

MONITORING AND ANALYSIS OF GROUND MOVEMENTS IN THE BABINA POST-MINING AREA

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The risk of secondary ground movements in post-mining areas persists even for decades after mining has ceased, necessitating continuous monitoring. Combined effects of open-cast and underground mining present an additional challenge for detection, monitoring and predictive modelling of ground movements in post-mining areas. The study presented focuses on assessing continuous ground movements in a post-mining area of the Babina lignite mine situated in the glaciotectonic zone of the Muskau Arch on the border of Germany and Poland.

With this aim six measurement campaigns were conducted between September 2020 and September 2024 with the initial measurement acting as a reference point for subsequent measurements. The measurements are based on a levelling network comprising 99 controlled points, stabilised in concrete columns, referenced to four points of the national levelling network located beyond the post-mining area. In addition, five detailed grids of controlled points were set-up and measured in known locations of sinkhole risk. Altogether, the monitoring network consists of 39 levelling lines with a total length of 36 km. The ground movements recorded range from -5.58 mm to +4.97 mm.

To study the ground movements between the first and the last measurement campaign three interpolation methods were tested (Inverse Distance Weighted, Radial Basis Function, and Ordinary Kriging). In the result ground movement maps were developed based on heights recorded at controlled locations. The data were subsequently used to develop ground movement maps of difference and to identify areas where ground movements reach significant values. The results were compared with the known extent of former mining activity.

The findings demonstrate that both uplift and subsidence processes occur in different parts of the study area. The causes of these ground movements, which may be related to former mining activity, as well as seasonal changes including climate changes (e.g. precipitation) are currently the subject of detailed analysis.

The study confirms the occurrence of the ground movements in post-mining area, which can persist even 5 decades after cessation of mining. This underscores the necessity for further monitoring and investigation. Whether these movements can be attributed to changes in groundwater and precipitation.

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