E R A·M I N 2

RESEARCH & INNOVATION PROGRAMME ON RAW MATERIALS
TO FOSTER CIRCULAR ECONOMY

Acronym: ERA-MIN 2
Title: Implement a European-wide coordination of research and innovation programs on raw materials to strengthen the industry competitiveness and the shift to a circular economy
Grant Agreement number: 730238
Funding scheme: ERA-NET COFUND
Start date: 1st December 2016
Duration: 60 months

DELIVERABLE D3.5

LIST OF PROJECTS SELECTED FOR FUNDING

WP 3: Evaluation and proposal selection for the co-funded call
Task 3.5: Funding decisions and use of the EC top-up
Task Leader: FCT and ANR
Lead beneficiary: FCT
Type: Report
Dissemination level: Public
Author(s): Dina Carrilho and Ana Luísa Lavado
Due date: M15
Actual submission date: M16

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ERA-MIN 2 comprises a progressive, pan-European network of 21 public research funding organisations from 18 countries/regions (Argentina, Belgium-Flanders, Brazil, Chile, Finland, France, Germany, Ireland, Italy, Poland, Portugal, Romania, Slovenia, South Africa, Spain, Spain-Castilla y Léon, Sweden and Turkey).

Built on the experience of the EU project ERA-MIN (2011-2015), **ERA-MIN 2** aims to enhance and strengthen the coordination of research and innovation programmes in the field of non-energy, non-agricultural raw materials (construction, industrial and metallic minerals) to support the European Innovation Partnership on Raw Materials, the EU Raw Materials Initiative and further develop the raw materials sector, in Europe and globally, through funding of transnational research and innovation (R&I) activities.

ERA-MIN 2 will support demand driven research on primary and secondary resources, and substitution of critical raw materials under a circular economy approach, to give the opportunity to the R&I community to apply to world-wide coordinated funding, gaining access to leading knowledge and new markets, while reducing fragmentation of R&I funding across Europe and globally. This will be achieved through one EU co-funded call for R&I proposals in 2017 and two additional calls, in 2018 and in 2019, designed and developed specifically for the non-energy, non-agricultural raw materials sector.

Publishable summary: The document summarises the list of the 16 projects selected for funding under ERA-MIN Joint Call 2017 co-funded by the European Commission. It includes the call statistics, the data on each project and the publishable abstracts. All these information are public and available at the ERA-MIN 2 website.

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1 INTRODUCTION

The ERA-MIN Joint Call 2017 on "*Raw materials for sustainable development and the circular economy*" was a two-stage submission procedure that began on the 1st February 2017 with the launch of the call and ended on 14th December 2017 with the Scientific Evaluation Board and the final funding decision by the Call Steering Committee (CSC) of the ERA-MIN 2.

By the 15th of January 2018, the results of the call were communicated to all proposals' coordinators as scheduled in the Call timetable. Afterwards, the list of the 16 projects recommended for funding, including the main call topic and sub-topics addressed by the proposals, the publishable abstracts and the consortium partners, was published at the ERA-MIN 2 website (www.era-min.eu), specifically in the section "Call results" (Figure 1).

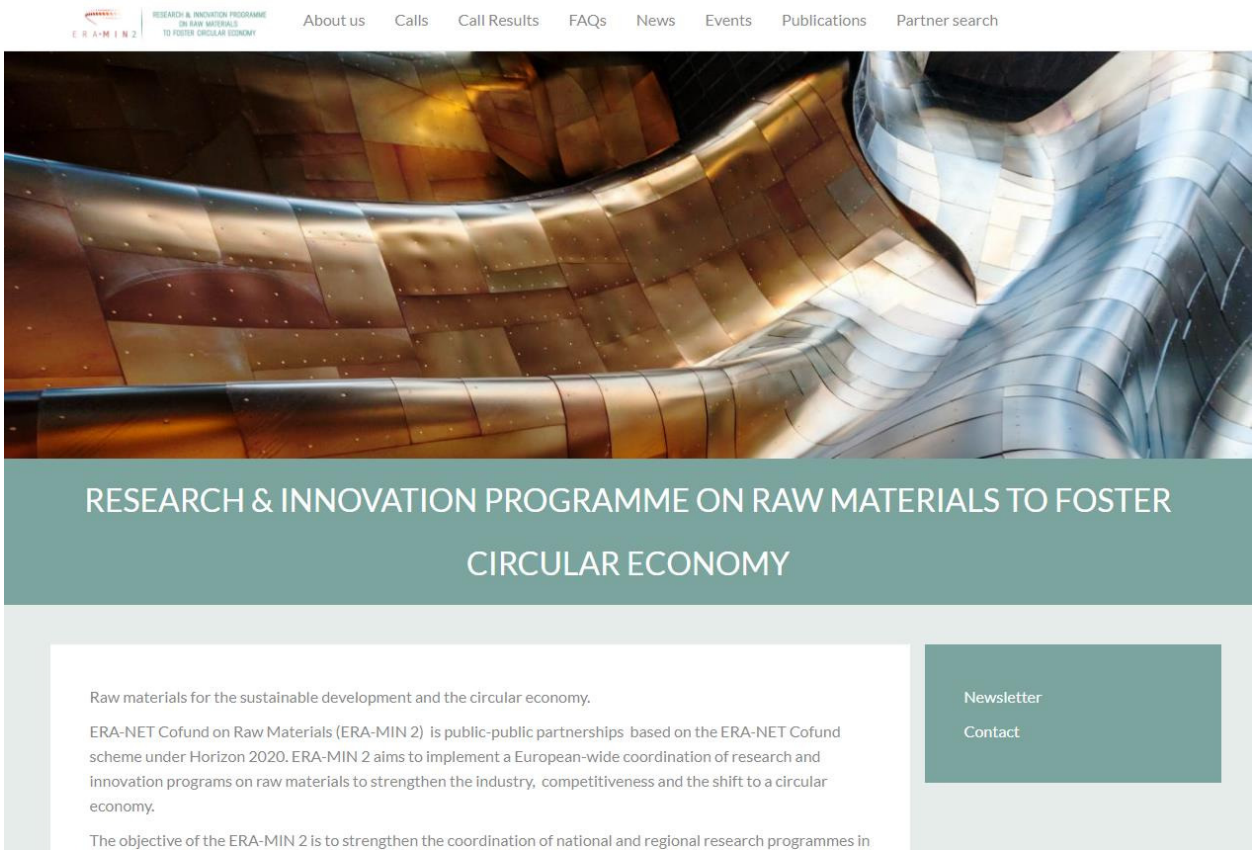

Figure 1 - ERA-MIN 2 homepage

In the next chapters all the information published at the ERA-MIN 2 website, including call statistics, list of funded projects and publishable abstracts is described.

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2 CALL STATISTICS

The ERA-MIN Joint Call 2017 was focused on needs-driven research on non-energy, non-agricultural raw materials addressing one or several areas of the circular economy.

The five main call topics were based on the challenges and priorities identified in the ERA MIN Research Agenda:

1. **1. Supply of raw materials from exploration and mining;**
   1.1. Exploration
   1.2. Mining operations
   1.3. Mine closure & reclamation
2. **Design;**
   2.1. Product design for increased raw material efficiency
   2.2. Product design for reuse or extended durability of product
   2.3. Product design to promote recycling
   2.4. Product design for critical material substitution
3. **Processing, Production and Remanufacturing;**
   3.1. Increase resource efficiency in resource intensive production processes
   3.2. Increase resource efficiency through recycling of residues or manufacturing
   3.3. Increase resource efficiency using information & communication technologies (ICT)
4. **Recycling of End-of-Life Products;**
   4.1. End-of-life products collection and logistic
   4.2. End-of-life products pre-processing
   4.3. Recovery of raw materials from End-of-life products
   4.4. Increase recycling of End-of –Life products information & communications technologies (ICT)
5. **Cross-cutting topics.**
   5.1. New business models
   5.2. Improvement of methods or data for environmental impact assessment
   5.3. Social acceptance and trust/public perception of raw materials

The ERA-MIN 2 Advisory Board together with the funding organisations have jointly elaborated the final versions of the call topics. Finally the call topics were in line with the integrated strategy proposed in the EU Raw Materials Initiative, the Strategic Implementation Plan of the European Innovation Partnership on Raw Materials and the EU Circular Economy Package.

2.1 PRE- AND FULL-PROPOSALS SUBMISSION STATISTICS

The Joint Call had a two-stage evaluation process, with the submission of 94 pre-proposals during stage 1 that were scientifically assessed and submitted to an eligibility check for compliance with the national/regional regulations. After Stage 1 evaluation, 36 pre-proposals were invited to submit a full-proposal during stage 2. On the full-proposal deadline, 35 full-proposals were submitted. These full-

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proposals were all eligible for funding and submitted to a centralized independent international scientific assessment.

The **94** pre-proposals submitted in stage 1 involved a total of **493** applicants, from which 27% were enterprises. In total, the proposal's costs were 81.2 million Euro and the requested funding was 61.7 million Euro (Figure 2).

In stage 2 submission, the **35** full-proposals involved **186** applicants, of which 33% of enterprises, total proposal's costs of 34 million Euro and 25.7 million Euro of requested funding (Figure 2).

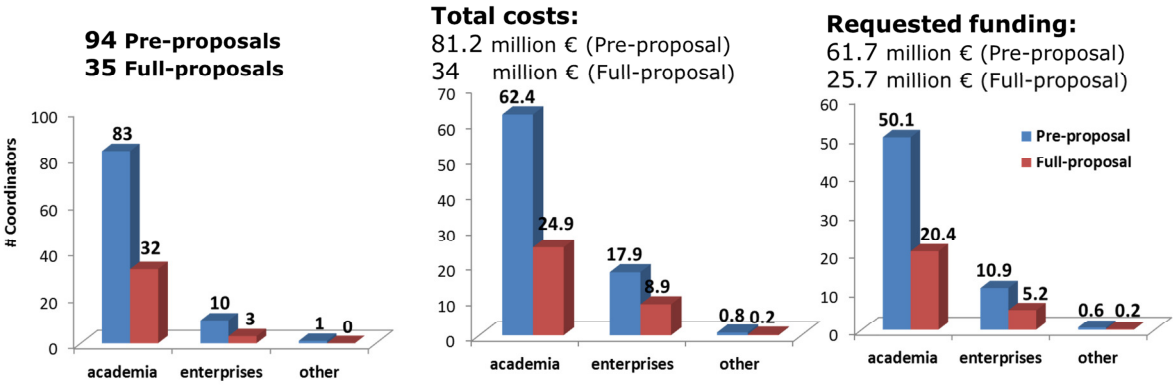

Figure 2 - Number of coordinators, total costs and requested funding in stage 1 and in stage 2 by type of organisation: academia, enterprises and other.

In Figure 3, the distribution of the pre- and full-proposals by funding organisation/country or region is presented. There were five applicants committed for project activities with own funds in stage 1 from 4 countries not participating in the Call, namely, Hungary, Norway, Switzerland and United Emirates.

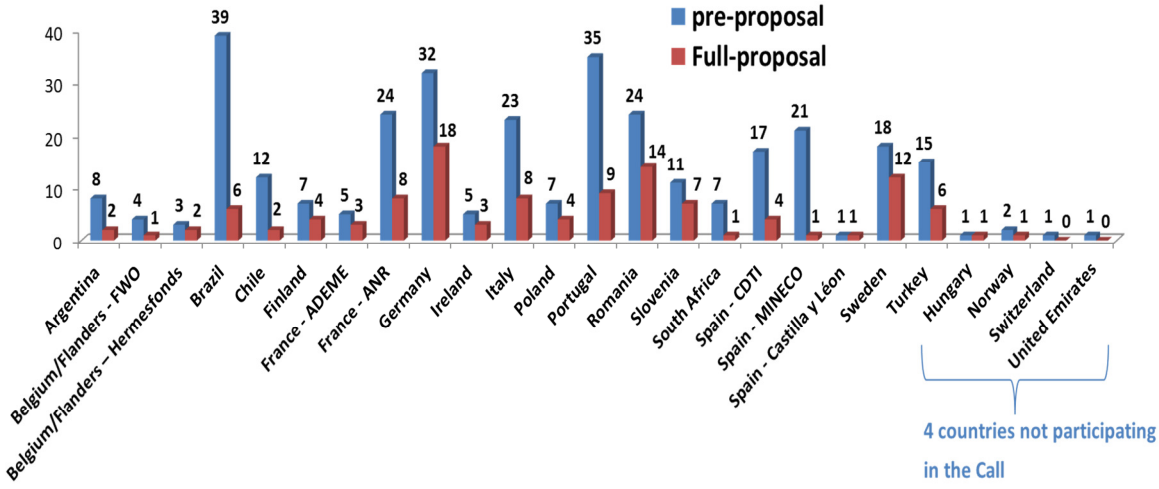

Figure 3 - Number of pre and full proposals per country.

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The Figure 4 shows the percentage of pre- and full-proposals submitted by main call topic. The topic #3 was the one with more proposals submitted in both stages and topic #5 the one with fewer applications.

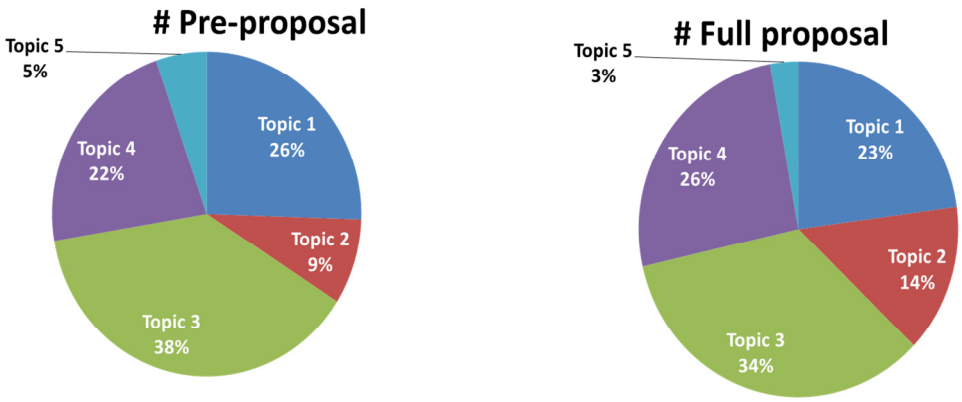

Figure 4- Number of pre and full proposals submitted per main call topic.

The distribution of the proposals by country and by topic in stage 1 and in stage 2 can be observed in the Figure 5 and Figure 6, respectively.

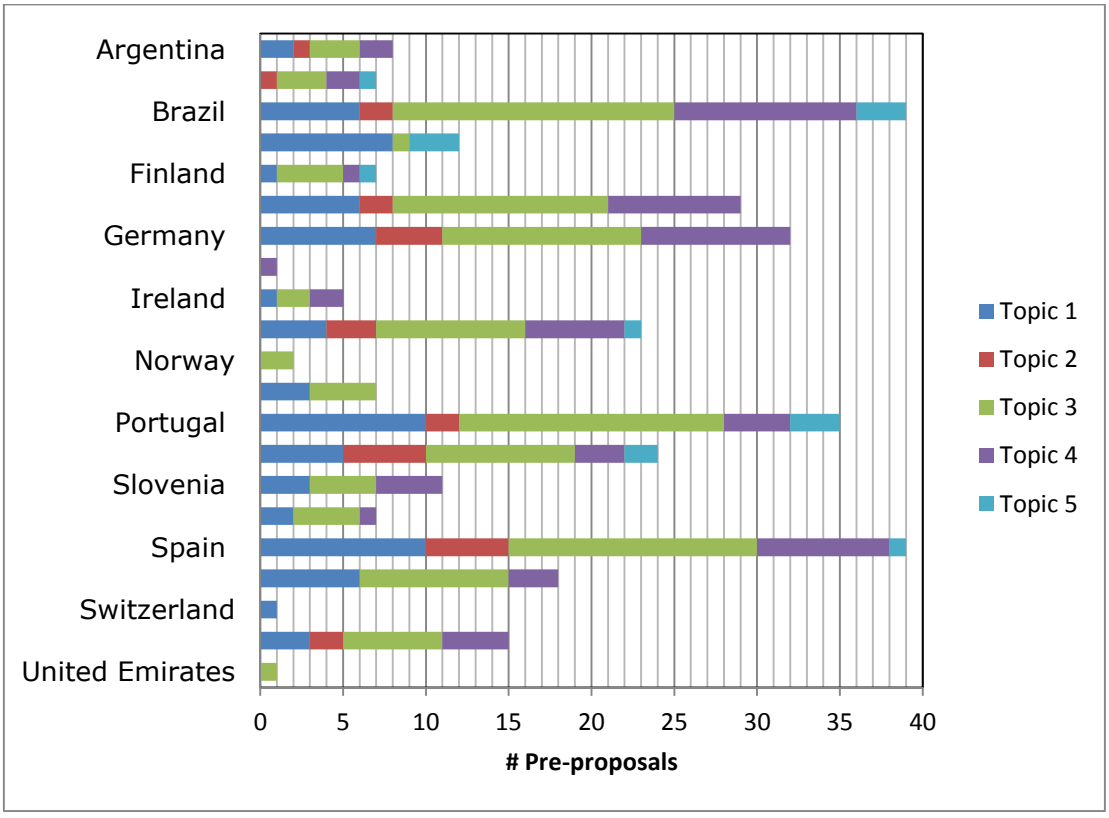

Figure 5 - Call topics addressed in each country in stage 1 (pre-proposals).

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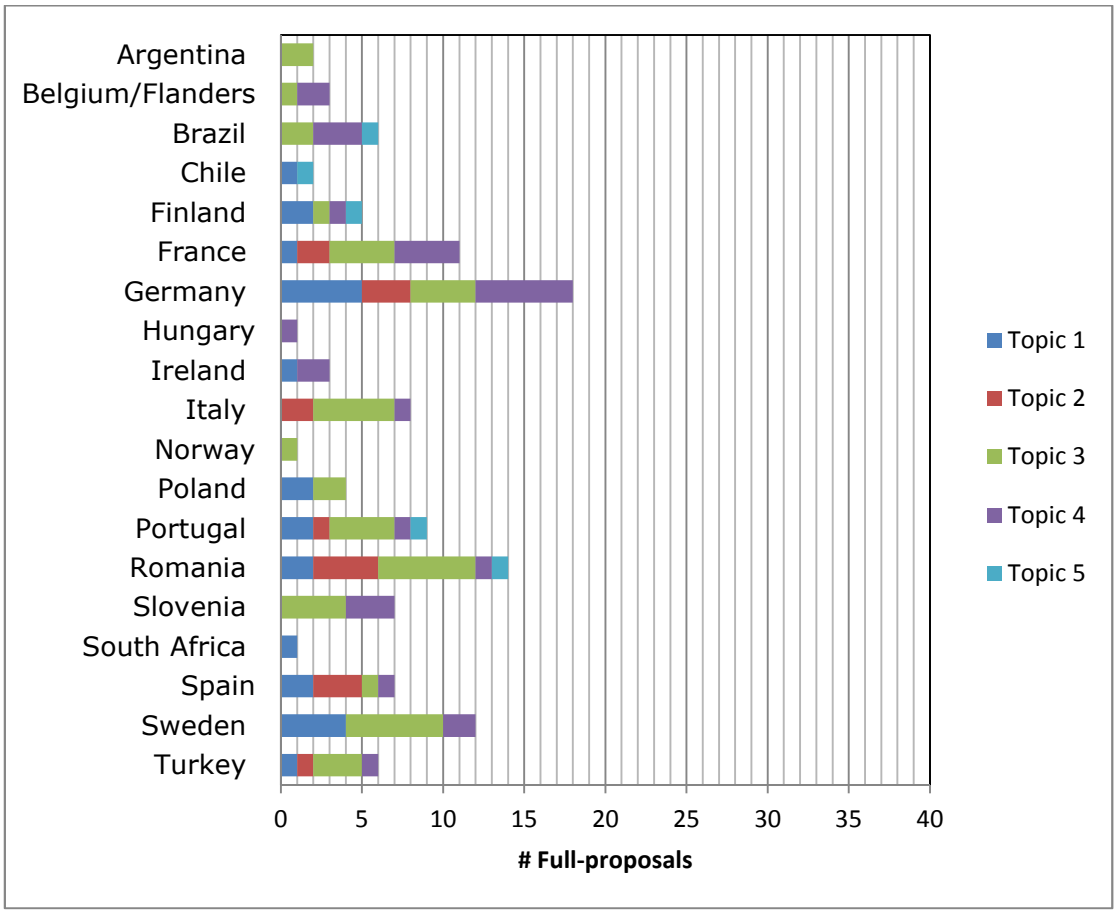

Figure 6 - Call topics addressed by each country in stage 2 (full-proposals).

2.2 FUNDED PROJECTS STATISTICS

Sixteen top-ranked transnational projects were selected and recommended for funding out of 35 eligible peer-reviewed full-proposals. These projects involved a total of 88 applicants of which 34 were enterprises. The total allocated public funding was 12.3 million Euro and the total projects' costs were 16 million Euro.

The Figure 7 shows the distribution of consortia coordinators and partners by type of organization while Figure 8 presents the distribution of totals costs and requested funding by type of organisation.

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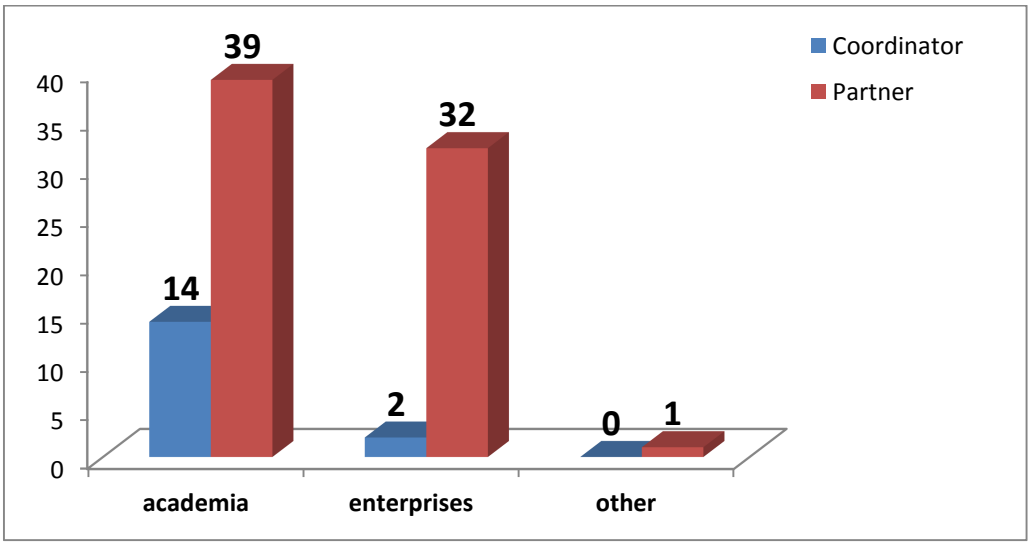

Figure 7 - Number of coordinators and partners by type of organisation.

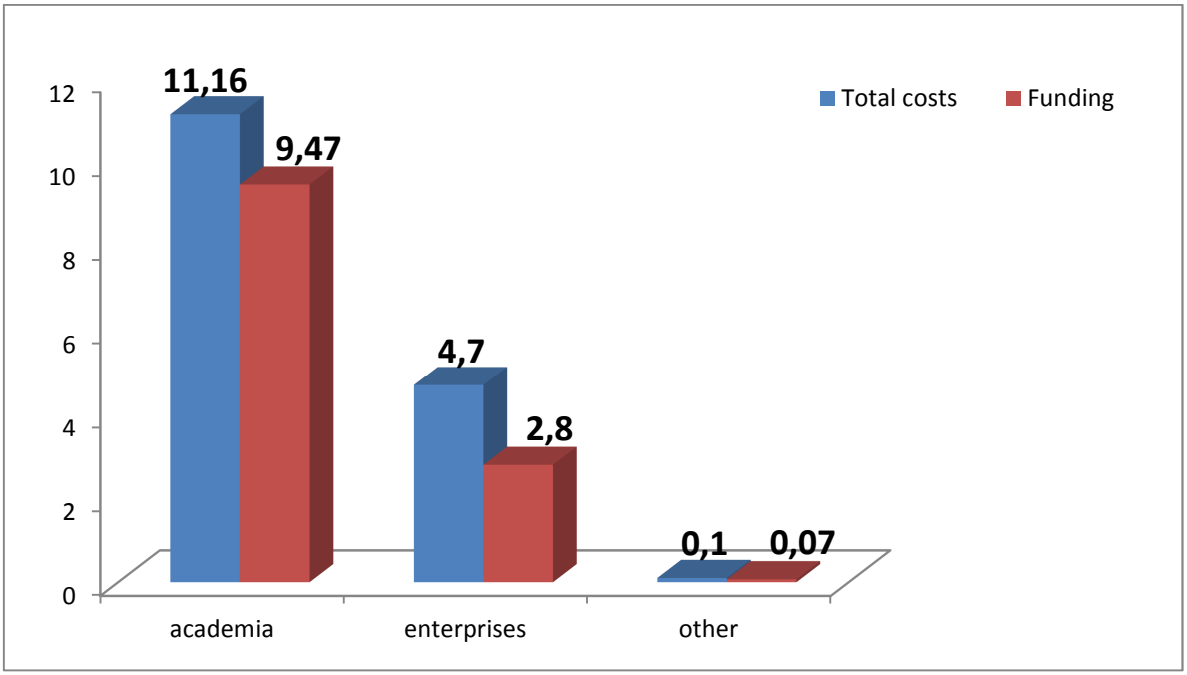

Figure 8 – Distribution of total costs and requested funding by type of organisation.

The number of transnational projects supported by each funding organisation from a country or region is presented in Figure 9. Germany and Sweden both support the highest number of projects. It should be noted that one project has the participation of a Hungarian partner participating with own funds.

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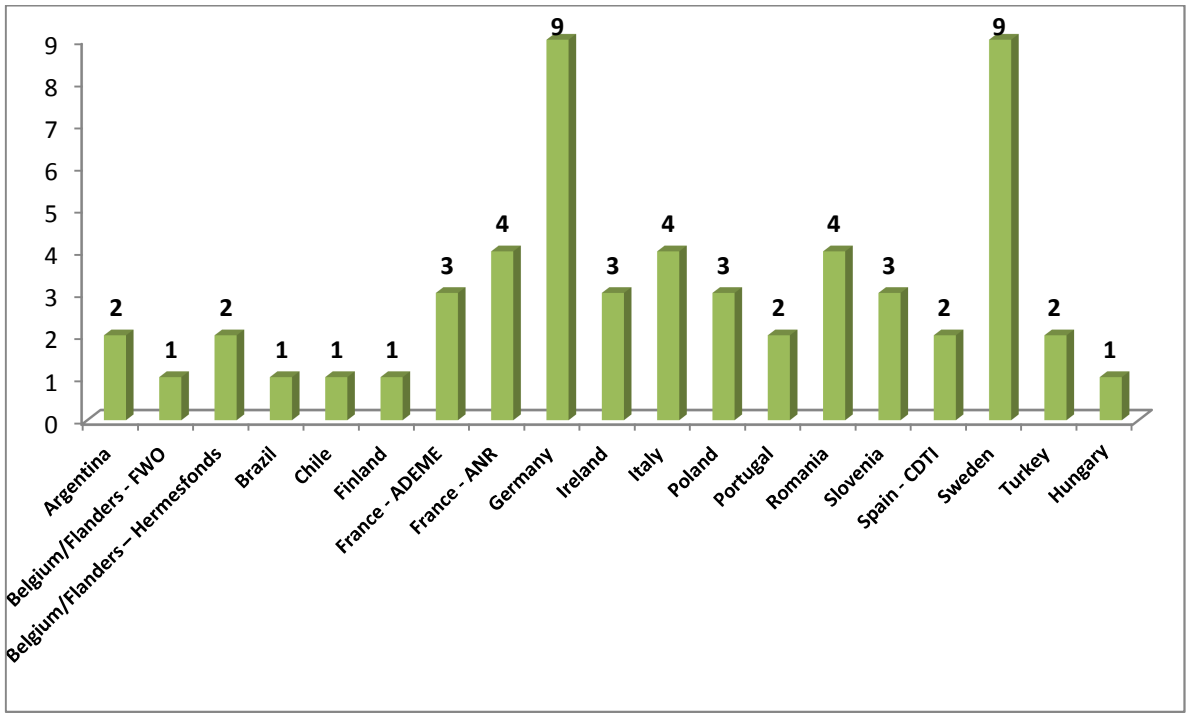

Figure 9 – Number of funded projects by country/region.

Figure 10 shows that in total 4 projects are coordinated by France whereas 3 out of 9 projects are coordinated by Germany and 3 projects coordinated by Slovenia.

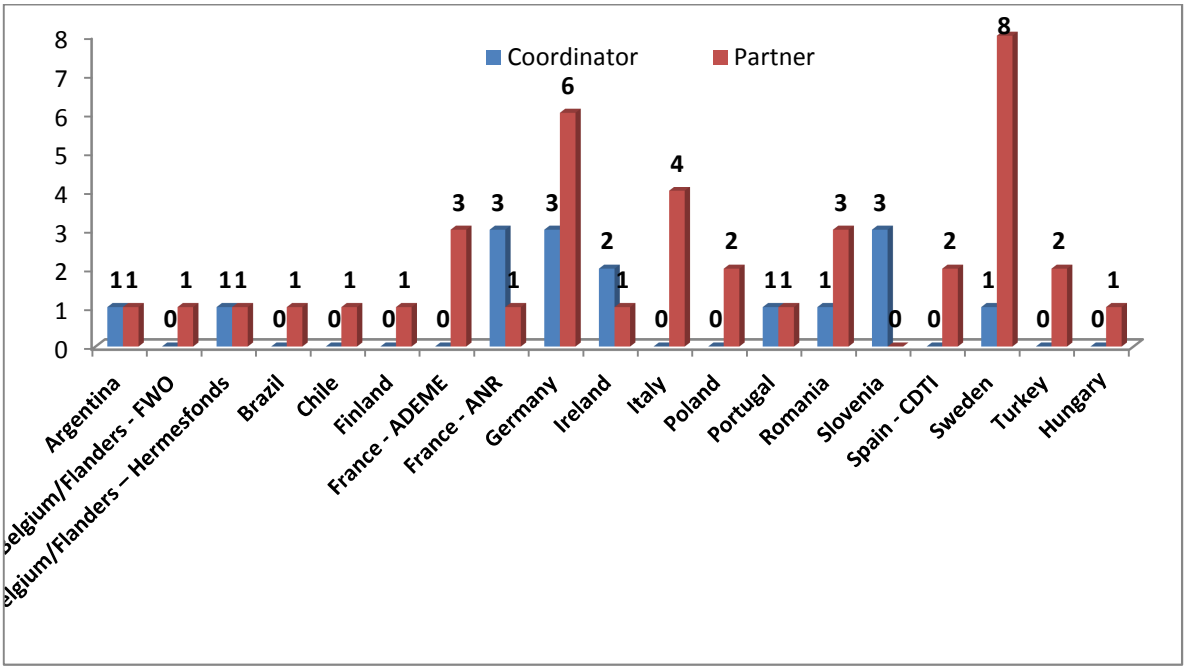

Figure 10 - Participation as coordinator and as partner in funded projects.

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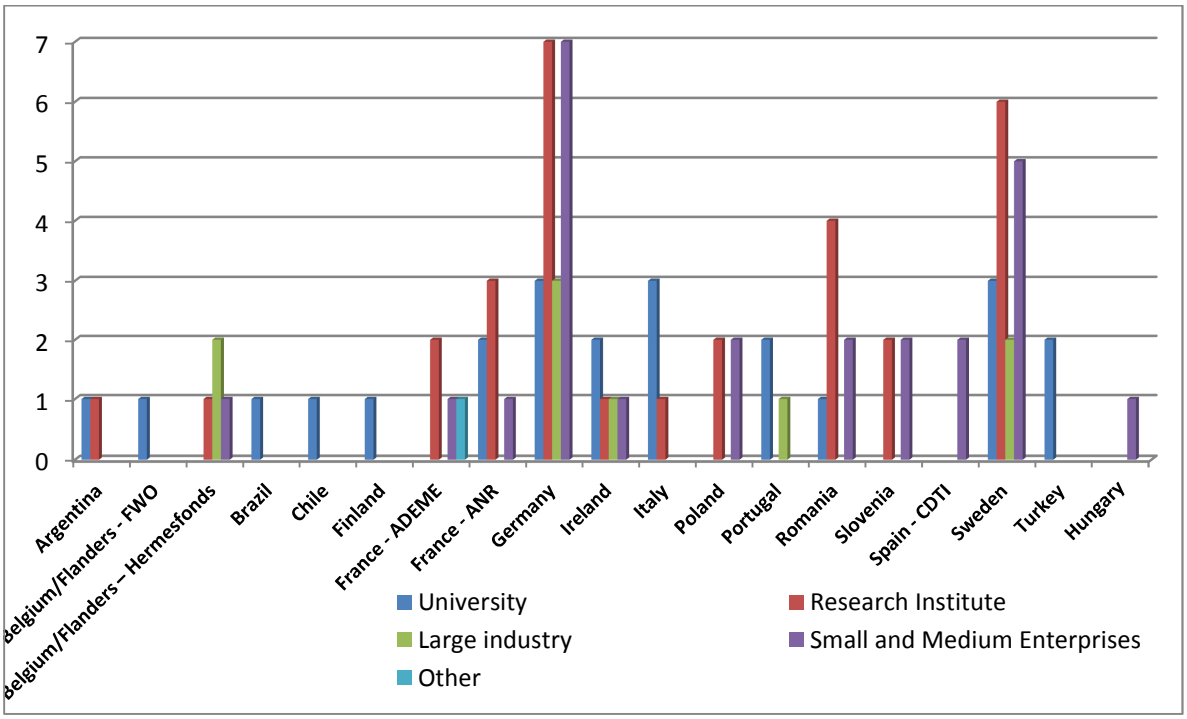

Figure 11 – Distribution of type of applicants in funded projects by country/region.

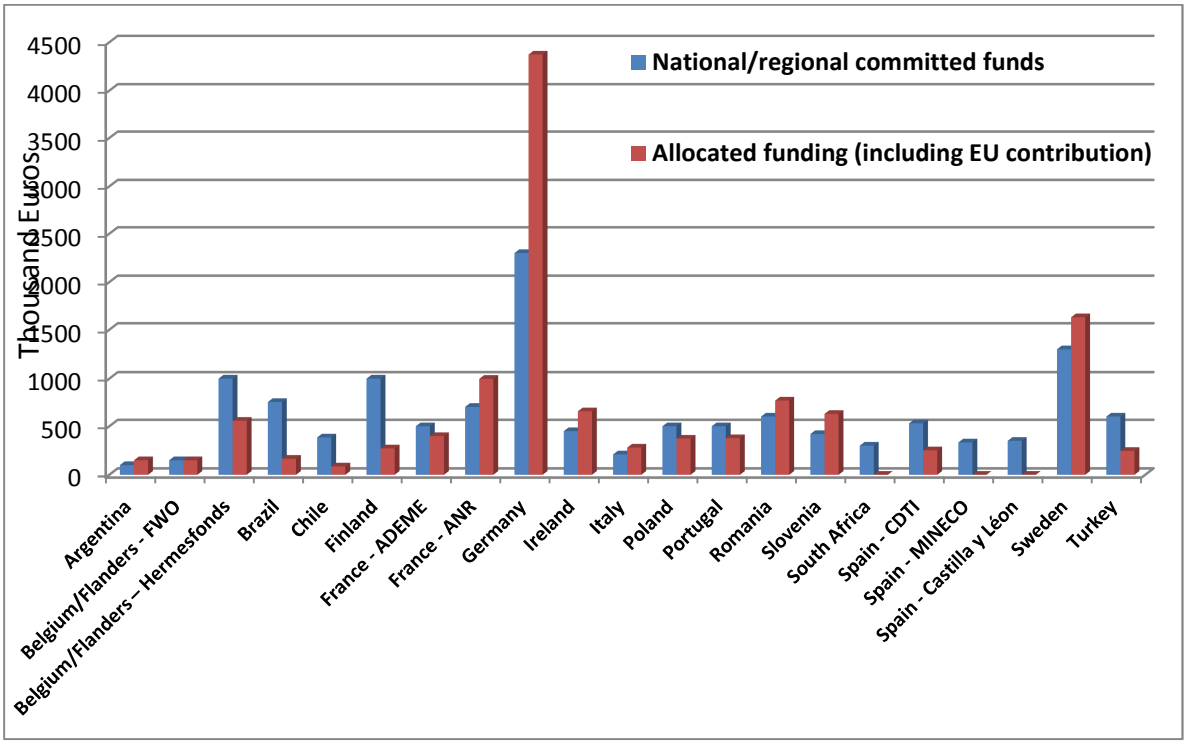

Figure 12 – Comparison between national/regional committed funds and allocated funding (including EU contribution) to funded projects by participating country/region.

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Figure 11 shows that German, Irish and Swedish partners in funded projects belong to all types of organisations whereas Belgium, Brazilian, Chilean and Finish partners are all from universities.

The distribution of public funds, including national/regional funds and EU contribution is compared with the indicative national/regional committed funds by the participating countries/regions (Figure 12).

The funding for the 16 selected projects was supported by 18 public research and innovation funding organisations of 11 EU countries, 1 EU region, 1 EU Associated Country and 3 non-EU countries. As a result, new partnerships between institutions of those countries have been established, as shown in Figure 13.

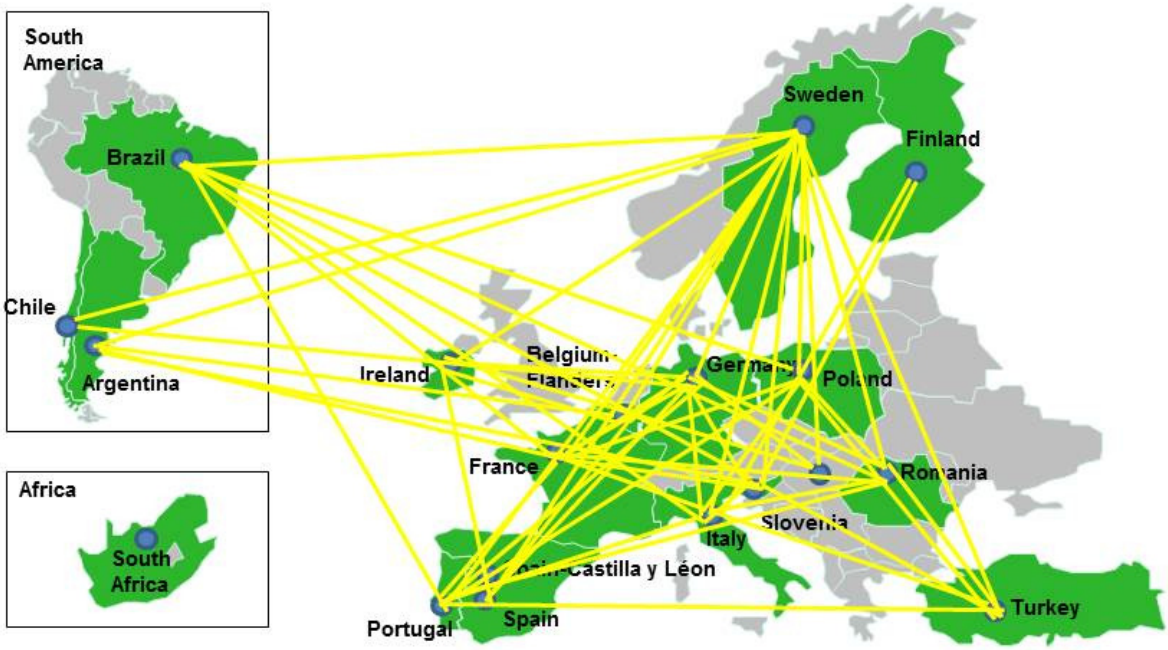

Figure 13 - Partnerships established between partners of the 16 funded projects.

All the thematic areas of the Joint call were addressed by the funded projects. Figure 14 shows that the thematic areas addressed by the funded projects covers the whole innovation cycle.
Four projects (AMTEG, Gold_Insight, LIGHTS and REWO-SORT) focus on the call topic 1 – "Supply of raw materials from exploration and mining" and sub-topics "exploration and mining operations". Only one project (MONAMIX) focused on topic 2. "Design" and sub-topics 2.1 and 2.4 - "Product design for increased raw material efficiency and for critical materials substitution".
Seven projects have selected topic 3 – "Processing, Production and Remanufacturing" as the main call topic of which three projects (FLOW, Li+Water, MINTECO, BASH-TREAT) focused on "Increase resource efficiency in resource intensive production processes and through recycling of residues or remanufacturing" but project BASH-TREAT also addressed cross-cutting sub-topic 5.2 : "Improvement of

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methods or data for environmental impact assessment"; two projects (Deasphor, MaXycle) addressed also sub-topics 2 in addition to sub-topics 3; and two projects (MaXycle, MetRecycle) also addressed sub-topic 4.3 "Recovery of raw materials from End-of-life products" but project MaXycle addressed also three sub-topics of the topic 2, all the four sub-topics of topic 4 and two cross-cutting topics: 5.1 "New business models" and sub-topic 5.2.

Four projects (BIOMIMIC, INSTAnT, ReCEOL, SUPERMET) addressed call topic 4- "Recycling of End-of-Life products" as the main call topic as well as the sub-topic 4.3 – "Recovery of raw materials from End-of-life products". In addition, project INSTAnT also addressed sub-topic 4.2 – "End-of-life products pre-processing: pre-treatment, dismantling, sorting, characterisation" and project ReCEOL addressed the cross-cutting sub-topic 5.1 and project BIOMIMIC addressed not only sub-topics 3.1 and 3.2 but also all the cross-cutting sub-topics 5.1, 5.2 and 5.3 – "Social acceptance and trust/public perception of raw materials".

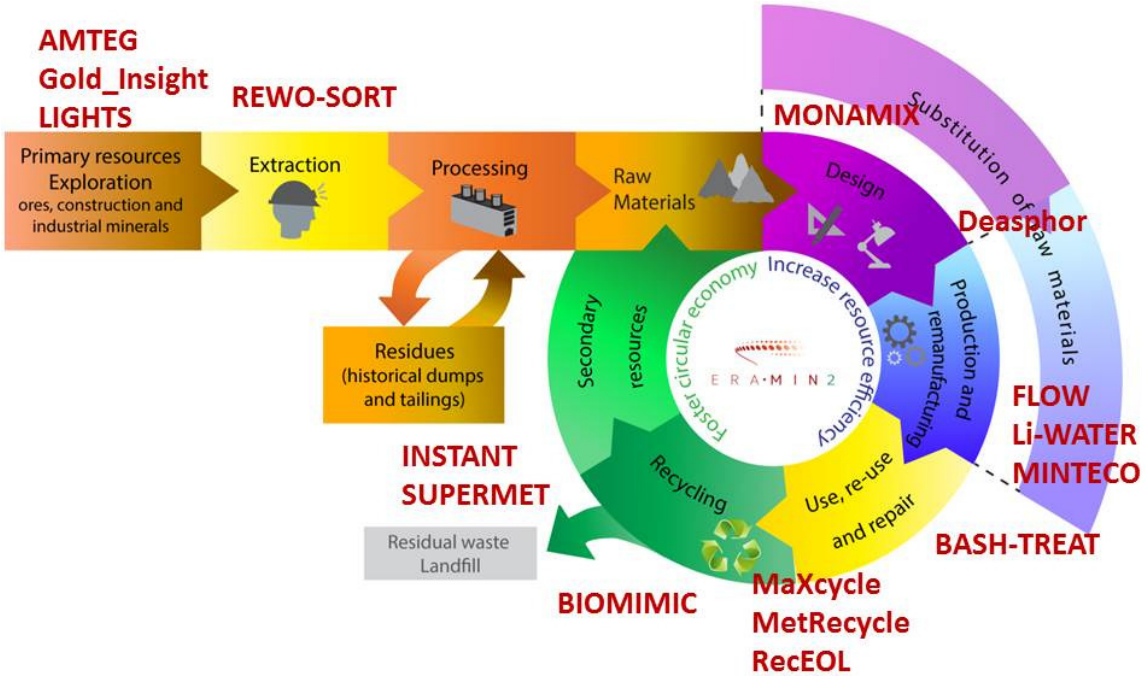

Figure 14 - Thematic areas addressed by the funded projects.

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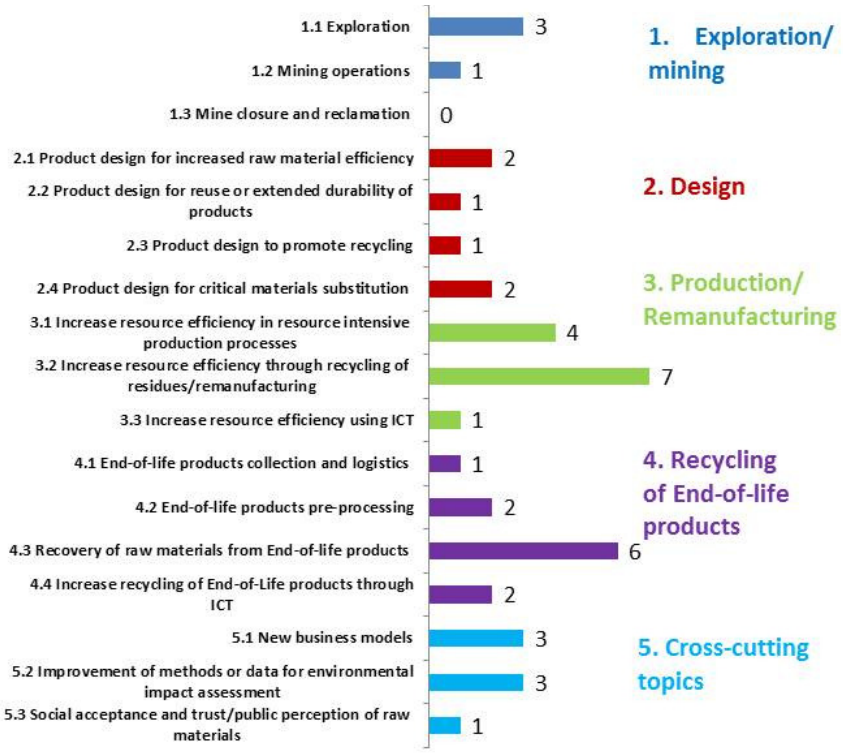

Figure 15 - Sub-topics covered by the 16 funded projects.

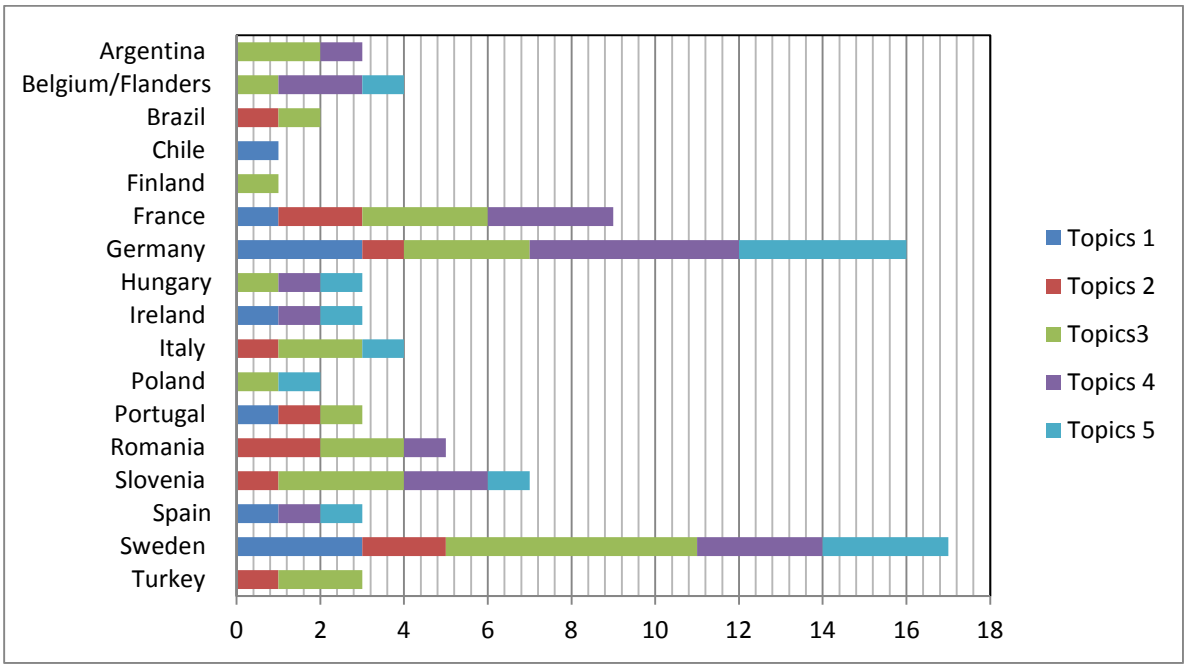

Figure 16 - Call topics covered by the funded projects in each country/region.

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All the information on the statistics of the ERA-MIN Joint Call is public and available at the ERA-MIN 2 website under the "Publications" menu (Figure 17).

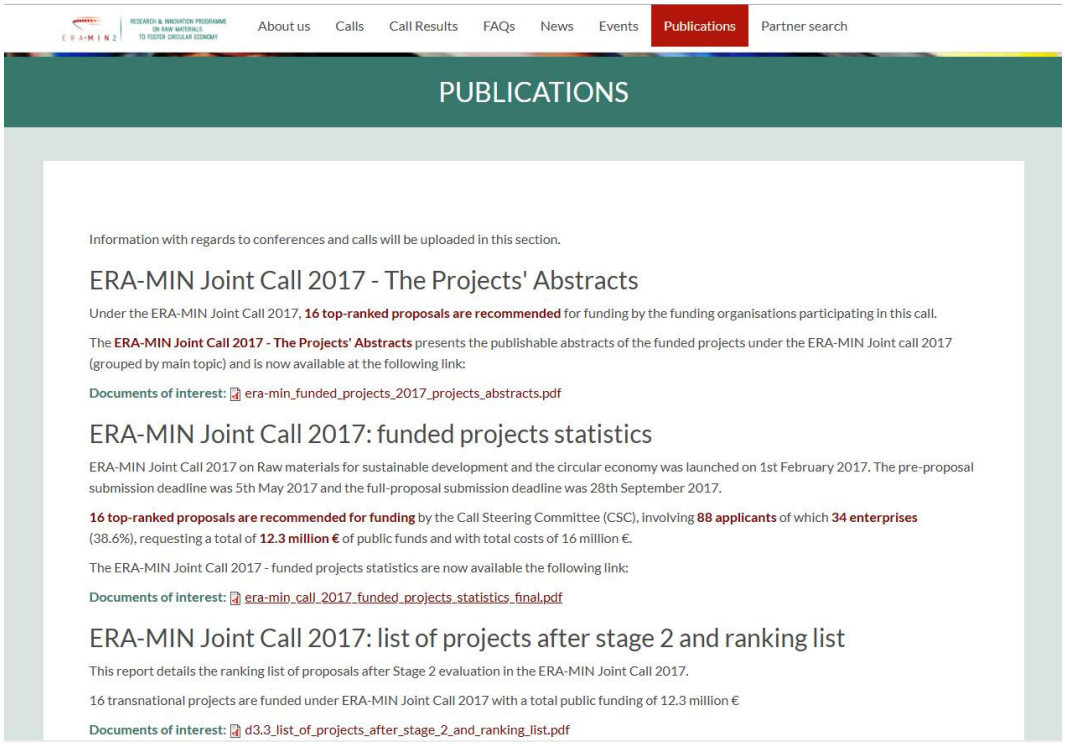

Figure 17 - ERA-MIN 2 website - "Publications" menu.

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3 PUBLISHABLE ABSTRACTS OF FUNDED PROJECTS

The following tables are grouped in a document called « ERA-MIN 2 Projects' abstracts ». This document is public and available at the ERA-MIN 2 Website in the «News» menu (Figure 18), under the title « Publishable abstracts of the 16 projects funded under ERA-MIN Joint Call 2017". In addition, the Projects' abstracts can be accessed through the « Call Results » menu (Figure 19).

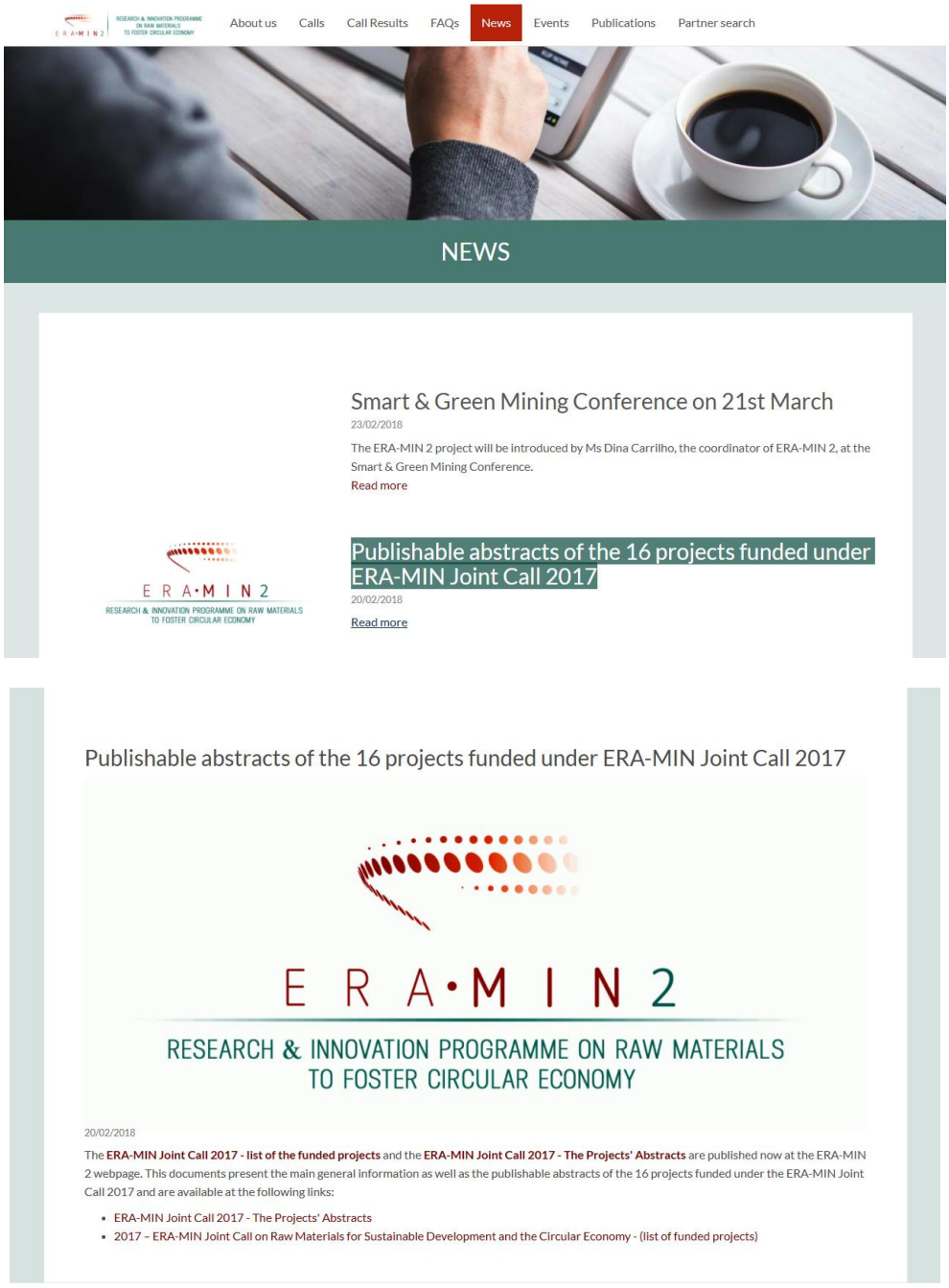

Figure 18 - ERA-MIN 2 website - "News" menu.

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Project acronym	**AMTEG**		
Project title	**Advanced Magnetic full TEnsor Gradiometer instrument**		
Main topic	1. Supply of raw materials from exploration and mining		
Sub-topics	1.1: Exploration		
Keywords	Exploration, magnetics, airborne, FTMG/3D-VM/OPM, high resolution		
Publishable abstract	The exploration of deep-seated deposits as well as the investigation and re-evaluation of former mine sites may be vital for securing the supply of European industry with important minerals. Unfavourable magnetic properties such as weak magnetization or weak signals in huge background in iron ore mining areas represent a major problem to existing airborne magnetic exploration systems. To meet future needs of exploration technologies, we aim to develop a new airborne magnetic exploration tool using a hybrid SQUID (Superconducting Quantum Interference Devices) based full tensor magnetic gradiometer and vector magnetometer as well as an ancillary optically pumped magnetometer (OPM) for absolute measurements which goes beyond current technology limits in sensitivity and dynamic range e.g. 24bit of signal digitizers. All partners contribute with their complementary expertise to develop the new airborne instrument: Leibniz Institute of Photonic Technologies will develop new SQUIDs and OPMs. Supracon's focus is on the new sensor read-out and data acquisition electronics. IGI Systems will take care of a high precision attitude system (GPS and advanced inertial unit) and navigation software. The demonstrator performance evaluation will take place in representative European mining areas like the Iberian pyrite belt (Spain) and the Baltic shield (Sweden) executed by Geognosia, Nordic Iron Ore, and Nordika Geophysics respectively. Advanced processing, inversion, and interpretation algorithms for the high resolution data will be developed. This project unites partners with magnetic instrumentation background, geophysical service providers, and a mining company. Appropriate stakeholder engagement practices will be encouraged during field operations to manage potential barriers for exploration. Exploration will benefit from the new airborne instrumentation by enabling a new level of magnetic field resolution translating into higher quality of inversion and interpretation results.		
Participating Institutions	1. Supracon AG (Germany) - Coordinator 2. Nordika Geophysics (Sweden) 3. Leibniz Institute of Photonic Technology (Germany) 4. Ingenieur-Gesellschaft für Interfaces mbH (Germany) 5. Geognosia S.L. (Spain) 6. Nordic Iron Ore AB (Sweden)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 1.366,733	**Total Requested Funding**	€ 952,149

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Project acronym	**Gold_Insight**		
Project title	**Tracing Gold-Copper-Zinc with advanced microanalysis**		
Main topic	1. Supply of raw materials from exploration and mining		
Sub-topics	1.1: Exploration		
Keywords	Innovative, gold, targeting, 3D modelling, microanalysis		
Publishable abstract	The proposed research will contribute to the Challenge of securing ***Primary Resources*** by developing innovative techniques for exploration. The innovative new techniques will arise from a novel combination of state-of-the-art micro-chemical analysis: trace element mapping and in situ Pb and S isotope analysis as well as trace-element informed geochronology. The technology readiness level of these techniques will be elevated by increasing the speed and throughput of analysis. The tools will be trained on known orogenic gold (Au) exploration targets for which full 3D geological and structural models will be developed and integrated with absolute geochronology. The targets are in active emerging orogenic gold districts in Sweden and Ireland where low environmental-impact extraction is feasible. We have assembled a three-partner consortium from two EU countries with some of the most exciting developments in exploration for Au and with outstanding field resources, analytical facilities, and world-leading expertise. The outputs of the proposed project will contribute to the implementation of the ERA-MIN2 work programme. It will significantly de-risk exploration in these and other minerals districts and develop an innovation platform for higher participation of EU institutions in the global exploration market. Orogenic gold deposits also often host other precious or base metals, including significant quantities of tellurium and its discovery will help secure the supply of this energy-critical-element (ECE).		
Participating Institutions	1. Trinity College Dublin (Ireland) - Coordinator 2. Luleå University of Technology (Sweden) 3. Swedish Museum of Natural History (Sweden)		
Project duration	24 months (2018 – 2020)		
Total Costs	€ 727,550	**Total Requested Funding**	€ 484,550

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Project acronym	**LIGHTS**		
Project title	**Lightweight Integrated Ground and Airborne Hyperspectral Topological Solution**		
Main topic	1. Supply of raw materials from exploration and mining		
Sub-topics	1.1: Exploration		
Keywords	Li-deposit exploration, drone, SWIR, LIBS, integrated software solutions		
Publishable abstract	Rechargeable lithium-ion batteries have become indispensable for consumer electronics and for powering electric cars. However, there are currently no available tools or methods to detect lithium in actual geological context by remote sensing and its feasibility is poorly understood. As a result of technological advances, the use of hyperspectral cameras with drones is now possible to map the mineralogy of rocks. This recent tool introduces new possibilities to easily map future exploitable mineral resources and possibly enhance associated resources and reserves. For this end, we are introducing the Lightweight Integrated Ground and Airborne Hyperspectral Topological Solution (LIGHTS) that comprises cutting edge drone, camera and software technology. It will be firstly applied to European Li-deposits. For the first time in the world, the proposed technology enables the mapping of lithium such that for a given area, the likelihood of the element is clearly displayed for each geographic point. The system requires a minimum amount of expertise on remote sensing or drone technologies, making it an ideal tool for field geologists, enabling them to focus on geology instead of technology. The LIGHTS project brings together world-leading industrial and research organizations to develop new methods and tools for drone-based lithium exploration. The general objectives of the project are: 1) To develop a software for easy and fast detection of lithium-host minerals combining drone-borne remote sensing data and field observations. 2) To understand how pegmatitic Li-deposits are formed. This is critical to establish how remote sensing and field observations can be used to unveil lithium deposits. We foresee that the tools developed during the project have the potential to boost mineral exploration industry in general, resulting in increasing exploration activities in Europe and beyond, to a variety of different ore deposits and geological environments around the globe.		
Participating Institutions	1. Université de Lorraine (France) - Coordinator 2. Faculty of Sciences, University of Porto (Portugal) 3. Laboratoire de Géologie de Lyon - Université Lyon 1 (France) 4. Helmholtz-Zentrum Potsdam - Deutsches GeoForschungsZentrum (Germany) 5. Beak Consultants GmbH (Germany)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 1.547,140	**Total Requested Funding**	€ 1.189,919

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Project acronym	**REWO-SORT**		
Project title	**Reduction of Energy and Water consumption of mining Operations by fusion of sorting technologies LIBS and ME-XRT**		
Main topic	1. Supply of raw materials from exploration and mining		
Sub-topics	1.2: Mining operations		
Keywords	Sensor fusion, LIBS, multi energy X-ray, mining, geological modelling		
Publishable abstract	In recent years, the mining industry has been faced with numerous challenges across Europe and worldwide. Among these is the need to process ore with successively lower grades due to the continuous depletion of high-grade deposits. This increases the consumption of energy and water and, thus, the operational costs at a mine site. Various approaches to solve this issue have been evaluated, but so far none of these could be validated as a satisfactory solution. The implementation of multimodal sorting techniques represents a promising approach by achieving a pre-concentration of valuable minerals already at an early stage in the metallurgical process. In this project we propose to develop a fusion technology including laser-induced breakdown spectroscopy (LIBS) and multi energy X-ray transmission (ME-XRT), which will be able to classify crushed mineral particles on a conveyor belt with the aid of deep learning technology. The combination of LIBS and ME-XRT is promising, as these sensors complement each other with regards to their analytical capabilities: LIBS can provide an elemental analysis of the sample surface, while ME-XRT produces volumetric data with lower accuracy. The technological fusion of both sensors will allow for the extrapolation of accurate surface data to the entire volume of the sample and therefore create representative data for the entire ore. In addition, the implementation of neural network technology will enable allow for automatic self-adjustments to varying ore types and geological parameters. The developed sensor fusion technology will enable constant and accurate monitoring of the mineralogy of the mined rock volume and will allow for on-line and in-situ measurement of geological, mineralogical, rock-mechanical and metallurgical properties of the ore. The development of an on-line feed of these data into 3D geological models of the ore bodies is envisaged, the accuracy and objectivity of which are crucial for successful mine planning.		
Participating Institutions	1. Fraunhofer Gesellschaft (Germany) - Coordinator 2. University of Chile (Chile) 3. Luleå University of Technology (Sweden) 4. SECOPTA analytics GmbH (Germany)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 714,840	**Total Requested Funding**	€ 608,340

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Project acronym	**MONAMIX**		
Project title	**New concepts for efficient extraction of mixed rare earths oxides from monazite concentrates and their potential use as dopant in high temperature coatings and sintered materials**		
Main topic	2. Design		
Sub-topics	2.1: Product design for increased raw material efficiency; 2.4: Product design for critical materials substitution		
Keywords	Monazite, rare earth oxides, doped zirconia, thermal barrier coatings, sintered zirconia		
Publishable abstract	The objective of MONAMIX project is to demonstrate the potential use of mixed REOs with naturally occurring composition, obtained from monazite concentrates, as dopant in the design of high temperature zirconia coatings and sintered materials. The naturally mixed REOs doped zirconia thermal barrier coatings (TBC) will be designed to increase the lifetime of Ni/Cr alloys or reduce the critical raw materials (CRMs) content in substrate alloys. Sintered natural mixed-REOs doped zirconia will be also designed as solid oxide fuel cells (SOFCs) with controlled ionic conductivity and low REO content. MONAMIX project addresses mainly the topic 2 of ERAMIN II call: **Design**: 2.1: Product design for increased raw material efficiency and 2.4: Product design for critical materials substitution. A hydro-chemical method for monazite concentrates purification by selective leaching and their usage for hydrothermal synthesis of mixed nanostructured zirconia doped with different REO/ZrO2 molar ratios by a cost efficient process will be developed. The mixed REO-ZrO2 materials obtained will be used as target material to obtain TBCs at TRL 4 and validated on industrial systems by RF sputtering and electron beam deposition and study their structural stability vs. mixed REO/ZrO2 molar ratios for TBCs aiming to increase the lifetime of Ni/Cr alloys or reduce the CRMs content in substrate alloys. Bulk mixed REO-ZrO2 will be obtained at ICMCB-CNRS, Bordeaux by using various innovative sintering techniques (TRL 4-6). Densification process and ionic conductivity will be optimized for SOFCs. Elimination of separation stages and mixed REO utilization instead of individual REO, if validated in applications, may reduce production costs along the whole fabrication cycle from raw materials to product, providing nanomaterials for high-tech applications in high temperature coatings (up to 1400-15000C) and SOFCs with operating temperature around 4000C, with cost efficiency and sustainable production.		
Participating Institutions	1. National R&D Institute for Nonferrous and Rare Metals (Romania) - Coordinator 2. ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development (Italy) 3. SC MGM Star Construct SRL (Romania) 4. Institut de Chimie de la Matière Condensée de Bordeaux CNRS (France)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 562,750	**Total Requested Funding**	€ 517,750

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**BASH-TREAT**		
Project title	**Optimization of bottom ash treatment for an improved recovery of valuable fractions**		
Main topic	3. Processing, Production and Remanufacturing		
Sub-topics	3.1: Increase resource efficiency in resource intensive production processes 3.2: Increase resource efficiency through recycling of residues or remanufacturing 5.2: Improvement of methods or data for environmental impact assessment		
Keywords	Bottom Ash, Metal Recovery, Construction Minerals, Recycling, Waste Minimization		
Publishable abstract	While incineration established itself as the best treatment option for municipal and industrial waste, with around 90 Mt/y of waste treated in EU incinerators, the management of its main residue that is bottom ash, rapidly became a crucial point in the waste chain. With 80 – 85 % (w/w) of mineral fraction and a valuable 10 – 12 % of metals, the recovery of residual useful components from bottom ash is a complex challenge for EU (20 % w/w of metals contained in bottom ash are not yet recovered), that may lead to important technical, socio/economic and environmental outcomes. BASH-TREAT objectives are: 1) a complete assessment of EU state-of-the-art bottom ash treatment options considering technical/economic/environmental viewpoint; 2) an optimization of the exploitation of the refining treatment of the fine fraction deriving from full-scale trial tests; 3) the development of EU guidelines for the enhanced and innovative full valorisation of valuable components of bottom ash (metals and mineral fraction). What is expected from BASH-TREAT is a database with information about performances, results, characteristic of bottom ash treatment in EU and suggestion for process improvement. The validation of the data via full-scale treatment plant plants. The development of new innovative technologies for the treatment of the fine fraction in a lab scale process. The technical, economic and environmental assessment will be performed for all the aspects faced in the project. An international, interdisciplinar and intersectoral consortium composed by two universities, one research center and two industrial partners with provide different and specific expertise-competences will face BASH-TREAT research activities.		
Participating Institutions	1. Hamburg University of Technology (Germany) - Coordinator 2. Politecnico di Torino (Italy) 3. Heidemann Recycling GmbH (Germany) 4. BAM - Bundesanstalt für Materialforschung und –prüfung (Germany) 5. Sysav (Sweden)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 506,600	**Total Requested Funding**	€ 451,600

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**Deasphor**		
Project title	**Design of a product for SUBSTITUTION of phosphate rocks**		
Main topic	3. Processing, Production and Remanufacturing		
Sub-topics	2.4: Product design for critical materials substitution; 3.2: Increase resource efficiency through recycling of residues or remanufacturing		
Keywords	Phosphorus recycling, P from manure ash, P-concentration, P-sustainability, Zero waste		
Publishable abstract	Phosphate rock production (included in the "List of critical raw materials for the EU") is abundant but finite, and controlled by few countries with Morocco and Western Sahara controlling 77% of the reserves. However, P-depletion is not the P-problem but the phosphorus market. During the high-volatility phosphate rock market prices , two major spikes occurred: in the mid 1970's and in 2008, where the prices jumped at level 10 times higher before the jump, and came down again but the price's after the 1975 and 2008 jump–slump held PR prices at a level 3–4 times higher than before the jump. The opportunity for P-recycling, however, is being implemented due to public awareness and new policies reflected in the European Union legislation ("zero waste", "Circular Economy Package", new rules on organic and waste-based fertilizers, considering phosphate rock a critical raw material, risks of trace elements in agro-ecosystems), and funding (e.g. ERA-MIN2). The project DEASPHOR aims P-recycling from poultry litter ash since the direct utilization of poultry litter has eight times more P than plants need. However, further P-concentration is needed to make poultry litter capable of substituting phosphate rocks. Therefore exploratory and innovative solutions are proposed: Increasing P-concentration through pre-combustion (improved by poultry litter collection) and post-combustion (beneficiation) measures, to produce poultry litter ash with an ore grade close to that of phosphate rocks. Product optimization through combustion measures to increase P-extraction efficiency. Research of metallurgical applications for the beneficiation tails to comply with the "Zero waste" policy. Evaluation of the phosphate rocks substitution based on embodied energy and the CO2 footprint.		
Participating Institutions	1. Faculty of Sciences of Porto University (Portugal) - Coordinator 2. Universidade Federal de Sergipe (Brazil) 3. Università degli Studi di Brescia (Italy) 4. Central Mining Institute (Glowny Instytut Gornictwa) (Poland) 5. University Politehnica of Bucharest (Romania) 6. Swerea MEFOS (Sweden) 7. Ege University (Turkey) 8. UMR GeoRessources (France) 9. Campoaves - Aves do Campo, SA (Portugal) 10. P.U.P.H „PROGEO" Sp. z o.o. (Poland)		
Project duration	36 months (2018 – 2021		
Total Costs	€ 1.533,318	**Total Requested Funding**	€ 1.370,998

Co-funded by the Horizon 2020 programme
of the European Union

Project acronym	**FLOW**		
Project title	**Lightweight alkali activated composite foams based on secondary raw materials**		
Main topic	3. Processing, Production and Remanufacturing		
Sub-topics	3.2: Increase resource efficiency through recycling of residues or remanufacturing		
Keywords	Waste recycling, slag, fibers, alkali activated foams		
Publishable abstract	New possibilities for the recycling of inorganic wastes or industrial residues are investigated in order to avoid the disposal of waste materials in landfills. Especially, aluminate- and silicate-containing materials can be utilized in alkali activation technology; when treated with an alkaline activator solution these precursors form a solid material at room temperature which could be used to replace concrete, ceramic and some other industrial materials. Additionally, significant environmental advantages are achievable by replacing the production of these energy-intensive materials by more sustainable processes. The main objective of this project is to develop new lightweight alkali activated foams based on secondary raw materials (e.g. fly ash, slags). To obtain highly porous structures, properly selected foaming agents and foam stabilizing agents need to be included in the basic compositions. Currently, the main disadvantage of such lightweight materials is their high fragility. Addition of fibers will be used to overcome this drawback and help to produce materials with more elastic nature. By incorporating organic fibers from a bio-based renewable source, and simultaneously using inorganic secondary resources as raw materials for alkali activated foams, a high performance in terms of energy efficiency and environmental impact will be reached. The developed materials will have applications in wide range of thermal and acoustic insulating products. The project will be performed by institutions already highly experienced in the field of alkali activation technology (Slovenian national Building and Civil Engineering Institute, Fiber and Particle Engineering Unit at University of Oulu, University of Modena and Reggio Emilia). Complementary knowledge possessed by the project partners guarantee the successful execution of the project. In addition to research partners, several industrial companies will participate in the project as potential exploitation partners.		
Participating Institutions	1. Slovenian National Building and Civil Engineering Institute (Slovenia) - Coordinator 2. University of Oulu (Finland) 3. University of Modena and Reggio Emilia (Italy)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 761,242	**Total Requested Funding**	€ 550,117

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**Li+WATER**		
Project title	**Membrane electrolysis for resource-efficient lithium and water recovery from brines**		
Main topic	3. Processing, Production and Remanufacturing		
Sub-topics	3.1: Increase resource efficiency in resource intensive production processes		
Keywords	Lithium, membrane electrolysis, water recovery, life cycle analysis, magnesium		
Publishable abstract	The electrification of our world drives a fast increase in demand for lithium, to be used mainly for batteries in electric vehicles and power storage from renewable but intermittent energy sources. Unfortunately, the most common methods to extract lithium belie the role in sustainability it is supposedly playing: lithium extraction from brines requires long-term and huge volumes of water evaporation, high chemical usage and production of waste. With the Li+WATER project we propose a radically new, electrochemical process. We will in three stages, driven by renewable electricity and without input of chemicals, harvest not just the lithium but also other products present in the brines such as magnesium hydroxide, as well as recover the water. The latter is very important, as particularly the region in South America where most brines are found is water-short. The flexibility of our process will also enable turning towards less optimal, today uneconomic lithium sources, such as geothermal brines present in Europe. Key to our development will be an adequate understanding of how lithium can be electrochemically harvested in the presence of variable concentrations of other ions (Ghent University focus). This will in turn allow testing on real brines (Universidad Nacional de Jujuy focus), and finally perform technical, economic and environmental assessment of the future process (Swedish Environmental Research Institute focus). If successful, Li+WATER will for the first time couple the role of lithium in sustainable development to a sustainable harvesting approach.		
Participating Institutions	1. Universidad Nacional de Jujuy (Argentina) - Coordinator 2. Universiteit Gent (Belgium/Flanders) 3. IVL Swedish Environmental Research Institute (Sweden)		
Project duration	24 months (2018 – 2020)		
Total Costs	€ 429,468	**Total Requested Funding**	€ 329,850

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**MaXycle**		
Project title	**A novel circular economy for sustainable RE-based magnets**		
Main topic	3. Processing, Production and Remanufacturing		
Sub-topics	2.1: Product design for increased raw material efficiency; 2.2: Product design for reuse or extended durability of products; 2.3: Product design to promote recycling; 3.2: Increase resource efficiency through recycling of residues or remanufacturing; 3.3: Increase resource efficiency using information and communication technologies (ICT); 4.1: End-of-life products collection and logistics; 4.2: End-of-life products pre-processing: pre-treatment, dismantling, sorting, characterisation; 4.3: Recovery of raw materials from End-of-life products; 4.4: Increase recycling of End-of-Life products through information and communication technologies (ICT); 5.1: New business models; 5.2: Improvement of methods or data for environmental impact assessment		
Keywords	Circular economy, magnet recycling, NdFeB magnets, end-of-life magnets, Eco-labelling		
Publishable abstract	Even though the alloying constituents of rare-earth (RE) based magnets have been classified as Critical Raw Materials in the EU and 90% of it is produced outside of the EU, there is still no developed recycling or circular economy for these types of materials. With the prediction that the consumption of RE magnets will double in the next 10 years, this problem becomes even more critical. Today's only way to recover end of life (EOL) magnets from waste of electric and electronic equipment is by shredding and recycling by chemicals and pyrometallurgical routes, which is expensive and energy intensive, and the quality of the recollected magnets varies significantly. The objective of MaXycle is to create a much more environmentally friendly 'short cycle' re-processing route achieved by: a) the development of an eco-labelling system for newly produced RE permanent, b) using the highly effective HPMS process by re-processing the extracted materials directly from the NdFeB alloy, c) better treatments to eliminate pre-processing residue, d) upgrading the magnetic properties of EOL NdFeB magnets by tailoring the microstructure and phase composition and e) elaborating the industrial up-scalability, including a thorough life cycle assessment. MaXycle will have a great impact to overcome the issue of low recycling rates suffering from poor collection, high leakages of collected materials and inappropriate interface management between logistics, and mechanical pre-processing and metallurgical metals recovery. It is estimated that MaXycle will increase the recycling quantities of NdFeB by 90%, intorducing a sustainable source of raw materials and increasing EU magnet production without recourse to foreign suppliers, further increasing revenues and creating jobs. Further development of recycled RE-based magnet raw materials should open up new markets for specialised recycled magnet products, strengthening competiveness and economic growth.		
Participating Institutions	1. Jozef Stefan Institute (Slovenia) - Coordinator 2. Magneti Ljubljana, d.d. (Slovenia) 3. OBE Ohnmacht & Baumgärtner GmbH & Co. KG (Germany) 4. Pforzheim University of Applied Sciences (Germany) 5. IVL Swedish Environmental Research Institute (Sweden)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 1.056,380	**Total Requested Funding**	€ 965,970

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**MetRecycle**		
Project title	**Recycling of metals using functionalized magnetic nanoparticles (FMNP)**		
Main topic	3. Processing, Production and Remanufacturing		
Sub-topics	3.2: Increase resource efficiency through recycling of residues or remanufacturing 4.3: Recovery of raw materials from End-of-life products		
Keywords	Rare earth elements, recycling, magnetic nanomaterials, e-waste, selectivity		
Publishable abstract	**The MetRecycle project** contributes to the Strategic Implementation Plan of the European Innovation partnership **on the recycling of raw materials,** dealing with the novel strategic approach using **advanced nanotechnology** to achieve **selective, efficient recycling** process **of REE's,** with the focus on the Heavy (HREE) REE's. REEs are key components of green energy and high-tech growth industries and they are imported into the European Union (EU) from a very limited number of producers. Until recently, China has been almost the sole supplier of REEs to the rest of the world. Tensions are particularly likely for five REEs (Neodymium, Europium, Terbium, Dysprosium and Yttrium) for which demand is expected to **grow by up to 30%.** The current level of **recycling** (urban mining) **is still very limited (< 1%)**. **The MetRecycle project** will **use the advantage of specific properties of REE's** for higher recycling **efficiency and selectivity.** MetRecycle project is focused to the development of **functionalized magnetic nanoparticles** as a **novel approach for REE's recycling** from aqueous solutions (waste waters) after pre-processing technology. Functional magnetic nanoparticles are easy to remove from aqueous solution by using external magnetic field to be recycled. The final stage of the project is **scale up** of novel functionalized magnetic nanoparticles to test, verify in practice. MetRecycle is furthermore **strengthening collaboration** between **high-tech SME's and research organisations,** addressing also **action for citizen awareness.** Expected results will cover **the field of research and development of novel adsorbent nanomaterials for recycling of REE metal ions i**n order to improve **REE selectivity and recycling rate**, to achieve **sustainable growth**, increase in **collection rates of e-wastes**, greater social demand for more **sustainable** **society**, forcing industries to reuse waste as a feedstock, governmental legislation/changes to existing laws by **providing incentives for recycling.**		
Participating Institutions	1. Institute for Environmental Protection and Sensors (IOS) Ltd (Slovenia) - Coordinator 2. Sveriges Lantbruksuniversitet (Sweden) 3. Instituto de Nanosistemas-UNSAM (Argentina) 4. CNRS (France) 5. SiKEMIA(France)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 784,700	**Total Requested Funding**	€ 651,000

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**MINTECO**		
Project title	**Integrated eco-technology for a selective recovery of base and precious metals in Cu and Pb mining by-products**		
Main topic	3. Processing, Production and Remanufacturing		
Sub-topics	3.1: Increase resource efficiency in resource intensive production processes 3.2: Increase resource efficiency through recycling of residues or remanufacturing		
Keywords	Mining wastes, mineral processing, hydrometallurgy, base and precious metals, economic and environmental assessment		
Publishable abstract	Metal-bearing mining wastes are produced during the recovery and processing of nonferrous metals from ores. Mining waste can be considered as a valuable secondary resource containing base and rare metals. But one should take into consideration the presence of hazardous elements for environment with threats to air, soil and water. Most of these solid-state mining wastes have been disposed in tailing reservoirs, without active management. And large volumes are still produced. For example annually, the mining industry in Poland produces around 50 Mtons wastes, 20% representing extraction and the rest being generated by the treatment process. R&D case study projects should then be performed to allow upgrading such waste to a valuable resource by recovering base and precious metals and manage pollution. MINTECO project aims to **develop an integrated innovative, efficient and ecological technology for the recovery of base (Cu, Pb, Zn) and precious (Au, Ag) metals from Cu and Pb bearing mining waste**. The project will allow establishing a global management methodology to treat historical mining sites and reduce disposed volumes of metal-bearing waste. Lab scale experiments (TRL< 4), on well-known representative samples, will first allow establishing optimized protocols to concentrate the metals in smaller fractions by innovative mineral processing and recover the metals by hydrometallurgy techniques. The main steps (pre-concentration/ leaching/ high grade metal recovery) will be studied in details by research institutes to optimize first relevant process sequences. Then, a global coherent flowsheet will be proposed and the developed technologies will be further validated by the industrial partners (SMEs) at TR>4. Final economic and environmental assessment will be performed. The consortium gathers 8 partners from 4 countries (France, Romania, Poland and Turkey) is composed of university, 3 research institutes, 1 public institution and 3 SMEs with complementary expertise.		
Participating Institutions	1. BRGM (France) - Coordinator 2. National R&D Institute for Nonferrous and Rare Metals –IMNR (Romania) 3. National Institute for Research and Development in Optoelectronics INOE 2000 (Romania) 4. Eskisehir Osmangazi University (ESOGU) (Turkey) 5. Romaltyn Mining SRL (Romania) 6. Mineral and Energy Economy Research Institute of The Polish Academy of Sciences (Poland) 7. TGM – Team Group Metals Sp. z o.o. (Poland) 8. AJELIS (France)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 973,834	**Total Requested Funding**	€ 639,700

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**BIOMIMIC**		
Project title	**Innovative biotechnological methods for effective mining of secondary material**		
Main topic	4. Recycling of End-of-Life products		
Sub-topics	3.1: Increase resource efficiency in resource intensive production processes; 3.2: Increase resource efficiency through recycling of residues or remanufacturing; 4.3: Recovery of raw materials from End-of-life products; 5.1: New business models; 5.2: Improvement of methods or data for environmental impact assessment; 5.3: Social acceptance and trust/public perception of raw materials		
Keywords	Critical Raw Materials, biometallurgi, sulfate reduction, bauxite residue, fly ash		
Publishable abstract	Metal supply is one of Europe's biggest challenges. The Commission has identified a number of metals as critical for its industry and the employment; meaning that they are essential for high-tech, green and defence applications, while their availability is fluctuating due to politically and economically driven factors. Ironically, metals of a high economic value end-up in low technology applications, being landfilled or in hazardous wastes, posing threat to the environment and health. It is estimated that fly ash from waste-to-energy plants produced annually in Europe, contains metals of the value of 600 million euro. Another promising resource of high-value metals is red mud; a by-product of aluminium industry considered to be hazardous and that has been involved in a couple of environmental incidents. The reason for not exploiting resources like ashes and red mud is that the metals are present at low concentrations and in complex matrices. With its unique multidisciplinary consortium of problem owning and end-user industries, innovators and researchers BIOMIMIC is aiming to solve the challenge of extracting these metals, while leaving the remaining material free from toxic substances. The project will explore naturally occurring bioprocesses, namely biosulfide precipitation and biosorption. Employing beyond state-of-the-art innovations in microorganism mixtures and reactor design is expected to increase the rate of these typically slow biotechnological methods. The expected impacts of BIOMIMIC include: i) pushing EU to the forefront of sustainable processing technologies, ii) improving competitiveness through creation of added value and new jobs, iii) creating value of raw materials currently landfilled enabling better efficiency of exploitation of raw materials' resources and iv) increasing the range and yields of recovered raw materials (including water and energy consumption) leading to reduced environmental footprint.		
Participating Institutions	1. Research Institutes of Sweden (Sweden) - Coordinator 2. Fraunhofer Institute for Systems and Innovation Research (Germany) 3. Flocazur AB (Sweden) 4. Nordic BioEngineering AB (Sweden) 5. Purac AB (Sweden) 6. Aughinish Alumina Ltd (Ireland) 7. Luleu University of Technology (Sweden) 8. Fortum Waste Solutions (Sweden) 9. G.E.O.S. Ingenieurgesellschft mbH (Germany) 10. University of Limerick (Ireland) 11. Geonardo Environmental Technologies (Hungary)		
Project duration	29 months (2018 – 2020)		
Total Costs	€ 1.078,708	**Total Requested Funding**	€ 854,978

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**INSTAnT**		
Project title	**Innovative sensor technology for optimized material recovery from bottom ash treatment**		
Main topic	4. Recycling of End-of-Life products		
Sub-topics	4.2: End-of-life products pre-processing: pre-treatment, dismantling, sorting, characterisation; 4.3: Recovery of raw materials from End-of-life products; 4.4: Increase recycling of End-of-Life products through information and communication technologies (ICT)		
Keywords	Bottom ash, sensor-based characterisation, sensor-based sorting, process model, optimization		
Publishable abstract	Within the European Union, more than 400 Waste-to-Energy plants are currently in use to convert 88 million tonnes of waste (municipal, commercial and industrial) to generate energy and decrease the volume of these waste streams. This thermal process produces approximately **18 Mt of bottom ash** which could be considered as the **'final sink' for many End-of-Life products**. Important quantities of metals (ferrous and non ferrous) and minerals (both industrial minerals and minerals for construction) are present in these bottom ashes offering **a great opportunity for recycling and turning this complex waste into new raw materials**. The objective of the INSTAnT project is to **close the material cycle of resources/materials present in bottom ashes** by using **smart recycling technologies** to 1) optimise process conditions in bottom ash treatment plants to **maximize metal recovery**; 2) separate out a valorizable **pure glass fraction**, and 3) detect and remove impuritities that hamper the **high-grade recycling of the mineral fraction**. INSTAnT will develop innovative **sensor-based characterization technology** allowing for fast, non-destructive, reliable material characterization to create data-driven decision tools for bottom ash treatment **plant optimization** and **enhanced resource recovery** (metals and minerals). This technology is based on machine learning and will turn big data into useful information by using artificial intelligence. Furthermore, INSTAnT will adopt a novel **sensor-based sorting technology** to separate glass from the mineral fraction of bottom ash. This will not only generate a new valorizable glass fraction, but also increase the quality of the mineral fraction to be used as high-grade construction material. Within INSTAnT, five partners **(SUEZ, TOMRA, XRE, RWTH and VITO)** are joining forces and bring together expertise in **waste recycling**, **sensor-based technology** and **big data** to maximize material recycling and reducing waste disposal whilst generating **new business opportunities**.		
Participating Institutions	1. Vlaamse Instelling voor Technologisch Onderzoek (Belgium/Flanders) - Coordinator 2. RWTH Aachen University (Germany) 3. SUEZ Treatment and Recycling NV (Belgium/Flanders) 4. Tomra Sorting GmbH (Germany) 5. XRE NV (Belgium/Flanders)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 1.137,781	**Total Requested Funding**	€ 871,317

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**RecEOL**		
Project title	**Recycling of End-of-Life Products (PCB, ASR, LCD)**		
Main topic	4. Recycling of End-of-Life products		
Sub-topics	4.3: Recovery of raw materials from End-of-life products 5.1: New business models		
Keywords	PCB, ASR, battery, critical metals, economic assessment full scale plant		
Publishable abstract	**RecEOL** provides evidence that a **patented** recycling process for **waste printed circuit board (PCB)**, **LCDs**, **batteries** and **automobile shredder residue (ASR)** is economically viable and environmentally sustainable. The project brings together industry and academia to solve the challenges of recycling above wastes while realising the business opportunities in recycling. **PCBs** are part of the **WEEE** (Waste Electrical and Electronic Equipment) stream; one of the fastest growing waste streams in the EU. The best way to increase the recycling rate will be to **offer a highly profitable process** to provide a financial incentive. PCBs are present in most electronic equipment such as televisions, computers or mobile phones. Hence **RecEOL** has **global** potential. The **objective and expected outcome** of the **RecEOL** project is to demonstrate (**1**) the capability of the process to recycle metals including **critical (indium)** and **special (tantalum)**, (**2**) that the metal recycling **yields** are significantly improved over current processes, (**3**) that the process is **economic** and **environmentally sustainable**. **RecEOL** is **applied research**. The aim is to show on the pilot plant scale that the **scaled-up commercial** plant is **economic**. Hence, **RecEOL** must establish the **metal yields**, the **kinetics**, the **mass balances** to find the **financial performance** of a commercial plant. The technology offers many **advantages** over current technologies: **1. Yields**: over 95% recycling rate of copper, steel and solder exceeding the current rates of 70-80%. Moreover, aluminium, solder and steel is separated and can be recovered. **2. Critical and special metals**: for the first time, metals such as indium and tantalum will be recyclable. **3. All PCBs**: even low value (TVs; low gold content) PCBs. **4. No shredding**: highly energy efficient process. **5. Simple process from established industries**: no moving parts, low capital cost. **6. Easy scale up**: doubling the salt volume, doubles throughput of the continuous process. The project is an essential step towards the ***commercial implementation*** of the **RecEOL** process.		
Participating Institutions	1. University College Cork (UCC)/ Environmental Research Institute (ERI) (Ireland) - Coordinator 2. Composite Recycling Ltd (CRL) (Ireland) 3. Coolrec BV (COR) (Belgium/Flanders) 4. Technische Universität Bergakademie Freiberg (TUF) (Germany) 5. Alumisel (ALU) (Spain) 6. Muldenhütten Recycling und Umwelttechnik GmbH (MRU) (Germany)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 1.299,163	**Total Requested Funding**	€ 902,943

Co-funded by the Horizon 2020 programme of the European Union

Project acronym	**SUPERMET**		
Project title	**Recovery of Precious Metals from Spent Catalysts by Supercritical CO2 Extraction Assisted by Polymers**		
Main topic	4. Recycling of End-of-Life products		
Sub-topics	4.3: Recovery of raw materials from End-of-life products		
Keywords	Precious metals recovery, supercritical CO2, complexing surface-active polymers, spent catalysts, secondary resources		
Publishable abstract	SUPERMET project proposes to explore an eco-friendly disruptive technology for the recycling of precious metals, especially palladium (Pd) and platinum (Pt), from spent catalysts, e.g. from petrochemistry catalysts, by extraction in supercritical CO2 (scCO2) thanks to complexing polymers bringing the insoluble precious metals into the scCO2 medium. Precious metals are used extensively in applications for catalysis not only in the petrochemistry, but also in the field of automotive (three way catalyst) and in the synthesis of fine chemicals. The scarcity of these metals poses a risk for the European countries which do not have this primary resource. The pyrometallurgical and hydrometallurgical state of the art techniques developed for the recovery of these metals are energy-intensive, destructive, and generate large volumes of toxic effluents. With our proposed innovative recycling process, the catalytic support and the precious metal remain intact and can be reused as well as the used CO2 and polymer, so that there are no toxic effluents. Due to adjustable solvent properties of scCO2, the dissolved polymer-metal complex can be removed from the CO2 simply by depressurization. So, this new process is eco-efficient and solves a core problem of the state of the art processes. Within the project, metal-complexing polymers, soluble in supercritical CO2, will be synthesized by ICGM (France). Afterwards, they will be used by Fraunhofer ICT (Germany) as additives for the extraction by supercritical CO2 of precious metals from spent catalysts (solid matrices) supplied by Heraeus (Germany). The project will focus on the recovery of extracted precious metals either directly as a polymer/metal mixture or as refined metals by subsequent separation techniques such as electrodeposition. Physico-chemical analyses will be done at ICIA (Romania). Networking, watch on supercritical fluid technology and life cycle assessment will be organized with the support of IFS (France).		
Participating Institutions	1. Ecole Nationale Supérieure de Chimie de Montpellier (ENSCM) (France) - Coordinator 2. National Institute of Research and Development for Optoelectronics (Romania) 3. Association: Innovation Fluides Supercritiques (IFS) (France) 4. Heraeus Deutschland GmbH & Co. KG (Germany) 5. Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (Germany)		
Project duration	36 months (2018 – 2021)		
Total Costs	€ 1.494,453	**Total Requested Funding**	€ 1.008,806

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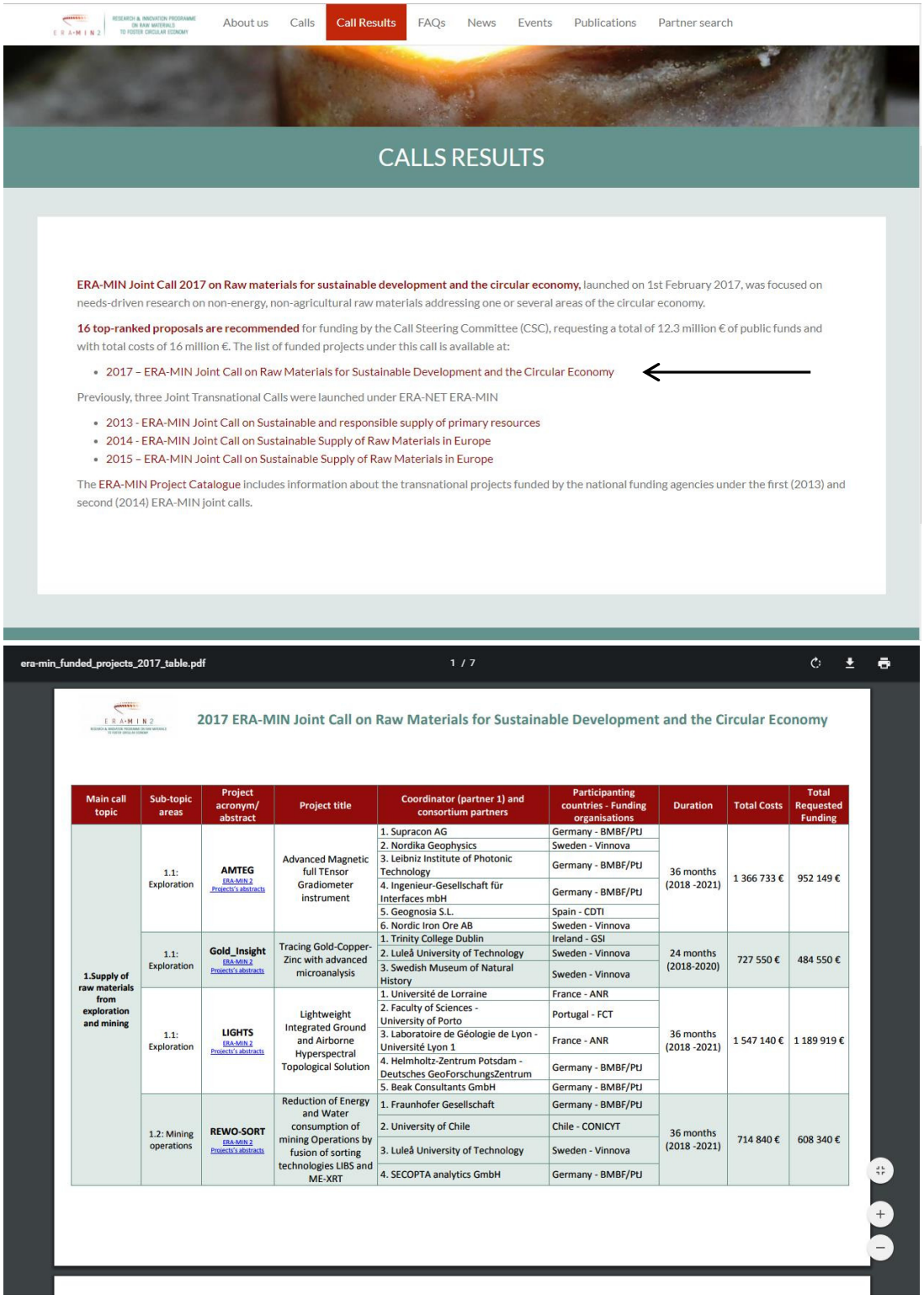
4 DATA ON FUNDED PROJECTS

The following tables are public and available at the ERA-MIN 2 Website in the « Call Results » menu (Figure 19). Under each project acronym, there is a link for the ERA-MIN 2 Projects' abstracts .



Main call topic	Sub-topic areas	Project acronym/ abstract	Project title	Coordinator (partner 1) and consortium partners	Participanting countries - Funding organisations	Duration	Total Costs	Total Requested Funding
1.Supply of raw materials from exploration and mining	1.1: Exploration	AMTEG ERA-MIN 2 Projects's abstracts	Advanced Magnetic full TEnsor Gradiometer instrument	1. Supracon AG	Germany - BMBF/PtJ	36 months (2018 -2021)	1 366 733 €	952 149 €
				2. Nordika Geophysics	Sweden - Vinnova			
				3. Leibniz Institute of Photonic Technology	Germany - BMBF/PtJ			
				4. Ingenieur-Gesellschaft für Interfaces mbH	Germany - BMBF/PtJ			
				5. Geognosia S.L.	Spain - CDTI			
				6. Nordic Iron Ore AB	Sweden - Vinnova			
	1.1: Exploration	Gold_Insight ERA-MIN 2 Projects's abstracts	Tracing Gold-Copper-Zinc with advanced microanalysis	1. Trinity College Dublin	Ireland - GSI	24 months (2018-2020)	727 550 €	484 550 €
				2. Luleå University of Technology	Sweden - Vinnova			
				3. Swedish Museum of Natural History	Sweden - Vinnova			
	1.1: Exploration	LIGHTS ERA-MIN 2 Projects's abstracts	Lightweight Integrated Ground and Airborne Hyperspectral Topological Solution	1. Université de Lorraine	France - ANR	36 months (2018 -2021)	1 547 140 €	1 189 919 €
				2. Faculty of Sciences - University of Porto	Portugal - FCT			
				3. Laboratoire de Géologie de Lyon - Université Lyon 1	France - ANR			
				4. Helmholtz-Zentrum Potsdam - Deutsches GeoForschungsZentrum	Germany - BMBF/PtJ			
				5. Beak Consultants GmbH	Germany - BMBF/PtJ			
	1.2: Mining operations	REWO-SORT ERA-MIN 2 Projects's abstracts	Reduction of Energy and Water consumption of mining Operations by fusion of sorting technologies LIBS and ME-XRT	1. Fraunhofer Gesellschaft	Germany - BMBF/PtJ	36 months (2018 -2021)	714 840 €	608 340 €
				2. University of Chile	Chile - CONICYT			
				3. Luleå University of Technology	Sweden - Vinnova			
				4. SECOPTA analytics GmbH	Germany - BMBF/PtJ			

Figure 19 - ERA-MIN 2 website - "Call Results" menu.

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Main call topic	Sub-topic areas	Project acronym/ abstract	Project title	Coordinator (partner 1) and consortium partners	Participanting countries - Funding organisations	Duration	Total Costs	Total Requested Funding
1.Supply of raw materials from exploration and mining	1.1: Exploration	**AMTEG**	Advanced Magnetic full TEnsor Gradiometer instrument	1. Supracon AG	Germany - BMBF/PtJ	36 months (2018 -2021)	1 366 733 €	952 149 €
				2. Nordika Geophysics	Sweden - Vinnova			
				3. Leibniz Institute of Photonic Technology	Germany - BMBF/PtJ			
				4. Ingenieur-Gesellschaft für Interfaces mbH	Germany - BMBF/PtJ			
				5. Geognosia S.L.	Spain - CDTI			
				6. Nordic Iron Ore AB	Sweden - Vinnova			
	1.1: Exploration	**Gold_Insight**	Tracing Gold-Copper-Zinc with advanced microanalysis	1. Trinity College Dublin	Ireland - GSI	24 months (2018-2020)	727 550 €	484 550 €
				2. Luleå University of Technology	Sweden - Vinnova			
				3. Swedish Museum of Natural History	Sweden - Vinnova			
	1.1: Exploration	**LIGHTS**	Lightweight Integrated Ground and Airborne Hyperspectral Topological Solution	1. Université de Lorraine	France - ANR	36 months (2018 -2021)	1 547 140 €	1 189 919 €
				2. Faculty of Sciences - University of Porto	Portugal - FCT			
				3. Laboratoire de Géologie de Lyon - Université Lyon 1	France - ANR			
				4. Helmholtz-Zentrum Potsdam - Deutsches GeoForschungsZentrum	Germany - BMBF/PtJ			
				5. Beak Consultants GmbH	Germany - BMBF/PtJ			
	1.2: Mining operations	**REWO-SORT**	Reduction of Energy and Water consumption of mining Operations by fusion of sorting technologies LIBS and ME-XRT	1. Fraunhofer Gesellschaft	Germany - BMBF/PtJ	36 months (2018 -2021)	714 840 €	608 340 €
				2. University of Chile	Chile - CONICYT			
				3. Luleå University of Technology	Sweden - Vinnova			
				4. SECOPTA analytics GmbH	Germany - BMBF/PtJ			

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Main call topic	Sub-topic areas	Project acronym/ abstract	Project title	Coordinator (partner 1) and consortium partners	Participanting countries - Funding organisations	Duration	Total Costs	Total Requested Funding
2.Design	2.1: Product design for increased raw material efficiency 2.4: Product design for critical materials substitution	**MONAMIX**	New concepts for efficient extraction of mixed rare earths oxides from monazite concentrates and their potential use as dopant in high temperature coatings and sintered materials	1. National R&D Institute for Nonferrous and Rare Metals	Romania - UEFISCDI	36 months (2018 -2021)	562 750 €	517 750 €
				2. ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development	Italy - MIUR			
				3. SC MGM Star Construct SRL	Romania - UEFISCDI			
				4. Institut de Chimie de la Matière Condensée de Bordeaux CNRS	France - ANR			
3.Processing, Production and Remanufacturing	2.4: Product design for critical materials substitution; 3.2: Increase resource efficiency through recycling of residues or remanufacturing	**Deasphor**	Design of a product for SUBSTITUTION of phosphate rocks	1. Faculty of Sciences of Porto University	Portugal - FCT	36 months (2018 -2021)	1 533 318 €	1 370 998€
				2. Universidade Federal de Sergipe	Brazil - FINEP			
				3. Università degli Studi di Brescia	Italy - MIUR			
				4. Central Mining Institute (Glowny Instytut Gornictwa)	Poland - NCBR			
				5. University Politehnica of Bucharest	Romania - UEFISCDI			
				6. Swerea MEFOS	Sweden - Vinnova			
				7. Ege University	Turkey - TUBITAK			
				8. UMR GeoRessources	France - ADEME			
				9. Campoaves - Aves do Campo, SA	Portugal - *own funding*			
				10. P.U.P.H „PROGEO" Sp. z o.o.	Poland - NCBR			
	3.1: Increase resource efficiency in resource intensive production processes	**Li+WATER**	Membrane electrolysis for resource-efficient lithium and water recovery from brines	1. Universidad Nacional de Jujuy	Argentina - MINCyT	24 months (2018-2020)	429 468 €	329 850 €
				2. Universiteit Gent	Belgium/Flanders - FWO			
				3. IVL Swedish Environmental Research Institute	Sweden - Vinnova			

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Main call topic	Sub-topic areas	Project acronym/ abstract	Project title	Coordinator (partner 1) and consortium partners	Participanting countries - Funding organisations	Duration	Total Costs	Total Requested Funding
3.Processing, Production and Remanufacturing	3.2: Increase resource efficiency through recycling of residues or remanufacturing	**FLOW**	Lightweight alkali activated composite foams based on secondary raw materials	1. Slovenian National Building and Civil Engineering Institute	Slovenia - MIZS	36 months (2018 -2021)	761 242 €	550 117 €
				2. University of Oulu	Finland - Business Finland			
				3. University of Modena and Reggio Emilia	Italy - MIUR			
	3.1: Increase resource efficiency in resource intensive production processes; 3.2: Increase resource efficiency through recycling of residues or remanufacturing	**MINTECO**	Integrated eco-technology for a selective recovery of base and precious metals in Cu and Pb mining by-products	1. BRGM	France - ANR	36 months (2018 -2021)	973 834 €	639 700 €
				2. National R&D Institute for Nonferrous and Rare Metals -IMNR	Romania - UEFISCDI			
				3. National Institute for Research and Development in Optoelectronics INOE 2000	Romania - UEFISCDI			
				4. Eskisehir Osmangazi University (ESOGU)	Turkey - TUBITAK			
				5. Romaltyn Mining SRL	Romania - *own funding*			
				6. Mineral and Energy Economy Research Institute of The Polish Academy of Sciences	Poland - NCBR			
				7. TGM – Team Group Metals Sp. z o.o.	Poland - NCBR			
				8. AJELIS	France - ANR			

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Main call topic	Sub-topic areas	Project acronym/ abstract	Project title	Coordinator (partner 1) and consortium partners	Participanting countries - Funding organisations	Duration	Total Costs	Total Requested Funding
3. Processing, Production and Remanufacturing	2.1: Product design for increased raw material efficiency,2.2: Product design for reuse or extended durability of products,2.3: Product design to promote recycling ,3.2: Increase resource efficiency through recycling of residues or remanufacturing,3.3: Increase resource efficiency using information and communication technologies (ICT),4.1: End-of-life products collection and logistics ,4.2: End-of-life products pre-processing: pre-treatment, dismantling, sorting, characterisation,4.3: Recovery of raw materials from End-of-life products,4.4: Increase recycling of End-of-Life products through information and communication technologies (ICT),5.1: New business models,5.2: Improvement of methods or data for environmental impact assessment	**MaXycle**	A novel circular economy for sustainable RE-based magnets	1. Jozef Stefan Institute	Slovenia - MIZS	36 months (2018 – 2021)	1 056 380 €	965 970 €
				2. Magneti Ljubljana, d.d.	Slovenia - MIZS			
				3. OBE Ohnmacht & Baumgärtner GmbH & Co. KG	Germany - BMBF/PtJ			
				4. Pforzheim University of Applied Sciences	Germany - BMBF/PtJ			
				5. IVL Swedish Environmental Research Institute	Sweden - Vinnova			

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	3.1: Increase resource efficiency in resource intensive production processes,3.2: Increase resource efficiency through recycling of residues or remanufacturing,5.2: Improvement of methods or data for environmental impact assessment	**BASH-TREAT**	Optimization of bottom ash treatment for an improved recovery of valuable fractions	1. Hamburg University of Technology	Germany - BMBF/PtJ	36 months (2018 -2021)	506 600 €	451 600 €
				2. Politecnico di Torino	Italy - MIUR			
				3. Heidemann Recycling GmbH	Germany - *own funding*			
				4. BAM - Bundesanstalt für Materialforschung und -prüfung	Germany - BMBF/PtJ			
				5. Sysav	Sweden - *own funding*			

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Main call topic	Sub-topic areas	Project acronym	Project title/ abstract	Coordinator (partner 1) and consortium partners	Participanting countries - Funding organisations	Duration	Total Costs	Total Requested Funding
3. Processing, Production and Remanufacturing	3.2: Increase resource efficiency through recycling of residues or remanufacturing,4.3: Recovery of raw materials from End-of-life products	**MetRecycle**	Recycling of metals using functionalized magnetic nanoparticles (FMNP)	1. Institute for Environmental Protection and Sensors (IOS) Ltd	Slovenia - MIZS	36 months (2018 -2021)	784 700 €	651 000 €
				2. Sveriges Lantbruksuniversitet	Sweden - Vinnova			
				3. Instituto de Nanosistemas-UNSAM	Argentina - MINCyT			
				4. CNRS	France - ADEME			
				5. SiKEMIA	France - ADEME			
4. Recycling of End-of-Life products	3.1: Increase resource efficiency in resource intensive production processes,3.2: Increase resource efficiency through recycling of residues or remanufacturing,4.3: Recovery of raw materials from End-of-life products,5.1: New business models,5.2: Improvement of methods or data for environmental impact assessment ,5.3: Social acceptance and trust/public perception of raw materials	**BIOMIMIC**	Innovative biotechnological methods for effective mining of secondary material	1. Research Institutes of Sweden	Sweden - Vinnova	29 months (2018-2020)	1 078 708 €	854 978 €
				2. Fraunhofer Institute for Systems and Innovation Research	Germany - BMBF/PtJ			
				3. Flocazur AB	Sweden - Vinnova			
				4. Nordic BioEngineering AB	Sweden - Vinnova			
				5. Purac AB	Sweden – *own funding*			
				6. Aughinish Alumina Ltd	Ireland – *own funding*			
				7. Luleu University of Technology	Sweden - Vinnova			
				8. Fortum Waste Solutions	Sweden - *own funding*			
				9. G.E.O.S. Ingenieurgesellschft mbH	Germany - BMBF/PtJ			
				10. University of Limerick	Ireland - GSI			
				11. Geonardo Environmental Technologies	Hungary – *own funding*			

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4. Recycling of End-of-Life products	4.2: End-of-life products pre-processing: pre-treatment, dismantling, sorting, characterisation,4.3: Recovery of raw materials from End-of-life products,4.4: Increase recycling of End-of-Life products through information and communication technologies (ICT)	**INSTAnT**	Innovative sensor technology for optimized material recovery from bottom ash treatment	1. Vlaamse Instelling voor Technologisch Onderzoek	Belgium/Flanders - Hermesfond	36 months (2018 -2021)	1 137 781 €	871 317€
				2. RWTH Aachen University	Germany - BMBF/PtJ			
				3. SUEZ Treatment and Recycling NV	Belgium/Flanders - Hermesfond			
				4. Tomra Sorting GmbH	Germany - BMBF/PtJ			
				5. XRE NV	Belgium/Flanders - Hermesfond			
	4.3: Recovery of raw materials from End-of-life products,5.1: New business models	**RecEOL**	Recycling of End-of-Life Products (PCB, ASR, LCD)	1. University College Cork (UCC)/ Environmental Research Institute (ERI)	Ireland - GSI	36 months (2018 - 2021)	1 299 163 €	902 943 €
				2. Composite Recycling Ltd (CRL)	Ireland - GSI			
				3. Coolrec BV (COR)	Belgium/Flanders - Hermesfond			
				4. Technische Universität Bergakademie Freiberg (TUF)	Germany - BMBF/PtJ			
				5. Alumisel (ALU)	Spain - CDTI			
				6. Muldenhütten Recycling und Umwelttechnik GmbH (MRU)	Germany - BMBF/PtJ			

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Main call topic	Sub-topic areas	Project acronym/ abstract	Project title	Coordinator (partner 1) and consortium partners	Participanting countries - Funding organisations	Duration	Total Costs	Total Requested Funding
4. Recycling of End-of-Life products	4.3: Recovery of raw materials from End-of-life products	**SUPERMET**	Recovery of Precious Metals from Spent Catalysts by Supercritical CO2 Extraction Assisted by Polymers	1. Ecole Nationale Supérieure de Chimie de Montpellier (ENSCM)	France - ANR	36 months (2018 -2021)	1 494 453 €	1 008 806 €
				2. National Institute of Research and Development for Optoelectronics	Romania - UEFISCDI			
				3. Association: Innovation Fluides Supercritiques (IFS)	France - ADEME			
				4. Heraeus Deutschland GmbH & Co. KG	Germany - BMBF/PtJ			
				5. Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.	Germany - BMBF/PtJ			

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