

PostMinQuake: Potential Learnings of induced seismicity during post-mining in European coal regions for the German oil and gas industry

M. Paloma Primo Doncel, Peter Goerke-Mallet, Stefan Möllerherm and Tobias Rudolph – Geomonitoring im Alt- und Nachbergbau
Technische Hochschule Georg Agricola, Forschungszentrum Nachbergbau Herner Str. 45, 44787 Bochum, paloma.primo@thga.de

1. Introduction

To match the European Union's goals of decarbonisation, underground hard coal mining is decreasing steadily, leading to its closure. In Germany, the Ruhr Basin's hard coal mining history started in the 14th century and finally ceased in 2018, also in Ibbenbüren in the North-West of Germany (Figure 1).

When closing an underground coalmine, the mine water raises by stopping mine water pumping, which can lead to micro seismic events due to the final change of the geomechanical stress-regime underground. The subsurface processes result in buoyancy that provokes a heave in the former deposit and in the overlying strata.

The monitoring of induced micro seismicity in mining operations is important, as can be seen in acceptance of the "Bürgerinfo Seismisches Messsystem" of the German oil- and gas producers.

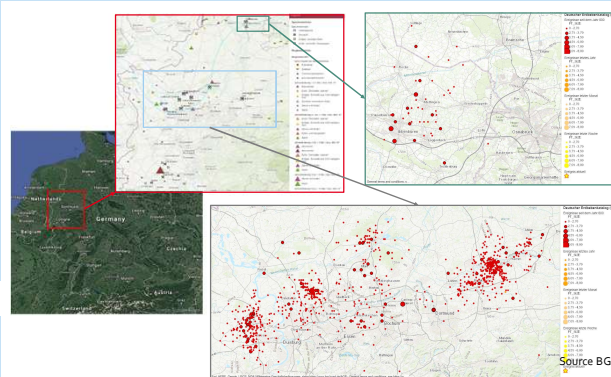


Figure 1. Seismic events since year 800 in Ibbenbüren (above) and Ruhr Area (below)

2. About PostMinQuake

The task of this European research project (PostMinQuake) is to identify mechanisms, relevant parameters and dependencies causing post-mining seismicity for several European coal regions.

The objective is to create a guideline, which will serve as reference in other areas to prevent and manage post mining seismicity. The other consortium partners (GFZ, BRGM, INERIS, CMI, SUT, SRK, IGN, Green Gas, DIAMO) will collect and analyse information from the coal basins Gardanne (France) and Upper Silesia (Czech Republic and Poland) (Figure 2).

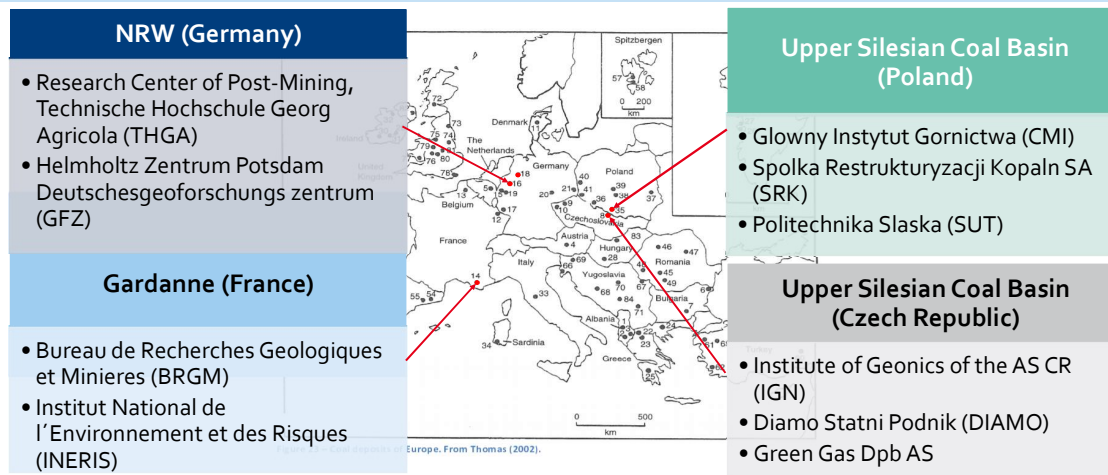


Figure 2. Partners and coal basins in the PostMinQuake Project

3. Methodology

In order to detect the processes that cause micro-seismicity, we are gathering the following information from the basins:

Historical Mining Context

- To identify similar practices in other coal areas

Geological Subsurface Information

- Hydrogeological situation (e.g. water level, pumping rate)
- Geomechanical regime

Mining Methods

- Timeline
- Seismic events
- Monitoring protocols during mining operation

Post-Mining Situation and Seismicity

- Regulatory framework for the closure of the mine
- Type of hazards monitored during closure (e.g. seismicity, subsidence)
- Management protocols of rising water level
- Monitoring network

The gathered information of the various European coal regions will be homogenised and analysed to identify common points and similar approaches to develop a synthesis of good practices and compulsory and desired improvements, as well as an ArcGIS post-mining seismicity map.

4. Objectives

This data will be the basis for developing tools for post-mining seismicity diagnosis and risk management:

Diagnosis

- Methodology for collection and analysis
- Reference database
- Website of European post-mining areas
- Mechanisms of seismic events

Management

- Ground Motion Prediction Equation
- Risk and vulnerability assessment and recommendations
- Mitigation guidelines

5. Summary

The final guideline could help the mining industry and decision-making bodies to manage the risks of post-mining micro seismicity, also of interest in old petroleum reservoirs when used to storage H₂.