



Frequently Asked Questions

ROBOMINERS Project – Test work in Mežica, Slovenia

1. What is the ROBOMINERS project?

ROBOMINERS is a 54-months project funded under the European Union's Research and Innovation programme Horizon 2020 (grant agreement n°820971) that started in June 2019.

The research project is developing a bio-inspired, modular and reconfigurable robot-miner for small and difficult to access mineral deposits. The aim is to create a prototype robot that is capable of mining underground and can be delivered in modules to the target area via a large diameter borehole drilled from the surface to the mineral deposit. ROBOMINERS aims at delivering a proof of concept for the feasibility of this technology which could enable the EU to access mineral raw materials from domestic sources that are otherwise inaccessible or uneconomic.

2. How does the robot work?

The ROBOMINERS concept is composed of the following steps:

1. Robot parts (modules) are sent underground via a borehole,
2. They self-assemble to form a fully functional robot,
3. Using specialised sensing devices, they detect ore minerals,
4. Using ad-hoc production tools, they produce a mix of water and minerals that is pumped out and processed at the surface,
5. The robot parts can re-configure on-the-job.

3. Who is working on this project?

The ROBOMINERS project is developed by a consortium consisting of 14 partners from 11 European countries. The research consortium encompasses a wide range of actors, consisting of:

- Geo-scientific Small and Medium-Sized Enterprises: La Palma Research Centre, GEO-MONTAN, K-UTEC, Resources Computing International LTD,
- Academics covering both mining and robotics: Universidad Politécnica de Madrid, Tallinn University of Technology, Tampere University, University of Miskolc, Montanuniversität Leoben,
- Non-governmental organisations: Assimagra, European Federation of Geologists
- Governmental bodies: Geological Survey of Slovenia, Geological Survey of Belgium/Royal Belgian Institute of Natural Sciences, IMineral and Energy Economy Research Institute/Polish Academy of Sciences.

4. Why is the EU funding this project?

As we transition further into the 21st century, it has become increasingly apparent that the current economic paradigm is propelling the planet toward irreversible climate change, exacerbating the ongoing biodiversity crisis, and perpetuating inequality. It is also creating social unrest due to restricted access to critical resources like food, water, land, energy, and minerals. Given that mineral resources will likely be the foundation of modern societies for the foreseeable future, it is incumbent upon the mining industry to adopt innovative and sustainable technologies.

ROBOMINERS is focused on developing a new generation of underground mining robots that can operate safely and autonomously in hazardous environments. By reducing the need for human miners and improving the efficiency and sustainability of mining operations, these robots can enhance the industry's overall performance. Of particular importance is the robots' capacity to sense and follow mineralised areas while simultaneously extracting and conveying a slurry containing minerals and water. This feature is particularly useful for mining small or difficult-to-access mineral deposits, including abandoned mines that are no longer accessible using conventional mining methods.

The ROBOMINERS concept would effectively render mines invisible and serve as a valuable tool for reducing the EU's dependence on imported mineral raw materials that are critical for the energy transition.

5. Why is ROBOMINERS conducting trials in Slovenia?

The research team is conducting field trials from 18 to 24 October 2023 in Mežica, Slovenia. These trials will take place in an abandoned underground mine. The field trials will play a pivotal role in validating key sensing functions of the full-scale prototype developed by the project, with a view to advancing its features. By conducting various tests and demonstrations relevant to future mining operations, the project seeks to provide tangible evidence of its successful completion and potential impact.



6. What is the scope of these trials?

During the field trials in Mežica, the ROBOMINERS project team will test and validate various sensors, which are needed for the RM1 robotic prototype to sense its environment, in the real mining environment. These tests encompass mapping lead and zinc ore in various galleries, distances and conditions, by using various types of sensors, such as Laser Induced Breakdown Spectroscopy (LIBS) systems, electrical tomography sensors, induced polarisation techniques and multispectral imaging. The demonstration will also include the use of the full-scale RM1 robotic prototype, which has been transported from Finland and assembled at Mežica mines.

The main institutions involved in the campaign are the Geological Survey of Slovenia (responsible for event organisation), Tampere University (demonstration of the RM1 robot), TalTech University (RM1 control and tactile sensing development), the Royal Belgian Institute of Natural Sciences (mineralogical and geophysical sensors), KUTEC (slurry management system), Universidad Politécnica de Madrid (robot AI and coordination, project coordination), Montanuniversität Leoben (production tool), RCI (data management), La Palma Research Centre (roadmapping), and the European Federation of Geologists (public relations).

7. Is it planned to extract minerals in Mežica using the ROBOMINERS technology?

For now, no commercial use of the ROBOMINERS technology is foreseen as the development of the mining robot is still at an early stage. In Mežica, only very small amount of minerals will be extracted to test the robot's sensing capabilities and to validate the progress in the technology development.

8. How does the ROBOMINERS technology impact the environment?

The ROBOMINERS technology has the potential to revolutionise current mining practices while reducing the environmental impact:

- Smaller galleries would reduce the production of mining waste,
- Mining could be conducted at greater depths, having minimal impact on surface, groundwater resources and biodiversity,
- Mining would be made deep underground, having minimal effects on ecosystems.

9. How can I learn more about the results of the trials in Mežica?

Information about the outcomes of the field trials will be shared through the ROBOMINERS communication channels (see below).

10. Do you plan any further trials to test the technology?

The funding period for the project is ending on 30 November 2023.

11. How can I find out more about ROBOMINERS?

For all further information about the ROBOMINERS project, we invite you to visit the project website at robominers.eu. Links to our different social media channels are provided here below. You may contact us at info@robominers.eu in case you have any specific questions.

Channel	Link
Website	https://robominers.eu/
Twitter	https://twitter.com/robominers?lang=en
Facebook	https://www.facebook.com/Robominers-1907805085986276/
LinkedIn	https://www.linkedin.com/company/robominers/
Instagram	https://www.instagram.com/robominersproject/
YouTube	https://www.youtube.com/channel/UCOIkha5N7wJreTH4SA-57Dw