



# Introduction to the objectives and highlights of the RFCS SUMAD project

**Charles Heron**  
**SUMAD project coordinator**

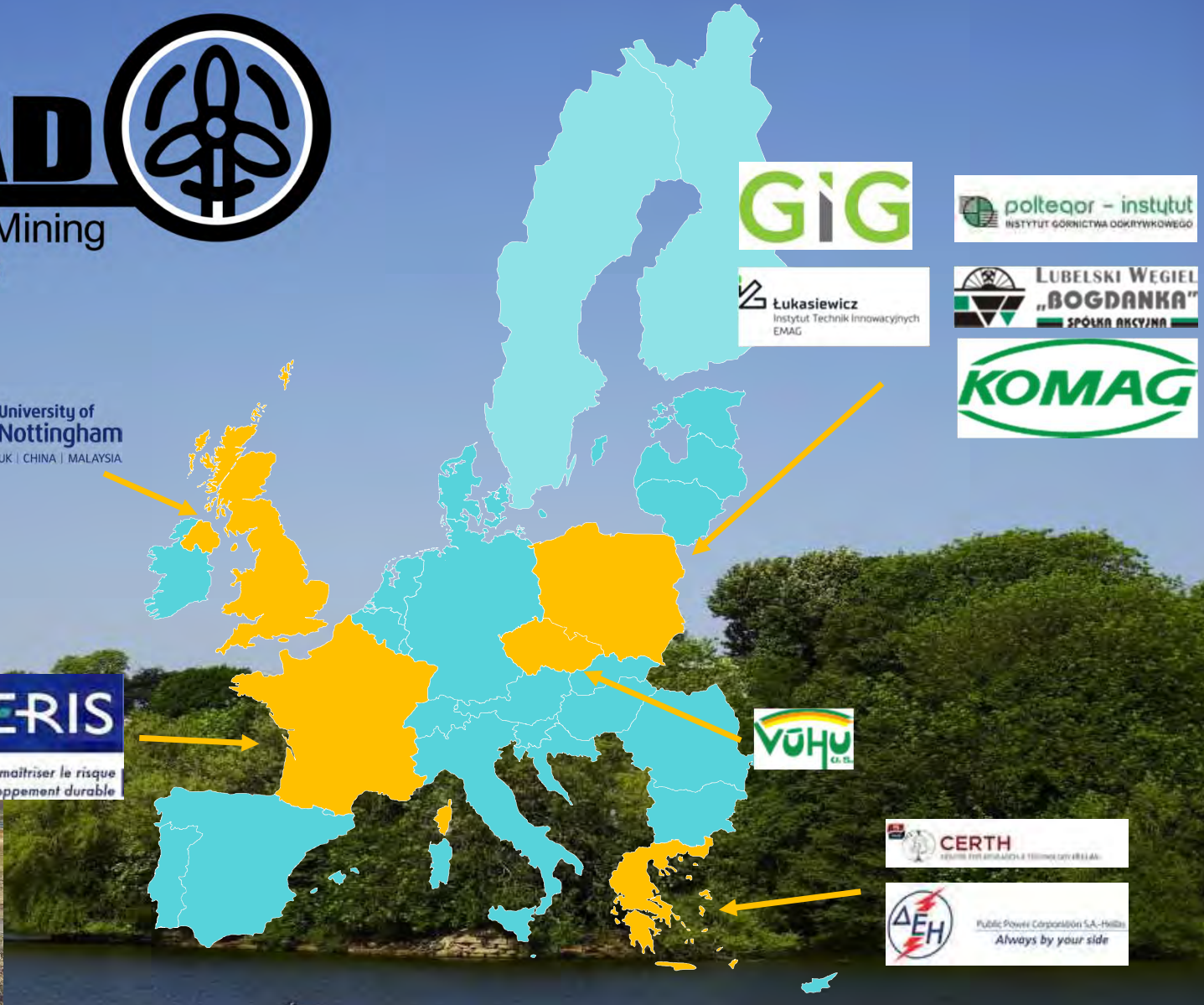
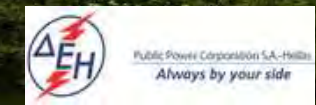
**Faculty of Engineering, University of Nottingham, UK**





# Sustainable Use of Mining Waste Dumps

Call: *RFCS-2018*  
Instrument: Research Project  
Start date: 01/07/2019  
End date: 31/10/2022  
Budget: €3.4 million



*The SUMAD project unites European experts to investigate the **future use of made-ground** consisting of coal-mining spoil with a focus on the **geotechnical, sustainability, environmental, socio-economic and long-term management challenges**. Advanced risk analysis and physical and numerical modelling will be applied to different sustainable rehabilitation schemes with a particular focus on the **technical viability** for the development of renewable energy infrastructure. Tip operators and developers as well as authoritative bodies involved in the project will provide valuable input to ensure the maximum possible impact. A case-study site will be used as a test-bed for the concepts developed during the project.*

July 2019

Oct. 2022

**WP1:** Identification and viability assessment of potential uses for spoil dumps

**WP2:** Geotechnical physical modelling of spoil material and foundation systems

**WP3:** Numerical simulation of spoil material and foundation systems

**WP4:** Ground improvement, monitoring and risk analysis

**WP5:** Reporting, Coordination & Dissemination

# Work Packages & Time Frame

July 2019

Oct. 2022

**WP1:** Identification and visual assessment of

**WP3:** Numerical simulation of sp... material and foundation systems

**WP4:** Ground improvement, monitoring and risk analysis

**WP5:** Reporting, Coordination & Dissemination



# Project Outcomes - Presentations

July 2014

Statistical characterization, probability distributions and spatial variability of lignite spoils

Dump remediation and possibilities for grass cultivation

Valorization potential of spoil heaps: from testing and geotechnical characterization to numerical modelling

"New life of post-mining areas" -assessment of the post-mining waste dump "Bogdanka"

**WP2:**

The challenges associated with laboratory scale physical modelling of high-plasticity spoil materials

Physical modelling of revitalization options for reclamation of high-plasticity spoil dumps

Numerical modelling of revitalization options for reclamation of high-plasticity spoil dumps

Advantages and limitations of installing photovoltaic panels on dumps – European feedback

Risk management tool to support spoil dumps revitalization

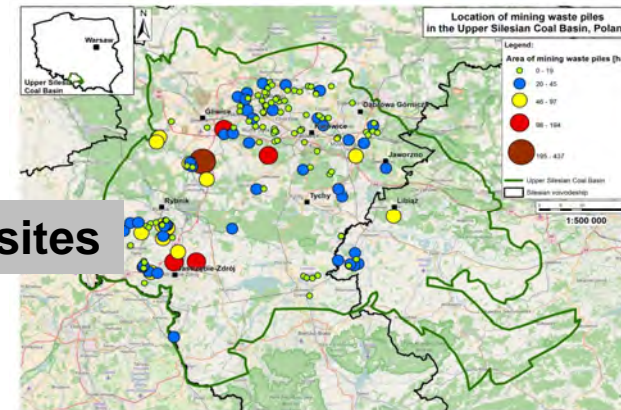
**WP5:** Reporting, Coordination & Dissemination

July 2019

Oct. 2022

**WP1:** Identification and viability assessment of potential uses for spoil dumps

**Identify and classify candidate sites**



**Social engagement**

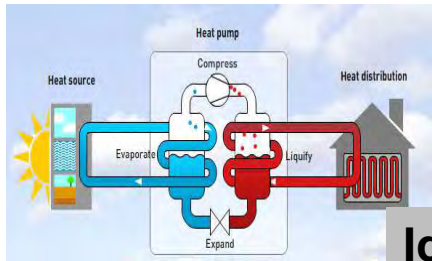
**Identify previous revitalization uses**



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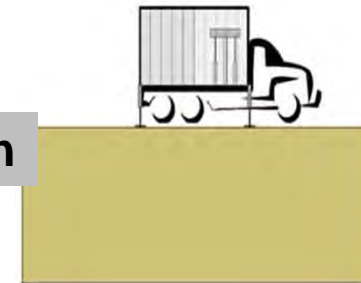
**WP1:** Identification and viability assessment of potential uses for spoil dumps



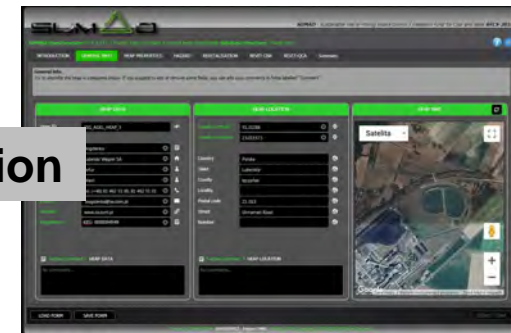
Identify potential revitalization activities



Spoil characterisation



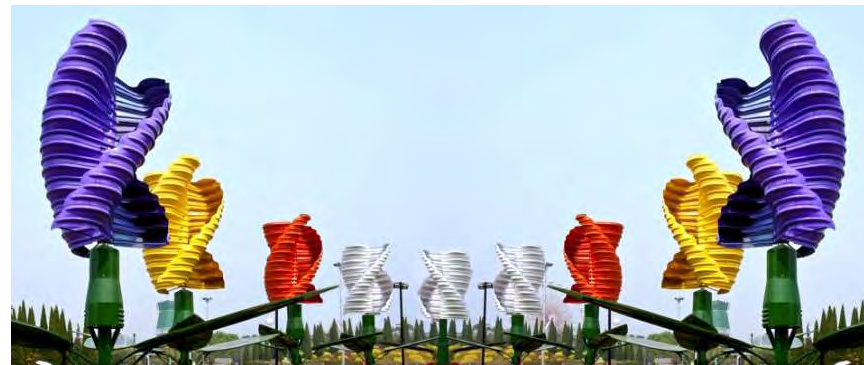
Risk management information collection



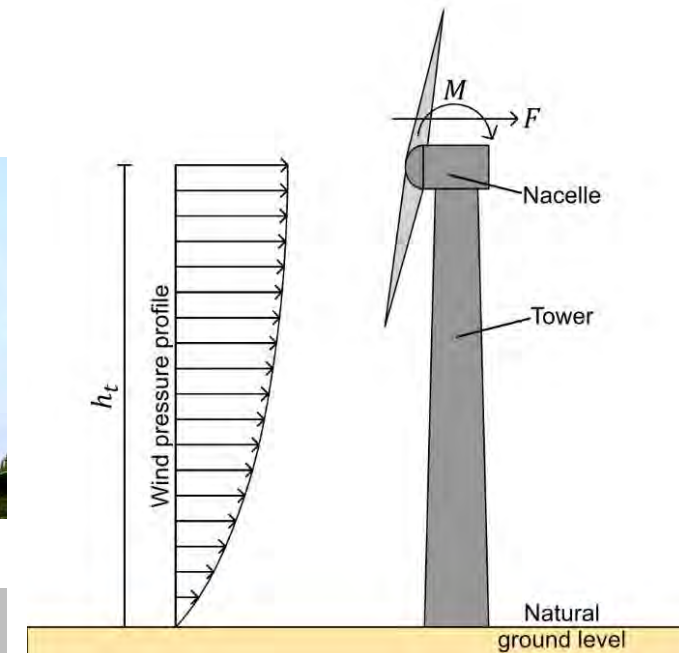
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**WP2:** Geotechnical physical modelling of spoil material and foundation systems



**How do we deal with these large cyclic loads on poor (weak) spoil?**



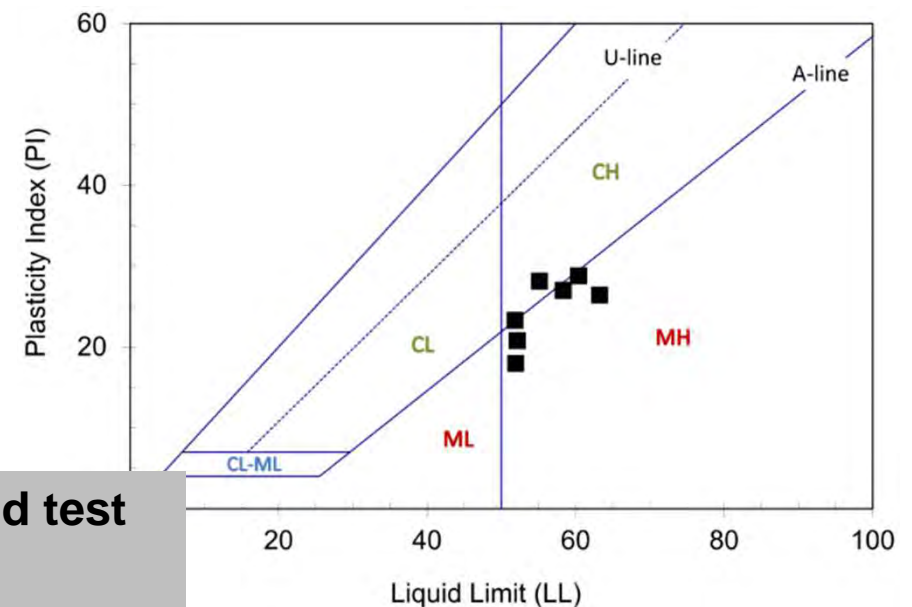
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**WP2:** Geotechnical physical modelling of spoil material and foundation systems



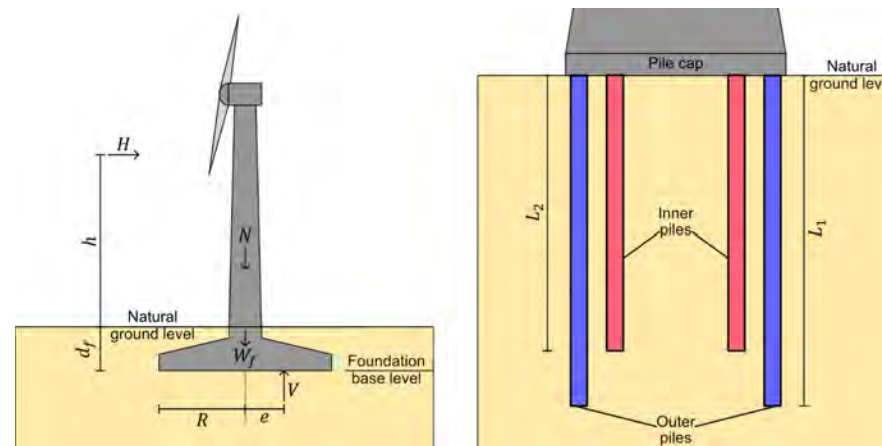
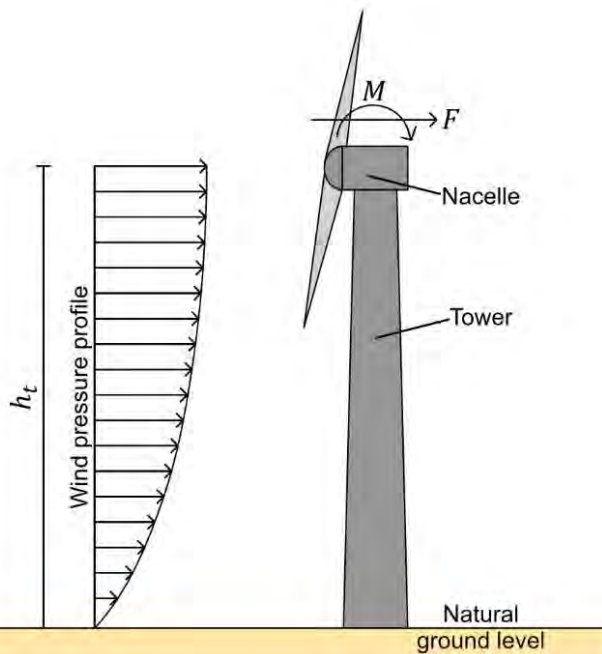
**Take samples from site and test in laboratory as well as conducting in-situ testing**



July 2019

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**WP2: Geotechnical physical modelling of spoil material and foundation systems**



**Design and test model-scale foundation systems to determine performance when subjected to cyclic loading**



July 2019

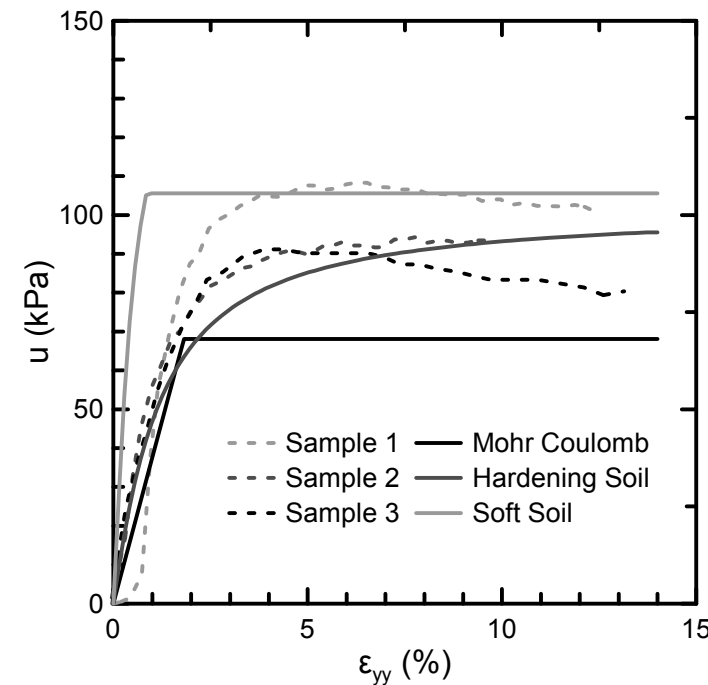
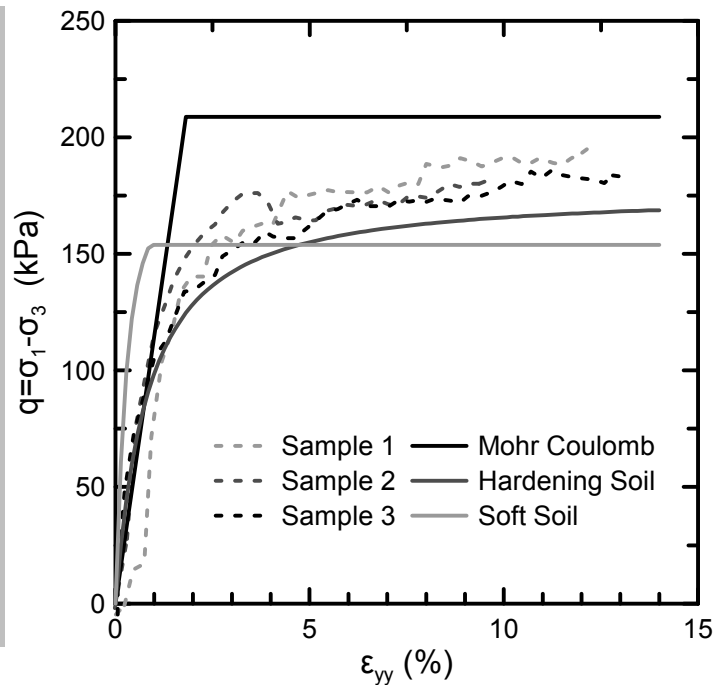
Oct. 2022

## WP3: Numerical simulation of spoil material and foundation systems

**Physical modelling (WP2) provides an understanding of the spoil behaviour.**

**Important to be able to model and predict that behaviour using numerical tools.**

**Step 1: To ensure the element scale behaviour can be modelled**

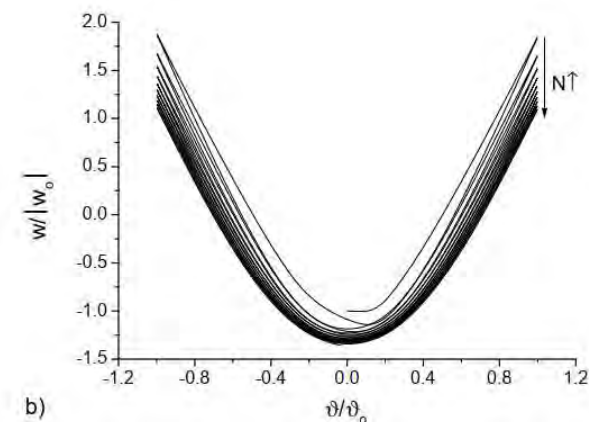
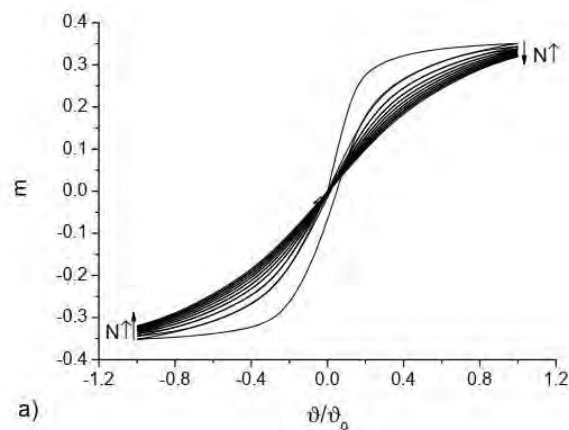
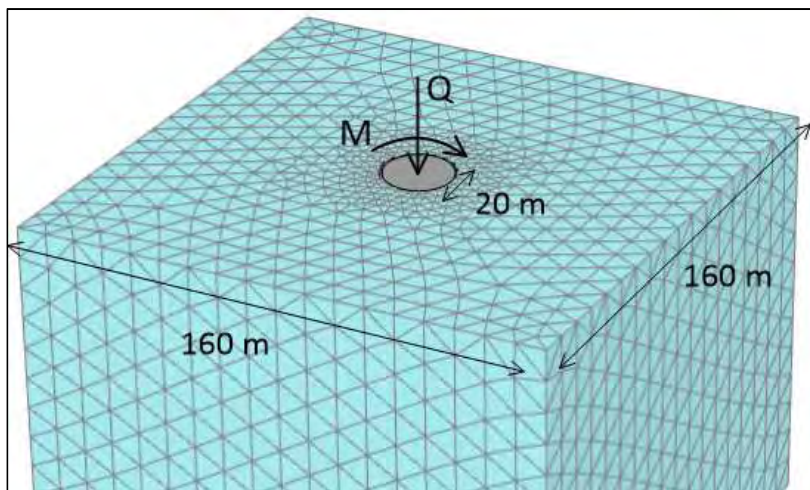


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**WP3: Numerical simulation of spoil material and foundation systems**

**Step 2: To model the prototype real-world problem**

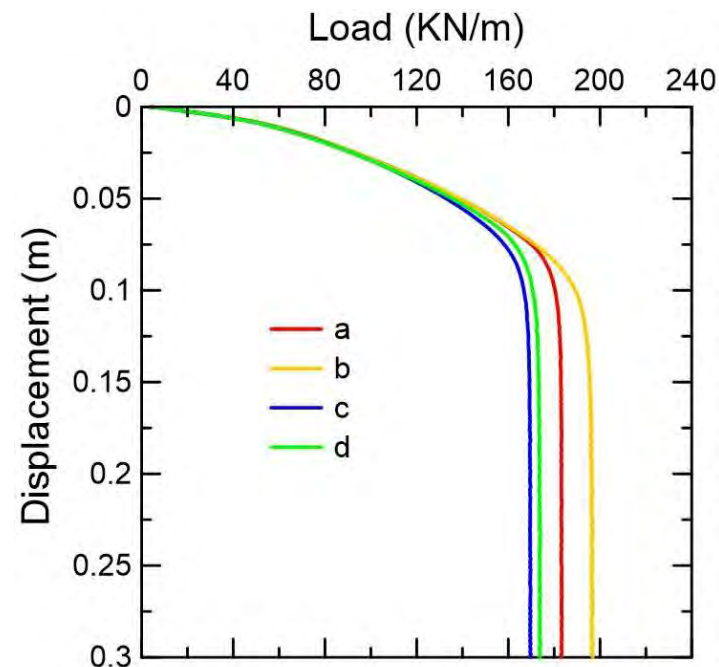
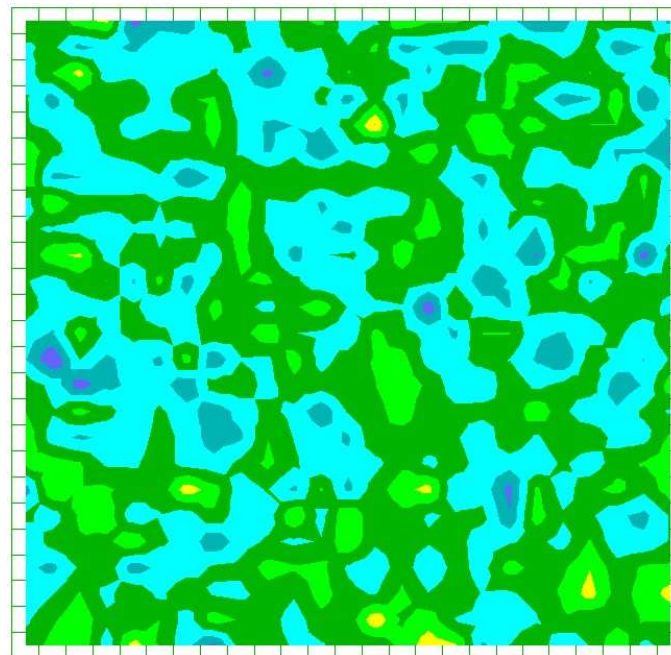


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**WP3:** Numerical simulation of spoil material and foundation systems

**Step 3:** To investigate how the natural variability of spoil material may impact the results



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## WP4: Ground improvement, monitoring and risk analysis

To understand the potential for wind or solar energy, it is important to monitor the amount of energy which could be harnessed



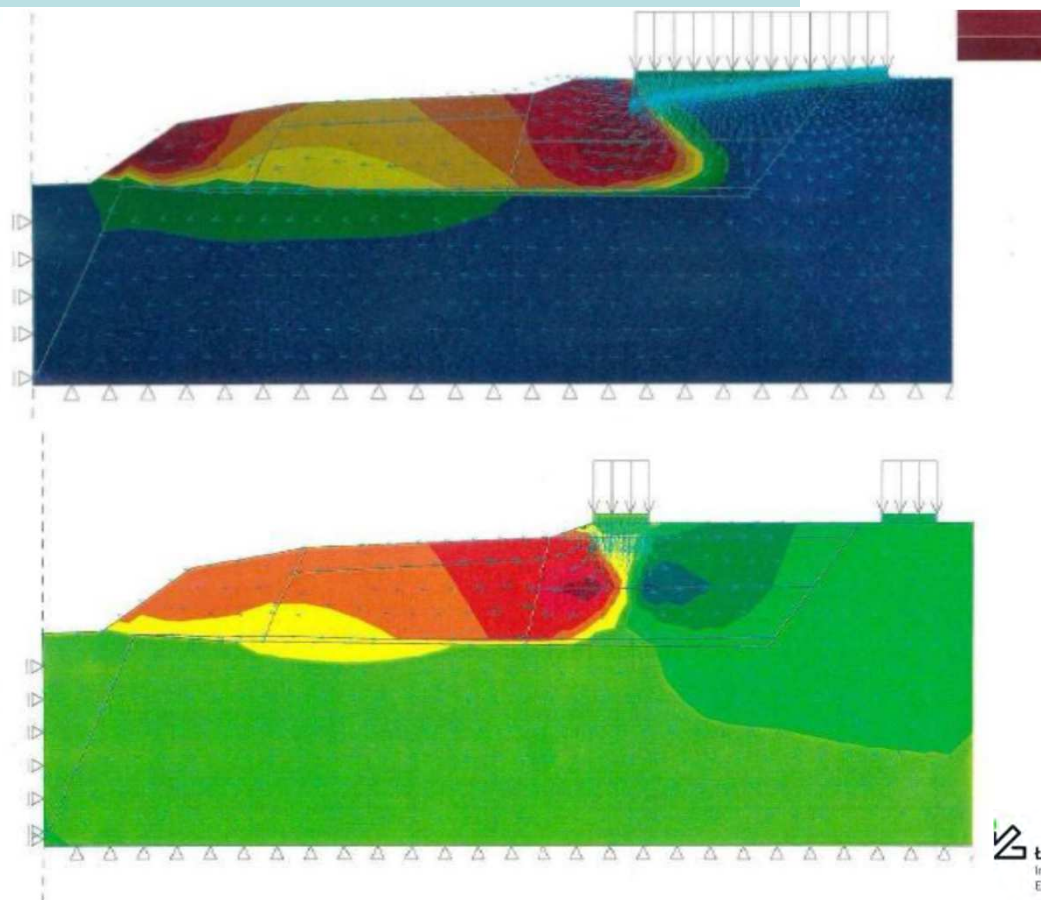
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**WP4: Ground improvement, monitoring and risk analysis**

**Scale of ground improvement works adjustment given impact of Covid on access to sites**

**Site test was completed with supporting element testing and numerical simulations**



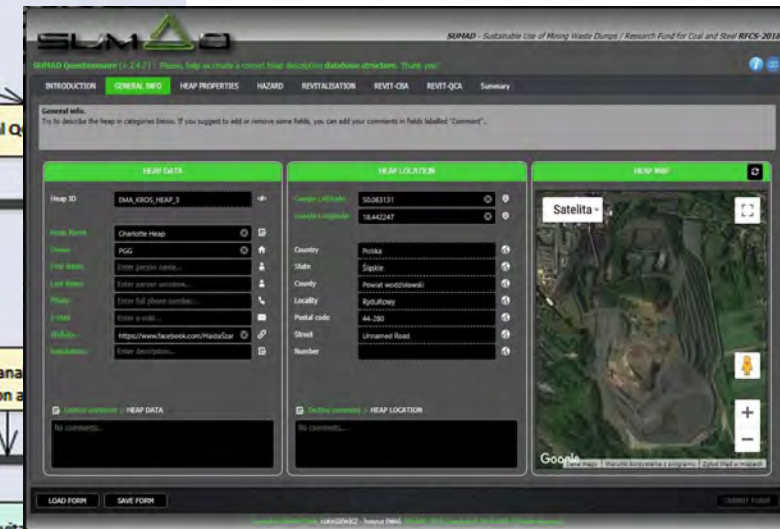
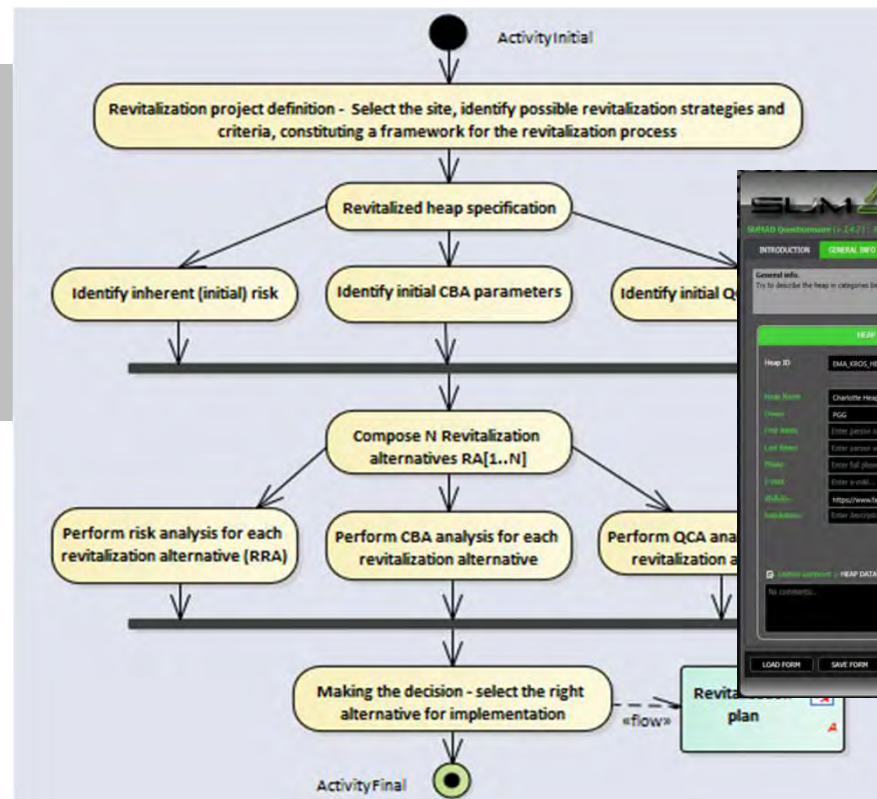
July 2019

Oct. 2022

## WP4: Ground improvement, monitoring and risk analysis

**SUMAD Risk Management Tool (RMT) was developed**

**Allows a range of factors to be fed into the decision making process**





## SUSTAINABLE USE OF MINING WASTE DUMPS

*A handbook for post-mining land developers  
and managers*



Sustainable Use of Mining Waste Dumps

SUMAD

Deliverable D.1.4

**Report on the identification and viability assessment of sustainable  
revitalization activities**

Project Co-ordinator:  
Dr Charles Heron, University of Nottingham

Beneficiaries:  
THE UNIVERSITY OF NOTTINGHAM (UON)  
INSTYTUT GORNICTWA ODKRYWKOWEGO POLTEGOR (POLTEGOR)  
VYZKUMNY USTAV PRO HNEDE UHLI AS (VUHU)  
ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS (CERTH)  
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INSTYTUT TECHNIKI GORNICZEJ (KOMAG)  
INSTYTUT TECHNIK INNOWACYJNYCH (EMAG)  
GLOWNY INSTYTUT GORNICTWA (GIG)  
LUBELSKI WEGIEL BOGDANKA SA (LWB)  
PUBLIC POWER CORPORATION S.A. (PPC)

Authors:  
GIG, INERIS, UON, POLTEGOR, VUHU, CERTH, KOMAG, EMAG, LWB, PPC

**Numerous technical deliverables prepared to  
provide a deeper insight than the high-level  
overview presented within the handbook**



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