



## **Soil physical properties: Key factors for successful reclamation of disturbed landscapes**

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The practice of open cast mining, e.g. for lignite, results in major landscape disturbances and especially affects soils because relocation and subsequent mixing of naturally developed soil horizons leads to areas with extremely altered soil properties compared to the undisturbed conditions.

Various reclamation measures are applied to recover the reconstructed landscape for different land use options. Major parts of the post mining landscapes are used for agriculture, agroforestry or silviculture, the remaining voids of the coal mines fill successively with groundwater after mine closure and are or will be used mainly for touristic and leisure purposes. Small proportions of the post mining areas are left for natural succession, or habitats for endangered flora and fauna are initiated.

In reclamation research, many studies have focused on soil chemical and biological constraints of post mining substrates and investigated factors such as unsuitable pH, in many cases very low pH, (poor) nutrient contents and (poor) biological activity.

But the initial and developing soil physical parameters and functions are also key factors for the success of reclamation practices. The soil water and gas balance influence strongly the suitability of a site for the intended future land use. The mechanical stability of the soil determines the rigidity of the pore system against deforming forces and thereby the persistence of soil functions, such as water and air permeability over time. The amendment of unfavourable (initial) soil physical properties is in most cases more complex and time-consuming than e.g. optimization of pH or fertilization with nutrients. Moreover, regarding the suitability of a site e.g. as a habitat for plants or microorganisms, poor physical pre-conditions can turn substrates with perfect nutrient contents and composition and pH into infertile locations of very low productivity.

We show results of an on-going field study where the effects of different agricultural reclamation measures on initial soil physical properties and their development are investigated. Site reconstruction creates the preconditions for the soil physical development, which depends on the subsequent soil disturbance, e.g. due to tillage and on the vegetation/crop rotation. We recommend that the process of site reconstruction should be accomplished with highest possible accuracy and pre-caution. Suitable vegetation, e.g. deep and intense rooting crops should be established and the mechanically unstable sites should be protected from heavy loads and intensive soil tillage operations to facilitate the development of soil structure in the course of reclamation.