# Re-evaluation of the mineral resource potential of the German Ore Mountains (Erzgebirge) using artificial neural networks

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Saxony possesses a unique, but only limited used treasure: detailed regional geological, geochemical and geophysical data covering the former mining area of the Ore Mountains in Germany. This "old" data and the empirical knowledge accumulated over centuries (Hösel et al., 1995) were the basis for a complete new approach to data integration and re-evaluation of the mineral resource potential of the Erzgebirge executed in the last years.

In the first project phase, the different data sets were reviewed and newly processed in order to use them later on for the to-be-executed predictive mapping task. The following base data, provided by the Saxon State Authority for Environment, Agriculture and Geology, were used: 1) stream sediment sampling point data with chemical analysis for As, Ba, W, Mo, Co, Cr, Sn, Cu, Li, Mn, Ni, Pb, Ti, Be, B and Zn; 2) point data from the airborne measurements for magnetics (delta T), gammaspectrometry (Th, K, U), and terrestric gravimetry (Bouguer anomaly); 3) isobaths of granite hanging wall (Tischendorf, et al., 1965); 4) detailed geological map sheets at scale 1:50,000 (Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie, 2010).

In the second step, this data served as input data for setting up different model scenarios. For predictive mapping, artificial neural networks (ANN) were applied. The core component of the used ANN-technology is the advangeo® Prediction Software, which has been developed in the frame of a research project that was partly funded by the BMWi (Federal Ministry for Economy and Technology). Training of the ANN was done by using locations of known mineral occurrences and deposits. After training, the "knowledge" of the ANN was applied to the whole Erzgebirge area.

As result, prediction maps for different commodities (Sn, W, Mo) and different genetic types (skarn, greisen) have been compiled. By this, a significant contribution to the re-evaluation of the local mineral resources of Germany has been done. For instance, Sn-skarns have been predicted in the areas of Oelsnitz in the Vogtland and near Bernsbach in the Western Erzgebirge. Other prospective areas have been identified between Ehrenfriedersdorf and Flöha and south of Freiberg.

With the expected medium-term availability of new and/ or more detailed data, further improvement and refinement of the validity of the method can be expected in the future, too, especially for exploration targeting in individual mining districts as well as in 3D-space.

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