

Key data

Acronym: GreenJOBS

Title: Leveraging the competitive advantages of end-of-life underground coal mines to maximise the creation of green and quality jobs

Call: RFCS-2021

Instrument: RFCS-RPJ Agreement No 101057789

Start date: 01/07/2022

End date: 31/12/2025

Duration: 42 months

Partners: UNIVERSIDAD DE OVIEDO (UNIOVI - ES); GŁÓWNY INSTYTUT GÓRNICTWA (GIG - PL); FUNDACIÓN ASTURIANA DE LA ENERGÍA (FAEN - ES); DMT-GESELLSCHAFT FÜR LEHRE UND BILDUNG mbH (DMT-THGA - DE); MAGELLAN & BARENTS (M&B - ES); WEGLOKOKS KRAJ S.A. (WEGLO - PL); HULLERAS DEL NORTE, S.A. (HUNOSA - ES); PREMOGOVIK VELENJE d.o.o. (PV - SI)

Budget: 2,202,647.35 €

Technical Group: TGK1

1. The problem

- Before GreenJOBS, there was no guidance focused on operating underground coal mining companies to understand, evaluate, design, and implement alternative economic activities within their future closing period, i.e. to have a holistic and long-term approach (incl a view on green and quality jobs).
- There were no studies on repurposing end-of-life underground coal mines, leveraging their competitive advantages: (1) mine water; (2) connections to the grid; (3) large waste heap areas; (4) very deep shafts and galleries; and (5) fine coal waste.

2. The objectives

- To develop for coal mining companies innovative business plans for deploying emerging renewable energy and circular economy technologies to facilitate their exploitation.
- To plan and disseminate among mining companies and regional authorities in the coal regions in transition, training and re-skilling programmes addressing former coal mining workers to maximise the implementation of the business plans to be developed.

3. The results/solutions

- Two innovative business plans: (i) a Virtual Power Plant where the energy locally produced will be sold to the grid or used for power electro-intensive industries or companies with constant energy consumption located close to mines, such as aluminium factories or green data centres (Figure 1), and (ii) a Green Hydrogen Plant where renewable hydrogen will be produced by electrolysis of mine water and green electricity.

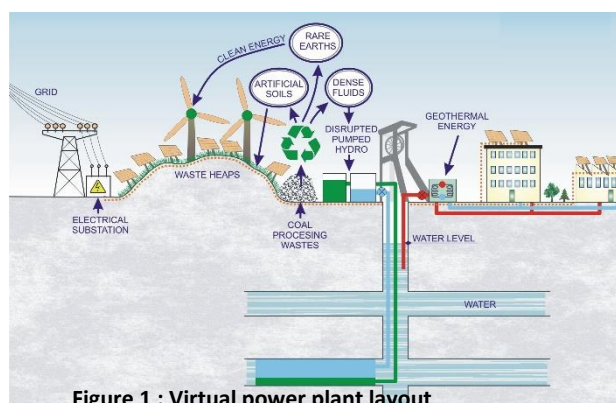


Figure 1 : Virtual power plant layout

- Training and re-skilling programmes in each of the stages of the value chains (research and development, equipment manufacture and distribution, project development, commissioning and handover, operation and maintenance, and cross-cutting/enabling occupations) and according to the skill levels required (professional/managerial, technician/skilled crafts/supervisor, semi-skilled and unskilled), addressing the skill gaps of former coal mining workers to facilitate the development of the business alternatives.

4. The **industrial/socio-economic impacts/outcome**

- Beyond the current extractive, take-make-waste industrial model, and underpinned by a transition to renewable energy sources, the GreenJOBS circular model builds economic, natural and social capital by designing out waste and pollution by valorising fine coal waste; by keeping materials in use by recycling fine coal waste into dense fluids; and by helping regenerate natural systems by developing soil substitutes to restore waste heaps before installing photovoltaic/wind, using different combinations of fine coal waste and local by-products.
- A roadmap for former mining companies that have decided to move towards deploying emerging renewable energies and circular economy technologies from a marketing, financial and operational point of view ready to be applied. → This will show the areas of responsibility of each manager and the employees to be taken on over the following years.
- GreenJOBS premises of alternative scenarios served as a basis for evaluation in the report developed by the United Nations Economic Commission for Europe (UNECE) titled *Technical, principle-based guidelines for designing and implementing a programme for efficient, safe and environmentally conscious mine closure in Albania and Serbia* (Geneva, Switzerland, 16 June 2022).

5. The **communication, dissemination, and exploitation**

- Project's website: www.greenjobsproject.eu
- Promotional video of the project: <https://www.youtube.com/watch?v=8LxmESmQsDs>
- Presentation at the 31st Session of the United Nations Economic Commission for Europe (UNECE) Committee on Sustainable Energy titled *Business Models to stimulate new economic activities and Jobs in coal regions in Transition* (Geneva, Switzerland, 22 September 2022).
- Presentation at the 6th Just Transition Platform Conference – Coal Regions in Transition and Carbon-Intensive Regions on *Innovative clean energy technologies for coal regions* (Brussels, 24 October 2022).
- Presentation at the United Nations Economic Commission for Europe (UNECE) session on the *Coal industry in transition: State of affairs of coal mine closure in the selected UNECE member states* (Jaworze, Poland, 9 November 2022).
- Presentation at the North of England Institute of Mining and Mechanical Engineers within the International Mining Lecture Series titled *A Green Energy Transition: Leveraging Competitive Advantages of Coal Mines* (24 November 2022).
- Presentation at the United Nations Economic Commission for Europe (UNECE) workshop on "Mine Closure in Albania and Serbia", titled *How can the infrastructure/resources of the active mines in Serbia and the closed mines in Albania be better utilised?* (Tirana, Albania, 9 December 2022).
- Presentation at the Euroheat & Power (EHP) panel debate on Large heat pumps in District Heating titled *Heat pumps as a way to harness mine water heat* (13 December 2022).
- Presentation at the 18th session of the United Nations Economic Commission for Europe (UNECE) Group of Experts on Coal Mine Methane and Just Transition, titled *Task Force on Safe Operations and Closure of Coal Mines* (Geneva, Switzerland, 21 March 2022).
- Presentation at the Workshop EU Research Fund for Coal and Steel Transformational Projects for a new era organised by EURACOAL in the European Parliament (Brussels, Belgium, 23 May 2023).
- Presentation of GreenJOBS at the 26th World Mining Congress, titled *Repurposing of coal mines and coal-fired power plants in low-carbon energy transformation process* (Brisbane, Australia, 26-29 June 2023).

6. The **lessons learnt & the recommendations**

- Rare earth concentrations from coal wastes range from 150-310 ppm (0.015-0.031%). For a mine to be mineable, concentrations between 1 and 2% are required. This suggests that the amount of rare earths present in the waste heaps in the three studied countries (ES, PL, SI) is too low to be economically viable.
- The economic assessment of hydrogen production via electrolysis showed that the investment is not feasible unless a specific subvention of at least 50% is obtained for developing the Green hydrogen plant.
- Experimental test consisting of fluid-dynamic analysis and rheology analysis showed that it is feasible to develop dense fluids with coal waste from the Spanish and the Slovenian mines. At the same time, it was not feasible to use the Polish mine coal waste.