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Mapping and management of acid sulfate soils in Lower Saxony, Germany

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In Lower Saxony, Germany, close to the North Sea, there are about 300.000 ha with high percentages of potential and actual acid sulfate soils (ASS). ASS have formed here within the past 10,000 years under waterlogged conditions. These deposits comprise various types of soils and sediments as well as fen peats influenced by sea/brackish water with sulfide-sulfur contents up to several weight percent.
For construction purposes, vast amounts of these materials have to be excavated and relocated. Due to sulfide oxidation upon exposure to atmospheric oxygen, they have the potential to cause significant environmental and economic impacts. The most important are loss of agricultural productivity, contamination of soils and groundwater (acidity, sulfate and e.g. heavy metals), corrosion of concrete and steel.
For any activities causing disturbance or relocation of ASS materials and/or lowering of the water table, stepwise guidelines were developed in order to minimize negative impacts. Two risk maps, for 0 to 2 m depth and for a depth below 2 m, depict the first step. These online maps are based on several soil and geological maps (1:5,000 to 1:50,000). They show three risk categories (red, yellow, green) which imply risk-related sampling intensities and a varying extent of required laboratory analyses. It is recommended to use these maps already in primary regional planning, e.g. electrical power lines, roads etc., within the relevant areas. The second step is the sampling and analysis within the area of concern as well as an assessment of the expected surplus masses. The last guideline step is to set up a management plan on how to handle the masses on the site during excavations (scheduling, maybe stockpiling) and how to deal with surplus masses.
Since adequate waste disposal sites are scarce, there was a need for a new, non-hazardous way to relocate ASS materials. Special fields, on which similar soil materials were washed via pipeline dredging during street constructions about 40 years ago, served as a prototype for the new so-called ‘semi-terrestrial relocation’ sites. Relocating the material includes choosing and preparing the receiving site. The site should be located in a comparable geological setting with a persistently high groundwater table. After disposal plus liming, the quick recovery of a high water table is mandatory so that oxidation is restricted to the surface layer of the relocation.