

DUB-GEM – Aerial mapping – radioactive contamination in Central Asia

Client II – International partnerships for sustainable innovations

At former uranium mining sites in Kyrgyzstan, Tajikistan, Uzbekistan and Kazakhstan, natural hazards such as flooding or landslides mean that uncontrolled radioactive contamination is entering transboundary rivers and threatening the entire region. In the “DUB-GEM” project, an association of German and Central Asian partners, an exploration technique installed on a drone is being developed in order to rapidly record levels of radioactive pollution in the vicinity of these locations.

Exploration of uranium mining legacies

Areas surrounding radioactively contaminated locations at former uranium mining sites in Central Asia are currently threatened by the uncontrolled entry of radioactive contaminants into the region’s transboundary rivers, caused by geohazards such as landslides or earthquakes. The spatial exploration of former uranium mining sites to measure contamination is carried out with the aid of so-called gamma spectrometers. Up to now, this usually took place on the ground e. g. on foot. However, exploration is often tedious and strenuous for the surveyor, especially in difficult, mountainous terrain. One alternative is helicopter-supported systems. These are efficient and can typically be done over any terrain, but they are very expensive and logistically complex. They are therefore only used in exceptional cases. The “DUB-GEM” project aims to develop a drone-based exploration method that offers the benefits of airborne systems with significantly reduced operational costs.

The development work in “DUB-GEM” will lay the foundations for future commercial use of an efficient exploration method as part of the planned rehabilitation of radioactively contaminated sites in Central Asia. Funded by the European Bank for Reconstruction and Development (EBRD), the Environmental Remediation Account for Central Asia (ERA) provides the financial basis for this rehabilitation project. Extensive studies have yet to be carried out on the use of relatively small gamma spectrometers on drones to investigate contamination with low-level radioactive material. The “DUB-GEM” project plans to develop two competing exploration methods, as the expected measurement distance between the surface of the survey site and the drone lies exactly in the transition range of the respective measurement distances of the previously used ground and air-based exploration methods.



An erosion channel on a uranium mining dump in southern Kazakhstan.

Use of drones

The results of the development work should provide information on which of the potential exploration methods – near the ground or at high altitudes – should be favoured in the future or whether both methods may be used in a complementary manner. The project is also expected to produce findings on efficiency gains in exploration and data quality compared to established methods. Specifically, the project investigates the selection of suitable gamma spectrometers as well as the selection, specification and construction of the drone. In addition, key flight parameters, optimized flight routes and operating parameters for drone deployment will be determined and detector-specific evaluation routines developed.

In the first stage, aerial surveys will be carried out in Germany to calibrate the two exploration methods and flight strategies will then be defined. Following this, selected areas will be flown in the partner countries and the two methods will be compared in terms of their overall performance in the field.



Third Element Aviation drone.

Decontamination support

The exploration method that will be developed within the scope of the project will allow for the demarcation and quantitative characterization of risk areas for radioactive contamination. At the end of the project, the collected data will be integrated into the environmental information system that is to be developed in the CLIENT II project “TRANSPOND”.

The Federal Institute for Geosciences and Natural Resources (BGR) is responsible for coordinating the project on the German side. The company Third Element Aviation from Bielefeld, Germany, will provide the required drone for carrying the gamma spectrometers, thereby expanding their product portfolio to include drones with a carrying capacity of up to 25 kilograms. The company IAF Radioökologie GmbH from Radeberg, Germany, is responsible for one of the two planned parallel development lines for drone-based gamma spectrometry. BGR is responsible for the second planned development line.

Their involvement in this project will secure these companies medium and long-term market opportunities in the partner countries as well as opportunities to further expand their presence in Central Asia. In return, the Central Asian partners will benefit from German expertise and will be in a better position to meet their obligations to decontaminate and monitor rehabilitated sites, for instance, after extreme events. Overall, the knowledge gained as part of the joint project can also be used in other regions to tackle similar problems or other fields of application. It will therefore contribute to further advancing the decontamination of radioactively contaminated sites in Central Asia.

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