The Tatra Mts. are a unique and valuable alpine ecosystem. At present it is a protected area, however, in the past it was an area of intensive mining and metallurgical processing of metals. Mining exploitation and metallurgical activity of Mn, Ag, Cu and Fe ores lasted from the 15th till the end of the 19th century. This activity led to the creation of solid wastes, which were deposited on land surface as heaps. Mining wastes consisted of rocks extracted from deposits, which were not used for further processing, while metallurgical wastes are represented mainly by slag produced as a result of smelting. Natural plant succession on the heaps initiated soil-forming processes, which resulted in creation of technogenic soils (Technosols). Technosols are soils developed from various post-industrial wastes. These soils contain a significant contribution of artefacts i.e. materials made or strongly altered by man or extracted from greater depths. Technosols in the Tatra Mts. have not yet been the subject of thorough research.

The goal of this project is to study the mineralogical, micromorphological and geochemical indicators of genesis and pollution degree of technogenic soils (Technosols) developed on historical mining and metallurgical sites in the Tatra Mountains. The project will be an attempt to answer the following research questions:

1. what is the degree of advancement of soil-forming processes and what are directions of these processes in Technosols developed from mining and metallurgical wastes generated by historical mining and metal ore metallurgy in the Tatra Mts?
2. what mineral transformations take place in the studied technogenic soils and what are the directions of these transformations?
3. what is the chemical composition, total concentrations of trace elements and degree of contamination of Technosols in the Tatra National Park area?

Within the framework of the study, eight research areas were selected (i.e. mining and metallurgical dumps) in the Tatra National Park in the area of Kościeliska Valley, Pyszniańska Valley, Starobociańska Valley, Chochołowska Valley and Kuźnice. The object of the research were soil samples taken from the soil horizons of thirteen profiles. The project will require: (1) analysis of soil mineral composition (total samples) by X-ray diffraction (XRD), (2) analysis of clay fraction from soils by XRD and infrared absorption spectroscopy (FTIR), (3) analysis of loose fine earth and thin sections from soils by optical microscopy, scanning electron microscopy (SEM-EDS) and electron microprobe analysis (EMPA), (4) extraction of pedogenic forms of Fe, Al, Si, as well as (5) study of total concentrations of trace elements and their forms by sequential extraction.

Technogenic soils on the areas of former mining and metallurgy in the Tatra Mountains are very poorly known. The research planned within the framework of this project will be one of the first attempts to recognize the mineralogy, micromorphology and geochemistry of these soils. Studies on mineralogical and micromorphological aspects of Technosol genesis as well as the scenarios of evolution of technogenic soils (Technosols) developed on historical mining and metallurgical sites especially in the high mountains are still rare. The results will also shed a new light on the degree of soil contamination in areas of former mining and smelting. The research will contribute to the development of knowledge on the functioning of technogenic soil formations in high mountain conditions.