T5-065

Minimising the risks of tailings dams with remote sensing data

Craig Goff, Olalla Gimeno, Gregor Petkovsek, Marta Roca,
HR Wallingford, Wallingford, UK

What is the challenge?

Tailings dams are used to store toxic mine waste and effluent. Their failure rate is estimated to be more than two orders of magnitude greater than that of conventional water retention dams, causing loss of lives, irreversible damages to ecosystems and large economic damages.

There is a need for a cost effective service to monitor operational, closed and abandoned tailings dams, especially those in remote locations, to help forecast potentially catastrophic failures.

Our objective

To provide a proof of concept of a more cost effective way of remotely monitoring tailings dams and other tailings deposit areas utilising Earth Observation and Global Navigation Satellite System technologies combined with real-time in-situ devices and associated analysis and forecasting tools.

We aim to:

> support the reduction of the environmental and social impacts of tailings dams failures in Cajamarca, Peru;

> influence the adoption of Earth Observation monitoring tools by engaging with key stakeholders;

> provide key stakeholders with an operational service to identify the probability of failure of tailings dams, the potential pollution incidents and to provide a recommended response.

DAMSAT
(Dam Monitoring from SATellites)

DAMSAT will help reduce the risk of failure of tailings storage facilities and the consequent damage to population and ecosystem services downstream.

Our methodology

Space-data production. We are using Interferometric Synthetic Aperture Radar (InSAR) to monitor surface movement on and around the infrastructure of interest. We are also using optical earth observation (EO) data to monitor indicators of pollutants downstream of tailings dams.

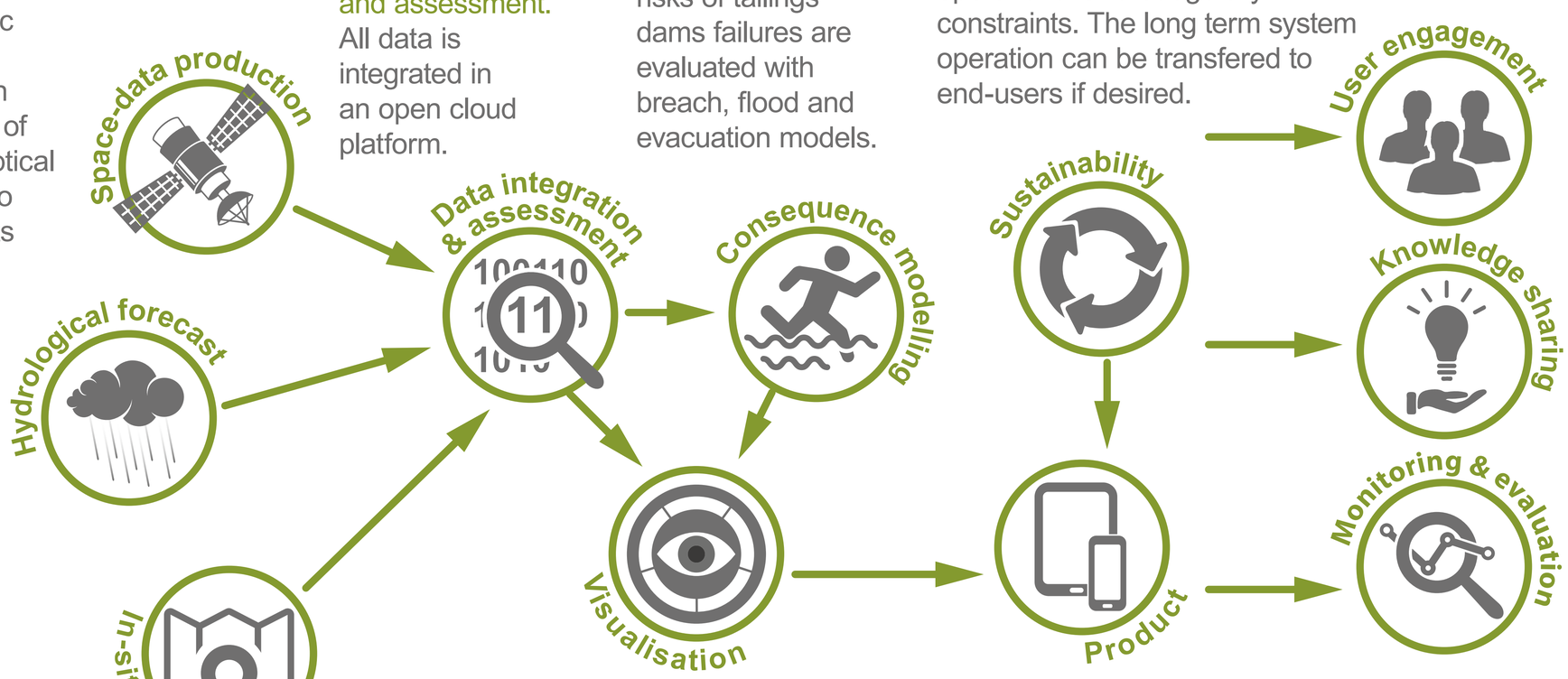
Hydrological forecast. We are coupling short term forecasts to hydrological models.

In-situ monitoring. For the displacement we are using Global Navigation Satellite System (GNSS) technologies combined with real-time in-situ devices.

Data integration and assessment. All data is integrated in an open cloud platform.

Consequence modelling. The risks of tailings dams failures are evaluated with breach, flood and evacuation models.

Sustainability. The system is developed in close collaboration with end-users to suit their operational and budgetary constraints. The long term system operation can be transfered to end-users if desired.



Visualization and product. DAMSAT will generate alerts of possible problems based on data of abnormal movements detected using INSAR or GNSS technologies, possible pollutant events, intense rainfall forecast and overtopping estimations.

DAMSAT is tested on a number of operational, closed and abandoned tailings storage facilities in the mining region of Cajamarca in Peru. It is currently challenging for governments with limited resources to be able to effectively monitor these sites.

Benefits

> Possibility to take early decisions to reduce the risks of failure and possible consequences downstream to communities and ecosystems.

> Better understanding of risks in larger and remote areas, helping to plan and prioritize the use of resources.

> Support coordination of actions between institutions.

> Provide real time information in selected locations.

Project team

From UK:

HR Wallingford leading the project, Telespazio VEGA, Siemens Corporate Technology, Satellite Applications Catapult, Oxford Policy Management, and the Smith School of Enterprise and the Environment at the University of Oxford.

From Peru: Ciemam, the National Foundation for Hydraulic Engineering, and the National University of Cajamarca (School of Hydraulic Engineering and Faculty of Engineering).

The project works with Government Agencies, local stakeholders and mining companies in Peru to test the approach on a number of sites.

The project is funded by the Global Challenges Research Fund under the International Partnership Programme run by the UK Space Agency.

For more information, visit: www.tailingsdams.info