Modern technologies, including those related to renewable energy production, are leading to an ever-increasing demand for rare earth elements, characterized by significant difficulties in extraction. A promising technique is phytomining, allowing this process to be carried out using plants. The bearded birch (*Betula pendula* Roth) is commonly used in the reclamation of degraded areas, including post-industrial waste heaps such as phosphogypsum dumps, being an important source of rare earth elements. Therefore, this species shows potential for its use in the extraction and recovery of these elements.

The aim of the project is to evaluate the bioaccumulation of rare earth elements in the biomass of the birch growing on technogenic soils formed on phosphogypsum waste heaps. The content of lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), samarium (Sm) europium (Eu), gadolinium (Gd), dysprosium (Dy), yttrium (Y), terbium (Tb), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb) lutetium (Lu), scandium (Sc), and promethium (Pm) will be analyzed in the roots of birch trees and their leaves, as well as in soils. The study will cover 4 heaps formed as a result of phosphogypsum waste deposition located in: Łąka, Silesian Province, Poland; 2) Police, West Pomeranian Province, Poland; 3) Wiślinka, Pomeranian Province, Poland; 4) Łowicz, Łódź Province, Poland. Ten medium-sized birch trees will be selected from each stand, from which roots (<5⌀) and leaves will be taken. In addition, soil samples will be taken from 0-10 cm, 10-20 cm, 20-40 cm and 40-80 cm depths. Basic soil properties and characteristics of the soil microbiome will be determined. Above that, BCR fractionation of rare earth elements will be carried out in soil samples, and the total content of rare earth elements will be determined in biomass samples using an ICP-AES spectrometer after mineralization in 65% HNO_3.

The proposed project will provide new interdisciplinary knowledge in soil science, landscape biogeochemistry, ecology, and environmental protection. The obtained results will contribute to a better understanding of the mechanisms of bioaccumulation of rare earth elements in birch organs and the possibility of their recovery from plant biomass. In addition, the results of the study will allow to assess the potential of the birch tree as a hyperaccumulator of these elements.