

Mining induced relief changes in the Rhenish lignite area between 1893 and 2015

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The computation of historic digital elevation models is one valuable tool to compare the natural topography with anthropogenic induced relief forms and changes due to mining activities. It accounts for a better understanding of humans as geomorphological agents in the Anthropocene and human made landscapes. The Rhenish lignite area is an extraordinary example of large-scale landscape changes and relief modification due to open-pit mining, but also an area with excellent historic topographic maps for the reconstruction of the former relief. A historic DEM is computed after the digitizing of contour lines from the first quantitative topographic mapping of the Preußische Neuaufnahme in 1893. The combination with a recent DEM from 2015 (Geobasis NRW) allows the detection and quantification of relief changes caused by the mining. Two examples are given: First, relief changes in the course of open-pit's and reclamation processes in the already completed area of the southern and central Ville horst are presented. Here, nowadays relief differences to the pre-mining relief ranges between – 80 to + 80m and various new positive and negative landforms. The spatial differences and distribution of total relief changes are lead back to the geological structure of the Ville and the technological development from small scale surface mining in the south without any larger dump sites, to large scale deep mines in the central and northern part. The second example detects the surface subsidence caused by groundwater lowering in the surrounding of the current large open-pit of Hambach. Here, ground level changes between 1893 and 2015 are up to 6 m. The relief changes comprise the critical zone as interface of all Earth spheres and can further be integrated into the study of (artificial) soils, ecology, (ground-)water and additional parameter of the pre- and post-mining landscape of the Rhenish lignite area.

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