

## **Geomorphic, sedimentological and palaeobotanical record of environmental changes, as a source of data for the historical reconstruction of the scarcely recognized metallurgical activity (in the southern and central Poland)**

### **Description for the general public**

According to historical sources, the water-powered metallurgy started in Poland in the 14th century. Ironworks were located in river valleys because of access to river water and the presence of forests. Water was used to drive water wheels which powered smelting machines and for the preparation of metal ore. Forests were the source of wood for charcoal burning, which was the fuel used in the metallurgical processes. Charcoal was produced through burning wood in piles called charcoal kilns. The production of charcoal and the exploitation of ore took place close to ironworks and caused an intensive exploitation of forests. In order to use water as a source of energy, it was necessary to build a dam which accumulated water, forming a smelter pond upstream of the dam. There were also channels for supplying water to the wheels and metallurgical machines.

Various types of metallurgical objects have changed the landscape significantly over the centuries. Weirs, canals, smelter ponds or charcoal kilns have led to the appearance of characteristic landforms and sequences of deposits. The aim of the project is a historical reconstruction of a scarcely recognized metallurgical activity, based on geomorphological, sedimentological and palaeobotanical changes in environment. The research will cover fragments of the Mała Panew river (southern Poland) and Czarna river basins (central Poland) and the adjacent areas connected with historical metallurgical activity. The project has two components complementary to each other, desk-based research and field research. During desk-based research, historical sources containing information on the former metallurgy will be analysed, as well as digital images showing a shaded model of the terrain sculpture, based on air laser scanning. This will allow to precisely locate the metallurgical centers and to recognise the landforms related to human activity. During field studies, landform analysis will be carried out, and pits and deposit excavations will be made to find sedimentological evidence for the metallurgy industry. The collected samples (charcoals from sediment) will be sent for anthracological analysis and radiocarbon dating to determine their age. The analysis of charcoals allows to reconstruct the forest communities existing during charcoal burning. The results obtained during a preliminary study (radioisotopic dating of charcoals: 1160-1277 AD) indicates that the objects associated with burning charcoal for the iron production and processing existed in one of the selected areas earlier than historical sources indicate. LiDAR data analysis shows a wide range of transformation occurrences in the valley relief as a result of metallurgical activity.

The historical metallurgy in Poland is a poorly researched area from the point of view of natural sciences. Also, the unexpected results of the first radioisotopic charcoal dating from the kilns, with results at the turn of the twelfth and thirteenth centuries, give a particularly strong motivation to examine more forms and find equally spectacular results, and finally to confirm a new perspective on the beginning of water-powered metallurgy in Poland. It seems that the implementation of the project will contribute to the broadening of the knowledge of the historical metallurgical activity from the point of view of natural sciences and the general knowledge. This research will also help to verify or supplement the historical sources. The indirect effect of the project will be to increase public awareness of the cultural heritage remaining after the historical metallurgy.