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Methodology for environmental monitoring of CO₂ geological storage sites from Romania

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Abstract

Romania is committed to decrease CO₂ emissions and to achieve net zero emissions by 2050, as Member of European Union. Recent climate commitments, including the Green Deal and Net-Zero Industry Act, have led to an increase of interest for carbon capture and storage technology at national level. It is expected that the largest industrial CO₂ emitters will make further steps to develop CCS projects, taking into account, apart from the regulatory obligations, the rising price of CO₂ emission certificates. Furthermore, there is the opportunity to finance this type of projects within the Innovation Fund.

From a regulatory perspective, Romania has a legal framework for the safe storage of carbon dioxide, under the supervision of National Agency for Mineral Resources, the competent authority for oil and gas exploitation and CO₂ geological storage. Still, there is still work to be done also in this field and efforts are currently made to harmonize Petroleum Law with CO₂ Storage Law. Besides this regulatory opportunity and challenge in the same time, development of CCS projects needs also additional financial incentives and governmental support.

Taking into account the increased interest for CCS in Romania and considering that an actual CCS project will be soon developed, we have proposed and started a new project financed by the Ministry of Research, Innovation and Digitalization, "Development of an Environmental Monitoring Methodology for Potential CO₂ Storage Sites in Romania" (PN 23300404). Through this project we aim to support future storage operators by developing an environmental monitoring methodology for onshore storage sites that will be tested and validated, in the absence of an actual CCS project, on natural analogues for storage of CO₂ (natural CO₂ fields) and analogues for CO₂ leakage (sites with natural CO₂ emissions).

The preliminary environmental monitoring methodology, already formulated in the first year of the project, has low implementation costs and it is based on a combination of monitoring methods, part of them being mature methods in the field of CO₂ monitoring such as the geochemical methods and near-surface seismic, and methods that still need some validation in this field, like GPR and resistivity methods. For each of these methods we have made preliminary implementation procedures, aimed to obtain maximum results for leakage detection in the near surface. These procedures will be implemented and tested comparatively on the selected natural fields, one CO₂ field and one field with natural CO₂ emissions.

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Together with the formulation of the preliminary monitoring methodology and of specific implementation procedures of the included monitoring methods, we have already started the process of selecting the best candidates for test sites. The selection process was started with two field campaigns in spring and autumn 2023 aiming at localizing and verifying the local situation of the sites, including access to the sites, level of CO₂ emissions, existence of local operators, potential for further investigation and possible support from local authorities. From the collected data, both literature and field data, the best candidates are currently Bodoc (mineral water exploitation) and Lazaresti (natural CO₂ emissions due to post-volcanic activity).

Further activities of the project include the final selection of the test sites, building the geological and geophysical models and testing of the developed monitoring methodology. Depending on the testing results, the methodology will be adjusted in order to maximize leakage detection. The results of the project will be gathered in a best practice guide for environmental monitoring of CO₂ geological storage sites in Romania to be used by the competent authorities in the field and by future storage operators.

Keywords: CO₂ storage, monitoring, natural analogues
