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Supporting reduction of risks of tailings dams using earth observation data

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Tailings dams are earth embankments used to store toxic mine waste and effluent. Their failure, as already seen in January 2019 with the fatal failure of Brumadinho dam in Brazil, can cause loss of life, irreversible damage to ecosystems and large economic damages. In countries with limited resources, it is challenging for the authorities to be able to assess the risk and effectively monitor this type of infrastructure, especially when located in remote areas.

We are developing DAMSAT (Dam Monitoring from SATellites), a web-based system for a sustainable and cost effective way of remotely monitor tailings and water retention dams to support early decision making and reduce the social, economic and environmental impacts downstream of potential failures.

DAMSAT monitors the displacement of the structures using earth observation technologies such as Interferometric Synthetic Aperture Radar (InSAR) and Global Navigation Satellite System (GNSS) technologies, combined with real-time in-situ devices. These observations combined with weather forecasting tools allow the issue of alerts for unusual behaviour or weather conditions that could lead to dam failure. These alerts are part of the Disaster Risk Management cycle to trigger the implementation of mitigation measures to reduce the likelihood of failure of the dam or the potential consequences downstream.

In order to have a better understanding of these potential consequences and provide all the information necessary for asset managers to take decisions, DAMSAT also assesses the hazard component of disaster risk due to dam failure using a set of modelling tools. A dam breach simulation model (EMBREA) is combined with a mud flow model to spread the flood hazard downstream of the dam if a failure occurs. The consequences of the flood are assessed in terms of loss of life using an evacuation model, the Life Safety Model. Different flood warning scenarios and evacuation strategies are mapped to inform emergency planning.

DAMSAT is currently being piloted in two mining regions in Peru with the involvement of government organisations and other relevant stakeholders.