

RESEARCH PROJECT APPLICATION

Title of the project: Environmental risk assessment related to potential soil acidification in the Polish coastal zone based on predictive maps

Scientific description of the project

1. Introduction:

Acid sulfate (AS) soils generally contain considerable amount of metal sulfide minerals, predominantly pyrite (FeS_2). These soils do not pose any danger unless they are exposed to oxidizing conditions where sulfuric acid is produced and contributes to the release of toxic quantities of such elements like Al, Cd, Co, Cr, Mn, Ni and Pb. These potentially toxic elements can be excessively concentrated in waters, plants, animals and humans. The Baltic Sea is still widely recognized as one of the most polluted seas in the world. As revealed by numerous studies from Sweden and Finland, AS soils can also be a source of heavy metals. Unfortunately, there is no data on this topic from the southern Baltic region.

2. The main goals of the project:

This project aims to enhance our understanding about the environmental hazards associated with coastal AS soils in Poland, to mitigate the contamination and take proper management strategies as well as development of an original environmental study model for AS soils in Poland.

3. Methodology:

Two coastal areas in the reverse delta of the Świna River and Puck Bay (50 km² each) will be selected in Poland. The first stage of this project is the generation of predictive maps of AS soil distribution using modelling techniques (e.g. artificial neural networks, random forest etc.) together with available spatial environmental and soil data, and their validation by field sampling and laboratory analysis. The second stage is to select some AS soils and Non AS soils areas for comparative environmental analysis to monitor the metal concentration change and the final stage is to generate an environmental assessment model to predict the pollution distribution, extend, intensity and also associated effects on environmental elements at risk including water, soil and living organisms. Finally, the results will be compared to results obtained from selected coastal areas in Finland, where overview mapping of AS soils was finished during 2020.

4. Expected results:

The results of this study will answer the question if the AS soils in Poland can be a potential source of heavy metal contamination affecting the Baltic coastal environment? The development of an approach of predictive map generation based on available geo-spatial data will allow to take soil samples only in precisely indicated sites and limits it only to the validation of maps. It will minimize the invasiveness of study procedures in the ecologically valuable and protected coastal areas in Poland.