European Innovation Partnership on Raw Materials

Application for a Raw Materials Commitment

Wastes from Construction industry As a ResourceE

Acronym:
WeCARE

Abstract / executive summary:
WeCARE commitment aims to propose solutions for two big problems in EU: waste generation and access to raw materials. WeCARE focuses on the development of sustainable technologies for the production of SRM from wastes and by-products generated in the construction industry, mainly focusing on Natural Stone and Demolition industry, although synergies with other industrial sectors will be studied. The SRM to be obtained will be composed by industrial minerals and construction raw materials (recycled calcium carbonate; recycled quartz, feldspar and mica; recycled aggregates) and metals (Co and W, which are also CRM).

A systemic approach will allow developing new Value Chains in a technically and economically feasible way. The project will follow a co-design, co-development and co-implementation methodology implying the major stakeholders (including civil society) to ensure the feasibility of the solutions. Concurrently, assessments of the related environmental and safety risks will be performed.

Three pilot areas from different European regions and industrial sectors were selected for a direct action in the project, but also general methodologies of action will be developed to easily transfer the results to other areas. Mobile and portable technologies will be encouraged to valorize wastes in situ and to reduce transportation costs. The obtained SRM will be validated in different industries (construction, composites and metallurgy) by the participation of industrial partners who will assure the scale of results to mass production and exploit the results.

Dissemination of the results will aim to transfer the developed strategies into other sectors. Since the approach requires a multidisciplinary cooperation between research community and industries at EU level, 2 SMEs and 1 IND are involved.

WeCARE will directly impact on the EU economy, including SMEs and industries for the commercial exploitation of the results and stakeholders interested in new value chains.

Links to the Strategic Implementation Plan:

- I. Technology Pillar
  - I.B Priority Area: Technologies for primary and secondary raw materials’ production
    - Action area n° I.5: Recycling of raw materials from products
3) Construction and demolition (C&D) waste recycling

Coverage of the Action Areas referred to above:

The strategy followed in the project will consist on the development of an energy-, material- and cost-efficient systemic solution based on a new value chain covering all the implied processes to assure the transformation of the considered wastes and by-products into Secondary Raw Materials, separating the mineral and metallic fraction, and also demonstrating the applicability of the developed Secondary Raw Materials into final applications.

The project aims to approach the new value chain for wastes and by-products with on-site and off-site methodologies, facilitating the integration of current waste producers into the overall process. The specific objective consists in the design and development of methods for the recovery and purification of the mineral and metal fraction in order to obtain two types of Secondary Raw Materials able to be used at large scale in construction or technological applications (additive or filler) and metallurgy industries (metal alloys and hardmetal). Life cycle assessments will be used as a decision tool continuously supporting and validating the development of the new recovery techniques. LCA will allow the project team to quantify the actual environmental benefits of the process in its entirety, taking into account each phase of the Secondary Raw Material recovery.

Objectives of the commitment:

- Development of clean and sustainable technologies for the production of SRM from wastes and by-products in the construction industry, focusing on wastes from natural stones machining and construction demolition.
- Strategic, Environmental and Technical specific objectives will be achieved addressing the long term sustainability of European Critical Raw Materials production, supply and recycling, implementing more ambitious environmental standards in waste management and reuse and improving competitiveness of the European Production of Secondary Raw Materials.
- New Secondary Raw Materials for Construction-Composite Materials (inert part) and Metallurgical Industry (heavy metal part).
- A complete characterization of wastes coming from three pilot areas/use cases.
- New market opportunities and employment
- Trust of the society in products containing sustainable SRM.

Description of the activities:

The program involves partners from both academia and industries in order to develop activities with theoretical fundamentals validated by practical evidences.

The main activities are:

a. Technical specific activities:
- Scope of case studies (Spain, Italy – Finland and Portugal) and sample collection.
- Sample characterization and analysis of the results.
- Development of a general methodology for the characterization of construction wastes and byproducts in the form of sludge and fine particles.
- Mineral-metal fractions separation processes and conditioning processes for the obtained fractions.
- Waste depuration treatments for the aqueous part resulting from the separation processes of the sludge.
- Mineral fraction conditioning/purification processes.
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- Demonstration of the use of the mineral fraction in different applications for the construction sector (bitumen for asphalt, component in structural concrete, binder or pozzolanic additive), the composites sector (polymer concrete and masterbatch) and the metallurgy sector (recycled sintered
beads for diamond wire and other sintered elements).

b. Horizontal activities:
-LCA, LCC and Risk Assessment: quality of the results, from an environmental and safety standpoint.
-Application of co-design, co-development and co-implementation methodology: quality of the results, from a socio-economic standpoint.
-Communication and dissemination.
-Search of synergies and capitalization of technical activities and results.

A base activity in WeCARE defines and forecasts the quantity, content and quality of by-products and wastes produced by de-construction and stone cutting: it allows identifying gaps and problems in the production chain to be addressed and solved through the developed approaches and new technologies. The mineral separation processes for the different kinds of wastes aim to valorize them. Separation of the inert fraction from the metallic one will be combined with the conditioning of both the fractions in order to optimize the following technology processes for Secondary Raw Material (SRM): transformation of the obtained pretreated wastes and by-products into homogeneous and stable Raw Materials, with technical properties that make them competitive against similar Primary Raw Materials. The results validation pass through the realization and characterization of lab-prototypes using the following SRMs: recycled calcium carbonate in plastic; hard stone muds in polymer concrete; demolition waste in construction as binders and pozzolans; metallic fraction in metallurgy. The activities of validation will be supported by LCA and Risk assessments in order to define the effective improvement reached at the implementation and supply chain level.

The commitment plans to look for:
-to contact and identify synergies with other projects and initiatives at European and international level;
-to analyze the applicability of the new developed technologies into other industrial sectors;
-to assess the economic impact of the results, thus developing particularized exploitation plans for the selected pilot areas, taking into account geographical, administrative, social, environmental and economic characteristics of each region;
-to develop general guidelines for analyzing the implantation feasibility of the new proposed Value Chains into different applications;
-to develop general technical guidelines for optimizing the generation of wastes and by-products in the natural stone and deconstruction industry.

**Description of the expected impacts:**

WeCARE commitment aims to exploit wastes coming from cutting of natural stones and from deconstruction processes as a sustainable source for the production of SRMs and CRMs. These wastes are generally contaminated with heavy metals such as cobalt and tungsten, which are toxic, responsible of high environmental impacts and critical (supply risk). Clarification of sludge and reuse of metal and mineral fractions into industrial processes will improve their environmental and social sustainability.

It has been estimated that the global quantity of stone production is about 130 million of tons and that the waste production is about 190 million of tons. WeCARE aims to suggest practical solutions to deal with the consequent EU priority issue of storage and valorization of wastes. Furthermore, cobalt is classified as a CRM: its supply is unstable, its price is variable and strongly controlled by the industrial demand. Cobalt comes mostly from Extra-UE and it is classified as a conflict material because of its extensive production in the Democratic Republic of Congo. Also in the case of tungsten, Europe is highly dependent on import (75-85% from China). WeCARE role is to lower these supply risks with a sustainable production of these heavy metals through higher recovery rates from wastes. WeCARE commitment will have positive effects on SMEs, which can profit of economically and environmentally sustainable solutions for waste management and SRM production. Moreover,
WeCARE will generate a large potential market and create new jobs opportunities in recycling processes and applications. The sustainable feature of products realized with SRW will enhance the competitiveness against low-quality products. WeCARE project will improve the awareness of society in SMR production in EU.

**Expected innovation outcomes:**
New processes
New technologies
New ideas to the market
Societal innovation

**Name of the coordinating organisation:**
Fundación Centro Tecnológico Andaluz de la Piedra

**Country:**
Spain

**Entity profile:**
Private sector - SME

**Role within the commitment:**
Managing the whole project
Stone muds clarification and analysis
Other conditioning processes for muds
Testing of the obtained raw materials in different applications
Dissemination activities to the stone sector

**Other partners:**

**Name of partner:**
COFIPLAST
**Country:**
Italy

**Entity profile:**
Private sector - SME

**Role within the commitment:**
End user - generation of Secondary Raw Materials Muds provider (granites, concrete, steel)
Italian demonstrator (multiwires cut)

**Name of partner:**
AZVI
**Country:**
Spain

**Entity profile:**
Private sector - large company

**Role within the commitment:**
End user – use of Secondary Raw Materials Demonstration of final uses in construction sector

**Name of partner:**
POLITECNICO DI TORINO
**Country:**
Italy
Entity profile: Academia
Role within the commitment:
Stone wastes analysis and characterization (mineralogical and merceological composition, physical and mechanical characterization) Research of methods for waste treatment, separation and conditioning Comparison between different muds (Luserna, marbles, granites) Research of methods for reuse possibilities of muds (polymer concrete, metallurgy industry) Heavy metal separation, conditioning and characterization Validation of technologies

Name of partner: GTK
Country: Finland
Entity profile: Governmental/public body
Role within the commitment:
Analysis, characterization and in situ monitoring Quarries involvement in the project (soapstones and granites)

Name of partner: ENVIPARK
Country: Italy
Entity profile: Private sector - SME
Role within the commitment:
Analysis of contaminated water LCC and LCA Support in the dissemination activities

Name of partner: CENTRO HABITAT
Country: Portugal
Entity profile: Private sector - SME
Role within the commitment:
Dissemination and communication to the habitat sector Look for sinergyes in this sector / Cluster with other projects

Name of partner: CTP
Country: Belgium
Entity profile: Private sector - SME
Role within the commitment:
- Development of mineral processing technologies of fine waste purification and recovery. - Technologies for metal purification. - Development of industrial applications for secondary raw materials.

Name of partner: SWEREA
Country: Sweden
Entity profile: Private sector - SME
Role within the commitment: Life Cycle and Risk Assessment

Name of partner: RCD
Country: Portugal
Entity profile: Private sector - SME
Role within the commitment:
- Reuse / reprocess of wastes from deconstruction - Potentiality of re-use and recycling of deconstruction wastes, improving existing uses to higher value-added applications.

Existing EU contribution:
No

Period to implement the commitment:
Thursday, 1 September, 2016 to Monday, 2 September, 2019

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