

ADRIANA – Remote sensing detection of industrial recyclables in mine tailings

Client II – International partnerships for sustainable innovations

Global demand for raw materials is increasing steadily, which is why the topics of recycling and the efficient use of valuable residual material streams are becoming increasingly important. In the German-Mongolian research project “ADRIANA”, innovative remote sensing technology is being used in conjunction with the possibilities of 3D deposit modelling in order to harness the valuable potential of recyclable materials in an industrial settling basin. The project focusses on a settling basin in Erdenet, Mongolia where residues from copper ore processing are deposited.

Ore processing from scrap materials

Ore processing produces residues which are usually deposited in the form of sludge ponds or mine dumps. These deposits sometimes contain a considerable amount of residual recyclable materials. It is considered possible to economically use these deposits to recover valuable materials, but this is currently only established in a few exceptional cases. To do this, it is necessary to know as much as possible about the recyclable content of the deposits in order to accurately evaluate economic feasibility.



Erdenet settling basin with its typical fine sandy tailings.

The central component of the “ADRIANA” project is the airborne remote sensing of a tailing settling basin (residues) from copper ore processing. The project aims to investigate how innovative methods of remote sensing can contribute to the investigation of the recycling potential of settling basins and comparable anthropogenic deposits, and to what extent these methods can complement conventional exploration and reservoir modelling methods. In order to determine the usable value potential of tailings deposits using the example of the tailings plant in Erdenet, “ADRIANA” will apply innovative airborne remote sensing methods and incorporate the results into 3D resource modelling in combination with existing data and conventional exploration results. In addition to this, treatment technology for

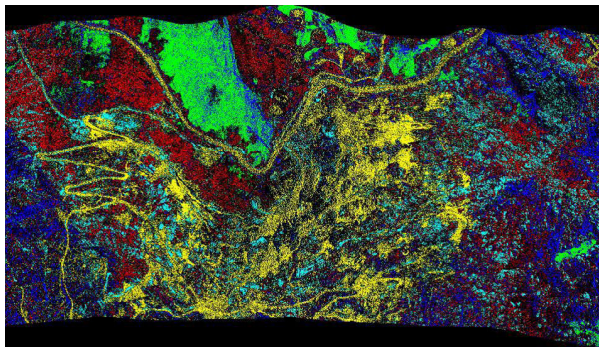
deposited tailings will also be developed and tested. Overall, exploration will be made more effective and economic assessments will become faster and more effective.

Innovative approaches

An important project objective is the testing of modern remote sensing technologies. The technique to be tested involves both the latest hyperspectral and hyperthermal sensors as well as newly developed polarimetric hyperspectral sensors. The selection of sensors should be optimized to allow comparisons with other tests. Furthermore, an optimized workflow for the processing and evaluation of the collected data will be developed within the scope of the project.

The remote sensing results are to be combined with those of conventional exploration. For this purpose, additional holes will be drilled in the tailings body and sampled for the chemical and mineralogical analysis of the tailings. The conventional research programme will also be optimized according to the characteristics of an anthropogenic tailing deposit. 3D resource modelling will be used to combine the results of remote sensing and conventional exploration. This procedure will be developed within the scope of the project.

The processing of the deposited tailings will be re-tested parallel to the exploratory methodology. It will be investigated at laboratory scale to see whether it is technically possible to recover copper by means of reprocessing with optimized procedures. The deposit model that is developed from this will be used to determine the quantity and quality of suitable tailing varieties. This will also make it possible to make claims regarding the economic viability of the process.



Beispiel einer Karte der Oberflächenmineralisation als Ergebnis der Erkundung mit Hyperspektralsensoren.

International partners

The project is coordinated by G.E.O.S. Ingenieurgesellschaft. Martin Luther University, a German university, the German-Mongolian Institute for Resources and Technology (GMIT), a Mongolian university, Erdenet Mining Company (EMC), a Mongolian mining operation, and EiT Institute of Technology (named after Sh.Otgonbileg), a Mongolian education and research institute, are all involved in the project along with two additional medium-sized German engineering companies CBM Gesellschaft for Consulting, Business and Management mbH and Dimap Spectral GmbH.

The project is divided into work packages, each headed by a project partner. The main responsibilities are distributed as follows:

- G.E.O.S. Ingenieurgesellschaft mbH: Project coordination, data research, resource modelling
- Martin Luther University Halle-Wittenberg: Optimization of remote sensing, data processing and evaluation
- Dimap Spectral GmbH: Preparation and execution of aerial surveys, data processing
- GMIT: Processing technology
- EMC Erdenet Mining Company: Provision of data, drilling, processing technology
- EiT: Data provision, processing technology
- CBM: Economic, environmental and safety studies

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Project partner

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