

# MINRESCUE Symposium

## From Mining Waste to Valuable Resource: New Concepts for a Circular Economy

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Call: **RFCS GA 899518**

Start date: 01/09/2021

End date: 28/02/2024

Budget: 3,185,067.25 Euros

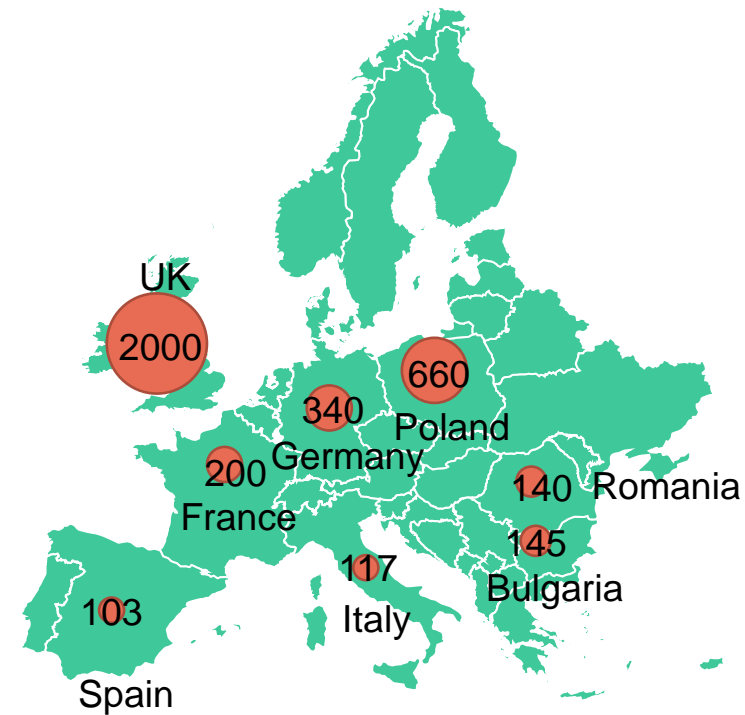
12 partners from 6 countries

MINRESCUE Project Symposium  
15<sup>th</sup> to 16<sup>th</sup> June 2023  
GIG, Katowice, Poland

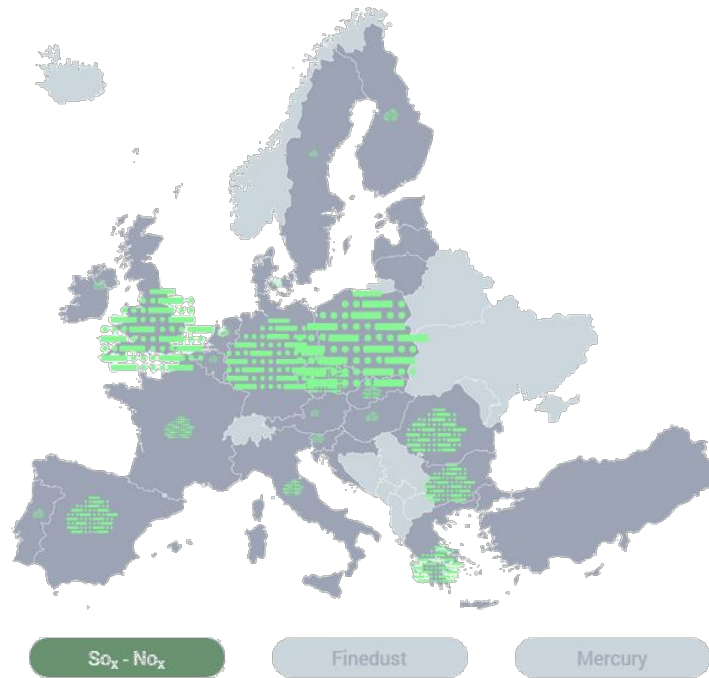
European  
Commission



# Problem tackled by MINRESCUE



Concentration of CMW in Europe (in Mt)

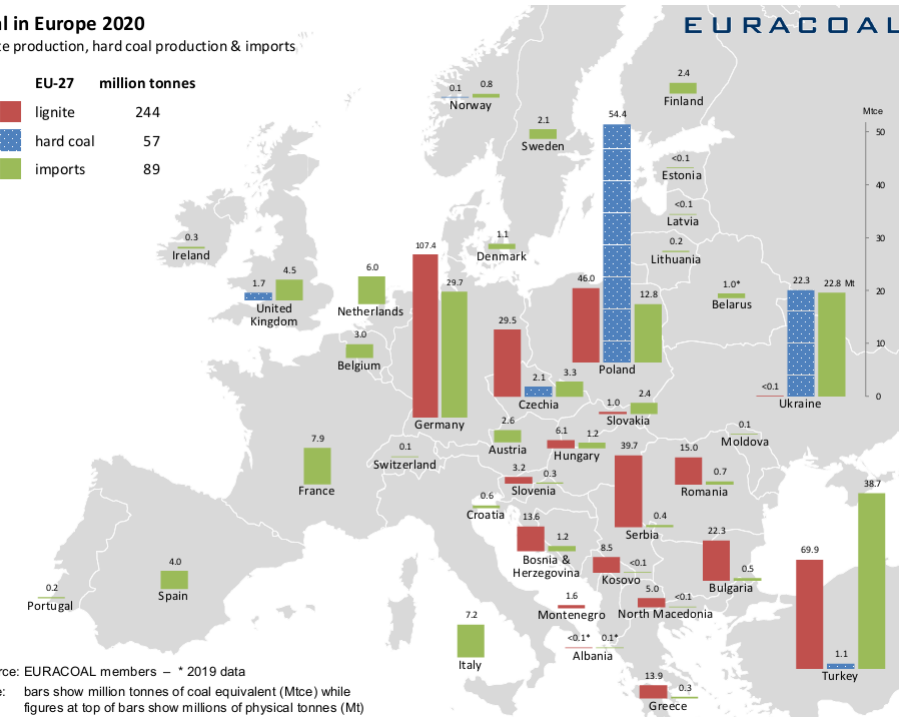


Environmental impacts of CMW

## Coal in Europe 2020

lignite production, hard coal production & imports

EU-27	million tonnes
lignite	244
hard coal	57
imports	89



Source: EURACOAL members – \* 2019 data  
Note: bars show million tonnes of coal equivalent (Mtce) while figures at top of bars show millions of physical tonnes (Mt)

Coal production in Europe (in Mt)

# Problem tackled by MINRESCUE

MINRESCUE aims to address one of the major challenges resulting from past/ present coal mining in Europe:

To develop practical concepts for managing, recycling and upcycling geowaste materials generated by coal mining activities across Europe.



Environmental pollutions



Large areas occupied by CMWGs



Large demand for raw geomaterials



Failure of waste dumps

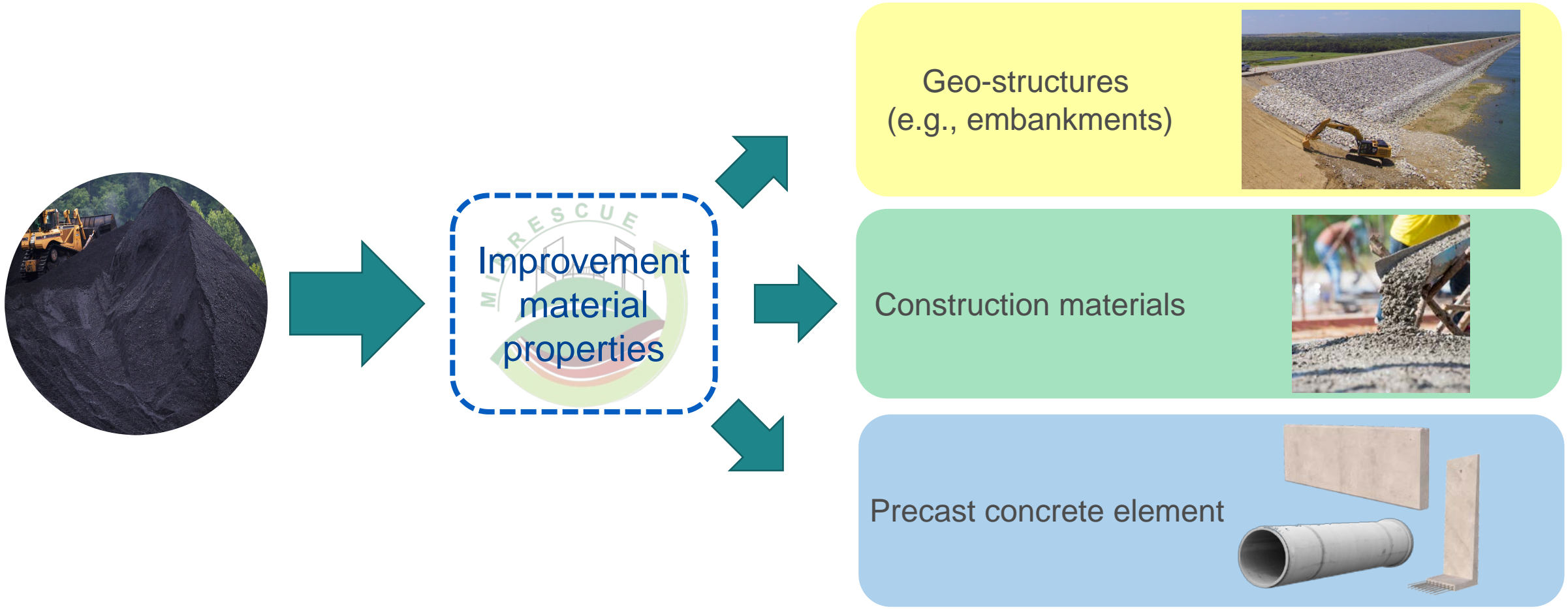
# Main objectives of MINRESCUE

- The physical, chemical and mechanical characterisation of the mining waste materials
- Numerical modelling to predict behaviour of CMWGs
- Assessment and demonstration of the durability of materials and (geo)-structures made by CMWGs under realistic conditions
- Providing guidelines for the design of construction materials and (geo)-structures with the treated

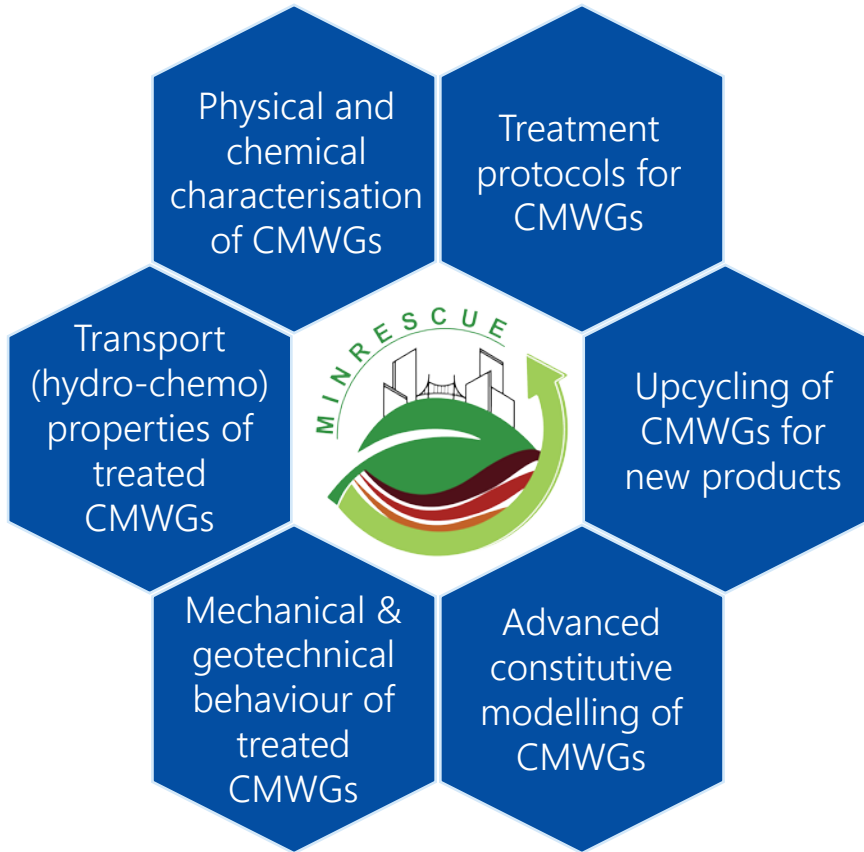


- Develop optimised treatment and remediation methods and tailored mixes for different applications
- Developing concepts for recovering upgraded components
- Substantiation of the reduction of environmental impacts through well thought-out life cycle assessment (LCA)
- Paving the way for market uptake of CMWGs upgrading and upcycling technologies

# Outcomes of achieving the objectives



# Main expected results

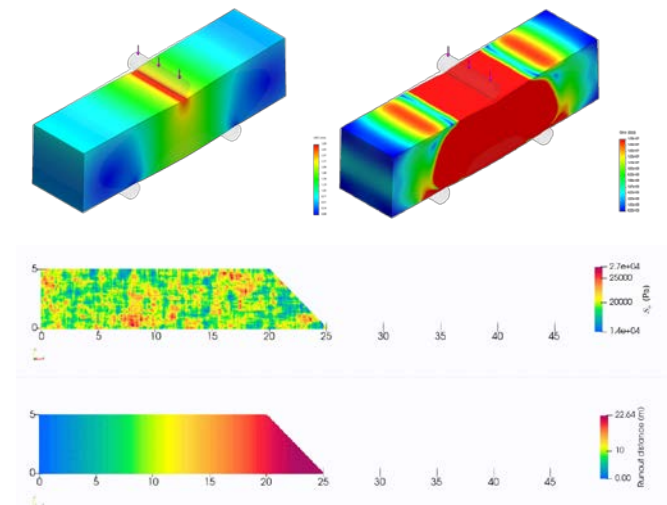
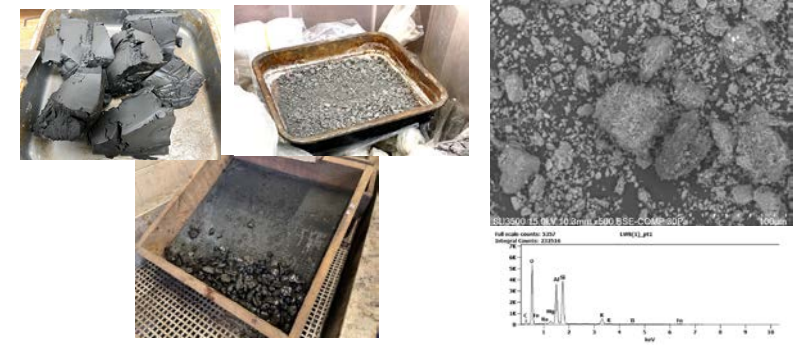


Database on characteristics of CMWGs & their classification

Practical solutions to upgrade geowaste materials for construction use

Technical guidelines for the design of construction materials and (geo-)structures with the CMWGs

Constitutive model and numerical framework for analysis of CMWGs & tips



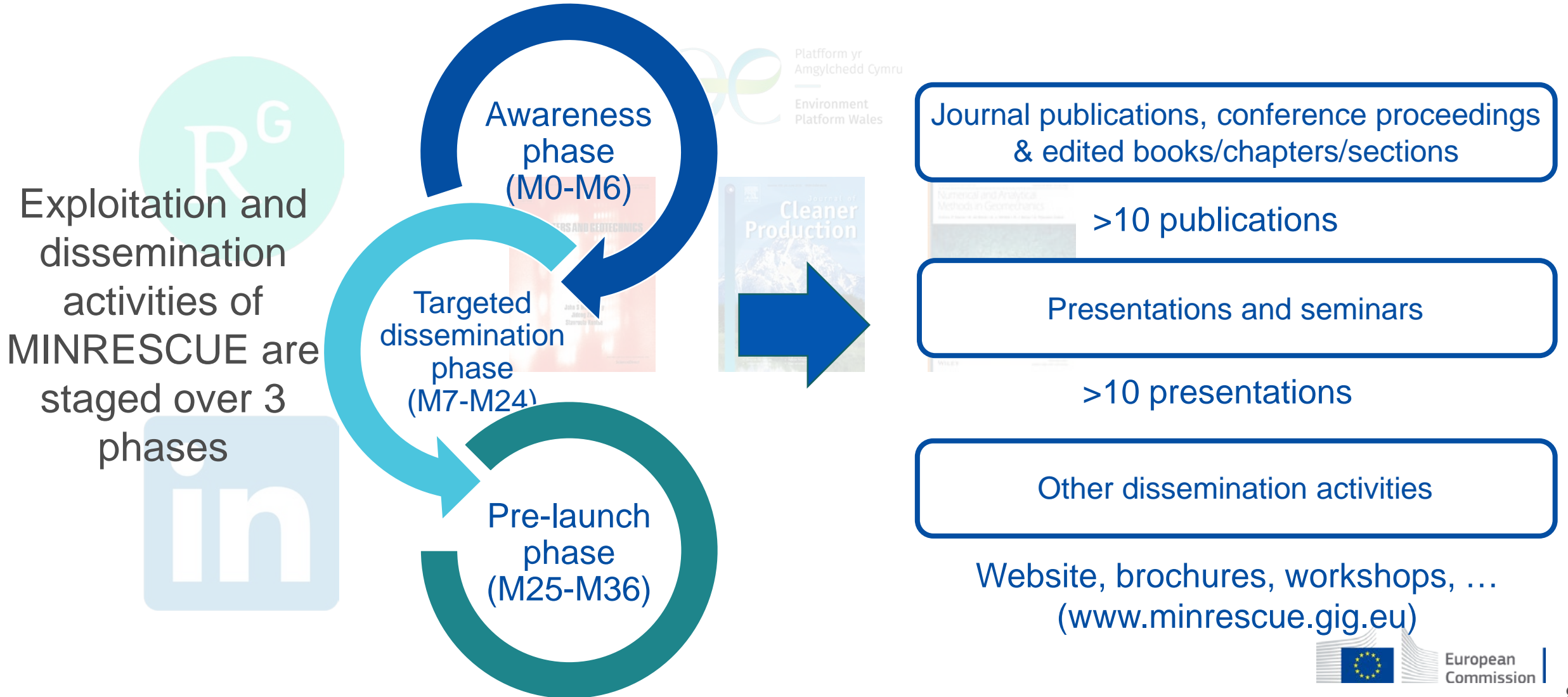
# Main industrial and/or socio-economic outcomes

Main expected impacts of the project include:

- Developing a guideline that facilitates the use of CMWGs as **reliable** construction materials which can potentially lead to new economic activities in post-mining areas across Europe.
- Contributing to the EU's new circular economy action plan which paves the way for a cleaner and more competitive Europe (One of the main building blocks of the European Green Deal).



# Communication, dissemination, exploitation





# Lessons learnt - recommendations

- Although CMWGs are mineralogically diverse, they share common features which could be exploited during **the initial screening stage** of these materials from storage facilities for recycling/upcycling into higher value products. For example, coal content can be inferred from simple particle density test, the degree of heterogeneity can be determined from simple particle size distribution test, the presence of certain (semi)expandable minerals (smectite group minerals, pyrite, ...) can be inferred from simple liquid – plastic limits test. These simple tests can be carried out in most civil engineering commercial and research laboratories, or even *in situ*. They can be used **to quickly rule out certain recycling/upcycling applications**.
- During **the detailed screening stage**, it is important to carry out both geophysical (BET, MIP, SWCC, ...) and geochemical tests (XRF, XRD, ICPMS,...) at the particle/pore scale levels (nanometre to millimetre), on the considered CMWGs pre and post-processing. To some extent, this is currently being carried out at commercial and research laboratories in Europe but there appears to be lacking a systematic/rational approach to justify the relative importance of certain tests for certain applications.

# Next steps

- What does the project need to go further?
- We believe that this project is the first step in a long series of future steps. For example, the innovative project outcomes on quick physical screening or sophisticated assessment of CMWGs can pave the way for assessing new mines with different mineralogy in order to evaluate the the CMWGs suitability for different purposes.
- Engagement with local authorities and land owners in post-mining areas to highlight the socio-economic potentials of realizing the developed methods to convert mining wastes into resources.
- Set up diverse pilot studies to use upgraded materials in a real projects (e.g., to construct embankment, or using precast concrete elements as structural elements).
- Pilot project to carry out risk assessment study to evaluate stability of existing coal tips using the developed constitutive and numerical frameworks.

Thank you!