

## **Project Title: Monitoring of Power Plant Ash Dams using Drone Technology**

Faculty of Engineering + The Built Environment

Centre for Applied Research + Innovation in the Built Environment University of Johannesburg

In Collaboration with

Faculty of Applied Science & Engineering, University of Toronto

A large power generating company in Southern Africa employs coal-fired power generation systems. This process produces large quantities of ash, which is disposed of in ash dumps and dams. The company uses coal of predominantly low grade and therefore produces large quantities of ash during combustion. The disposal of ash has a direct impact on the generation of electricity. If there is nowhere to dispose the ash, electricity generation cannot be done in view of environmental regulations. However, the reliable provision of electricity by the company is critical to the country. Therefore, if the company is to meet its commitment to supply the ever-increasing demand for electricity, the need to manage ash dumps and dams to meet environmental requirements is critical.

Coal ash dams are tailings dams whose primary objective is for the wet ash to remain contained. The environmental risk posed by dams include: uncontrolled release of the tailings and water by failure of the dam embankment; uncontrolled release of pollutants; operational failure and emission of dust. Management of the ash dumps and dams therefore should ensure safe and stable containment of tailings and contaminants; rainfall runoff and seepage.

### **PROBLEM STATEMENT**

Management of ash dams depends considerably on the effectiveness of the monitoring system(s). Presently, the monitoring systems the company uses are not sufficient and new approaches are needed.

### **PROJECT AIM**

The aim of this project would be to devise innovative solutions that can be used to monitor and effectively manage the ash dams with the ultimate goal of ensuring environmental integrity as well as for the company to meet its mandate. This work may involve exploring the potential of new technological approaches, especially the drone technology, to map and monitor the considerably large areas covered by the site.

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We aim to explore the use of drone technology for activities such as:

- • estimating the progress rate of the dams with a higher spatial and temporal resolution
- • calculating the volume of ash that is dumped in the dams
- • monitoring the dam's geometrical configuration and its expansion directions
- • monitoring any steep slopes or tension cracks in the dam that can increase the risk of geotechnical instability, and
- • estimating moisture content of the ash that has been dumped

### **PROJECT TEAM**

The project is anticipated to be a collaborative initiative between a group of engineering students at the University of Toronto (UofT) and counterparts at the University of Johannesburg (UJ) in South Africa. Successful UofT applicants will be joined with postgraduate students based in South Africa and work as a unified team to help address the stated challenge. The teams will collaborate virtually as much as possible. Short-term travel may be required to visit the site in South Africa for data collection and team collaboration.

### **PROJECT ADVISORS**

This project will be jointly supervised by Prof. Kamran Esmaili of the UofT's Department of Civil Engineering and UJ's Prof. Innocent Musonda of the Centre for Applied Research and Innovation in the Built Environment.

### **APPLICATION PROCESS**

Interested students should send their resume/cv along with a cover letter explaining how your expertise and interest relate to the project aims to [matthesa@mie.utoronto.ca](mailto:matthesa@mie.utoronto.ca). Please indicate "Drone Project Application" in the subject line.