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LANDFORM CHANGES IN POST-MINING AREA, MUSKAU ARCH GEOPARK (POLAND) - A HISTORICAL GIS APPROACH

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Mining operations often cause extensive changes to the original landscape and result in post-mining redevelopment of the affected area. These changes, depending on the type and intensity of mining, may include: land depressions due to subsidence, large-scale excavations, development of waste dumps/heaps, anthropogenic lakes, and changes in land cover.

This study quantitatively assesses the landscape change as a result of long-term, combined, underground and open-pit mining of shallow lignite deposits in the glaciotectonic structure of the Muskau Arch on the border of Poland and Germany.

For this purpose, a geo-database of mining-related feature classes was developed in a geographic information system (GIS) based on a series of archival topographic maps, photographs, mining plans and data representative of present-day land cover and digital elevation models (DEMs). Altogether, historical data including five different time steps between 1903 and 1972 were used to relate the data to the present day. Spatial processing techniques were used to reconstruct the original, transitional and current landscapes. To quantify the transformed area, compare the original and current landscapes, and statistically describe the anthropogenic features, spatial techniques including differential DEM and overlay analysis were employed. The findings of the study were presented in the form of five thematic maps, as well as graphs and tables.

As a result, the spatio-temporal evolution of underground and open-pit mining related landscape change was examined using the historical GIS (HGIS) approach. The methodology can be applied to other post-mining sites worldwide where archival documentation exists.