------------|---------------------------------|
| ITRB | ENGINEERING |
| Ingegneria dei Sistemi | SYSTEMS |
| DES Systems Innovation | |
| Quaternium | UNMANNED VEHICLES |
| Novadrone | |
| IDS | |
| GAF Earth Observation ag | COPERNICUS EARTH OBSERVATION |
| E-geos (a Leonardo Company) | |
| Uaviation | OPERATIONS |
| Embiq | SOFTWARE |
| ACCURE | |
| Admiris | MINING ENGINEERING |
| WAVESTONE | MANAGEMENT |
| Information and Design Solutions | COMMUNICATION |

| END-USERS | |
|---------------------------|-------|
| Codelco | Chile |
| AOG (Aluminium of Greece) | GR |
| AL Prospecta | Chile |
| CONFIDENTIAL | UK |
| CONFIDENTIAL | Chile |

| RESEARCH CENTERS | |
|--|----|
| Fraunhofer Institute ICT | DE |
| National Technical University of Athens NTUA | GR |
| Instituto Geologico y Minero Español | ES |
| Universita' del Salento, Lecce | IT |
| Politecnico di Bari | IT |

The specific UAV for the specific mission have been pre-selected, among several candidates belonging to 4 different classes, both rotary and fixed wing, including the Hero from Leonardo Company (former Finmeccanica) a vehicle of 150 Kg of Maximum Take Off Weight (MTOW).

HERO by Leonardo Company (former FINMECCANICA)



HYBRIX 2.0 by Quaternium



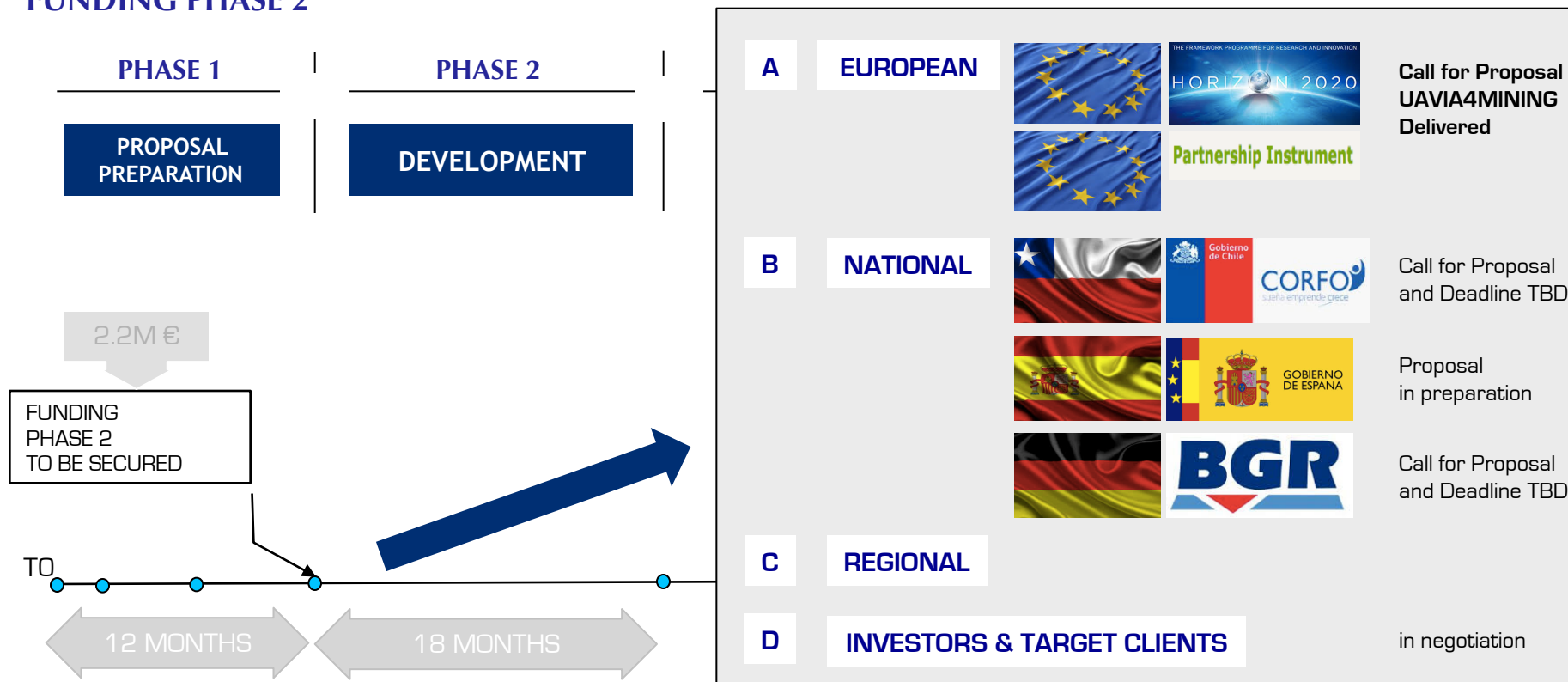
COLIBRI by IDS Ingegneria dei Sistemi



NOMAD by Novadrone



FUNDING PHASE 2



FINAL PRODUCT

The Project will generate a specific **Know-How, Methodology and dedicated Software** which will result in value added services to be provided to mining and agro companies worldwide

BUDGET

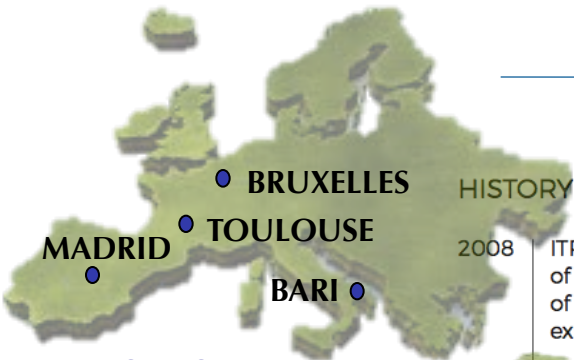
ITRB has tailored the full-project budget, by reducing it from 8 M€ to 2.2 M€ for 1 specific site and 1 material

SCHEDULE

ITRB has tailored the initial estimated schedule from 48 to 18 months

PARTNER SEARCH

ITRB seeks a partnership agreement with a Mining Company that provides financial support for the initial estimated budget through a JV agreement.



ITRB SITES

HISTORY

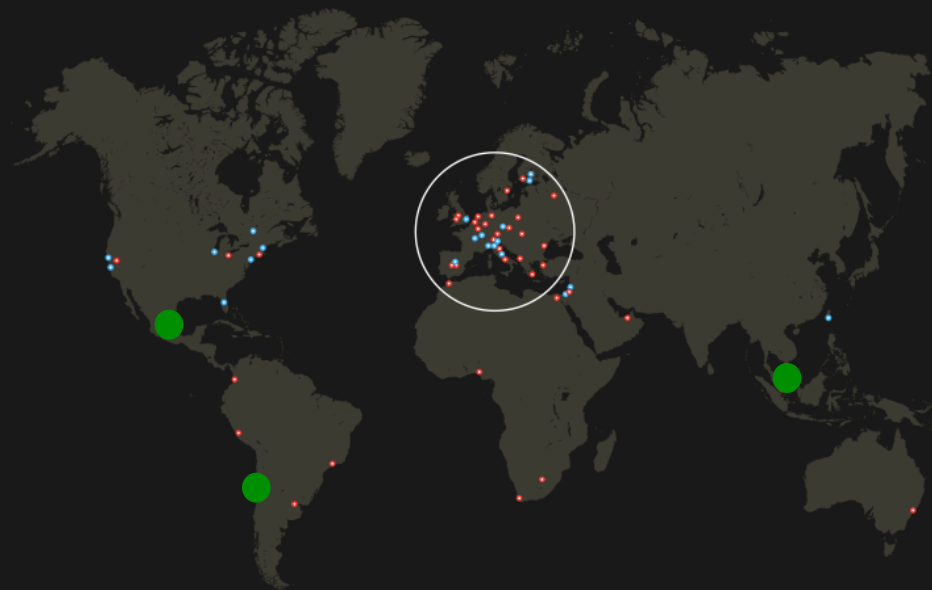
- 2008 ITRB is founded by a group of engineers with an average of over 20 years of professional experience in Aerospace.
- 2012 ITRB 2.0 is launched with the target of boosting R&D content
- 2015 TRB 4.0 is set to cover the entire Product Life-Cycle



GLOBAL PRESENCE

ITRB & SALES FORCE EUROPE establish the TECH HUB

- CLIENTS
- SALES REP
- ITRB SITES



INNOVATION

INNOVATION KNOWLEDGE MANAGEMENT (IKM)

1. Support clients to a **resource-efficient & environmental friendly** production by implementing best practice
2. Technology support through own and network knowledge
3. Innovation Hub

INNOVATION FUND MANAGEMENT (IFM)

1. Support **EU companies and ITRB projects** to enter Global market by IFM & strategical biz development
2. Proposals for **EU companies** with pre-award and post-award to get **beyond the state of the art**



INNOVATION

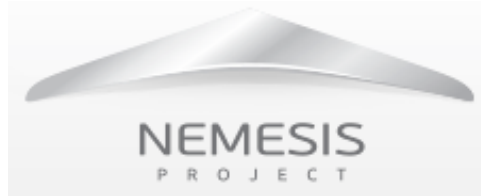
ITRB shows an impressive record of **47% of Success** Rate in Innovation Projects thanks to 3 pillars:

- ❑ Consortium Members Balance
- ❑ KIM (Knowledge & Innovation Management)
- ❑ Program Management in Feasibility and Execution Phase

Following examples of Successful Projects



www.remartproject.com



<http://nemesisproject.org>



<http://plitproject.org>

ITRB, together with its partners, decided to launch 3 Spin Off Companies in late 2015:

1.HYPERAVIO

2.CYCLEFIBER

3.UAVIATION

THE REMAGHIC PROJECT

New Recovery Processes to produce Rare Earth -Magnesium Alloys of High Performance and Low Cost

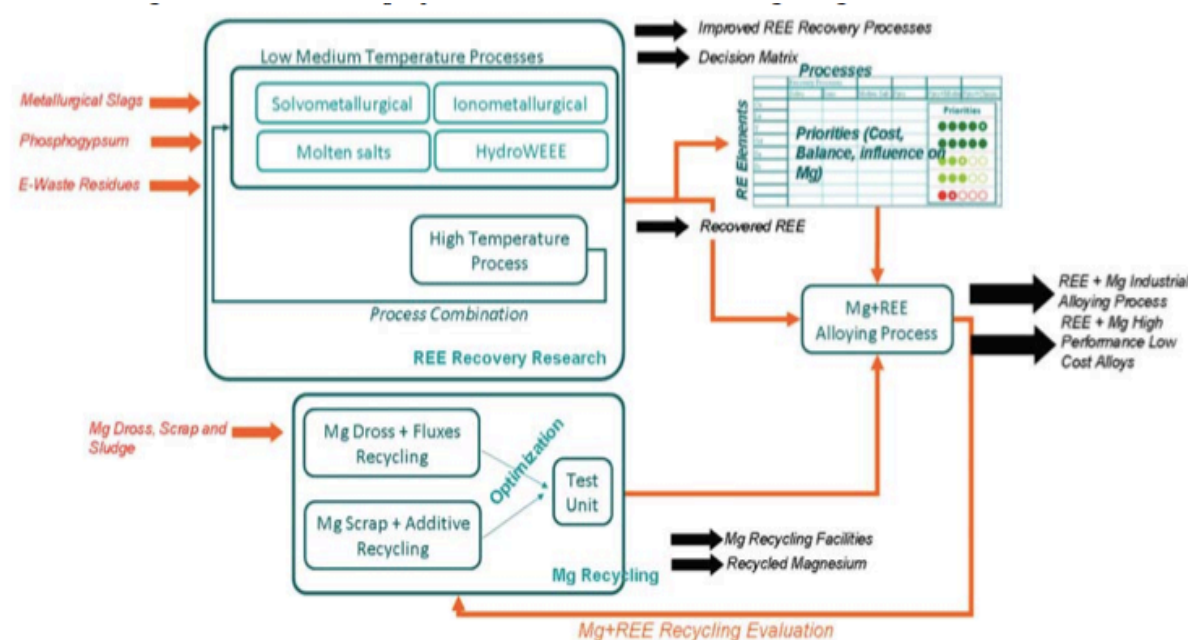


TARGET

REMAGHIC is focused on contributing to Europe's rare earth recovery and magnesium recycling technologies, improving the efficiencies of these processes and advancing the technology readiness levels for a new generation of industrial processes that will produce new low cost competitive alloys for a wide variety of sectors across Europe's manufacturing value chain.

PARTNERS

10 Partners
5 European Countries





Bauxite
Residues
TiO₂ Pigment
Acid Wastes

mg/kg

EXTRACTING

Sc from waste

g/kg

REFINING

Sc
concentrates

PRODUCING

Sc Metal

Sc₂O₃



SCALE:

Production of
Sc compounds &
Sc-Al alloys from
Bauxite Residues

scale

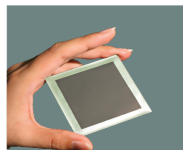
SCANDIUM ALUMINIUM EUROPE

**LASERS:
YSG GARNETS**

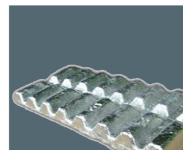


IFVI

**SSZ LAYER
SOLID OXIDE
FUEL CELLS**



AL-SC ALLOY



**KBM AFFILIPS
MASTER ALLOYS**

**SCALMALLOY
3D PRINTING**



AIRBUS

A BARRIER-BREAKING MODEL

A viable process, from extraction to production

Sc EXTRACTION

BREAKTHROUGH TECHNOLOGIES ➤

Extracting Sc from low grade and complicated resources and by-products

TECH

BARRIER

Sc REFINING

OPTIMIZATION TECHNOLOGIES ➤

Multi stage S-X processing
Use of HF(g)

MARKET

BARRIER

Sc PRODUCTION

BREAKTHROUGH TECHNOLOGIES ➤

High processing costs
Small production scales

SCALE: AN RTD PROJECT DEDICATED IN DEVELOPING A NOVEL Sc SUPPLY CHAIN



Horizon 2020



4 year project



7,000,000.00



AoG demo plant

EU MARKET POTENTIAL

- **Alumina Sector:**
up to 500 t/y of Sc
- **Titania Sector:**
up to 140 t/y of Sc

SCALE RAW MATERIAL SOURCES

AoG Bauxite Residue:
130 g/t Sc; 750,000 t/y

AOS Bauxite Residue:
93 g/t Sc; 900,000 t/y

TRONOX acid waste filter cake:
150 g/t Sc; 50,000 t/y

The research leading to these results has been performed within the SCALE project and received funding from the European Community's Horizon 2020 Programme (H2020/2014-2020) under grant agreement n° 730105.



University of Applied Sciences and Arts
Northwestern Switzerland



CONSORTIUM HAS BEEN AWARDED ADDITIONAL H2020 PROJECT IN THE FIELD OF RAW MATERIALS.

DETAILS TO BE KEPT CONFIDENTIAL UNTIL PROJECT KOM

CONSORTIUM CORE GROUP

Organizations to be included in the Core Consortium, with the target of jointly develop R&D projects seeking for both private and public funding.
Target 2018: 11 Calls for proposal from H2020

H2020 PROJECTS FORUM

To cluster with H2020 and corresponding LATAM instrument projects, in order to foster synergies and Cross-Sectorial Cooperation.

INTERNATIONAL COOPERATION

To pursue the Innovation and Knowledge Transfer between EU and LATAM via a yearly meeting and a Permanent Forum.
Next Meetings: December 2017 in Europe and April 2018 in Chile

ADVISORY BOARD

To include Stakeholders in a permanent H2020 ITRB Projects Advisory Board



THANK YOU

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