Tailings 2018

5th International Seminar on Tailings Management

Tailings Dams Monitoring using Satellite-enabled Technologies

Maral Bayaraa, Stephen Spittle, Chris Williams, Vladimir Stoijkovic, Quillon Harpham, Darren Lumbroso and Craig Goff
Outline

1  Introduction
2  About Our Project
3  Human Centred Design Approach
4  Our Proposed Solution
SATELLITE APPLICATIONS CATAPULT

Who are we?

An innovation and technology company transforming the way the world uses satellite technology and data.

- WE HELP ORGANISATIONS GROW THEIR BUSINESS
- WE ARE INDEPENDENT
- WE ARE GOVERNMENT BACKED
What we do

Satellite applications to better understand the impact of human activity on the environment and support the UN Sustainable Development Goals.
The ambition of the IPP Peru project is to reduce the risk of tailings dam failures by developing a satellite enabled monitoring platform and an early warning system.
AN IPP PROJECT

The International Partnership Programme (IPP) is a 5 year £152 million Programme run by the UK SPACE Agency.

Funded by BEIS Global Challenges Research Fund

Delivering sustainability, economic and societal benefit from UK Space Sector research and innovation
ABOUT THE PROJECT

- ~200 active mining operations
- Thousands of closed and abandoned mining facilities in Peru, with many of them possessing tailings dams.

- Pilot study: Cu-Au-rich region Cajamarca
- **Ambition** to upscale nationally and internationally
User requirements

A Human Centred Design approach to ensure that our solution design is based on an in depth understanding of our user needs.
REQUIREMENTS GATHERING PROCESS

1. Research, interviews and observations to understand existing processes and challenges

2. Stakeholder analysis, information synthesis to identify opportunities and develop ideas

3. Technical analysis, requirement prioritisation, workflows & wireframes to finalise the concept
OPERATIONAL MINE

- Physical and chemical stability of tailings dams
- Routine environmental monitoring

“So many babies were born in our emergency vehicles! Helping our the community helps build our relationship.”
Mining Company
Our Proposed Solution: PHYSICAL stability

- Integrate satellite-based InSAR and GNSS systems
- InSAR provides a long term **wide-area** coverage
- GNSS system provides a **near-real time** continuous monitoring
Our Proposed Solution: CHEMICAL stability

- Optical satellite technology to detect pollution and leaching
- Spectral analysis
Our Proposed Solution: WEATHER data

- Incorporate large scale *weather forecasting* data
- Integrate with *rainfall-runoff* model to obtain the rate of water inflow into Tailings Storage Facility
Our Proposed Solution: IMPACT modelling

- Inundation extent modelling in case of an incident
- Life safety modelling (human behaviour, escape routes..)
Train a state of the art Machine Learning algorithm to characterise ‘normal’ vs. ‘abnormal’ behaviour.

Early Warning System to detect abnormal behaviour of tailings dam.

Visualise and alert relevant stakeholders.
Thank you!

Any Questions?

Maral Bayaraa
maral.Bayaraa@sa.catapult.org.uk