

An Indian-Australian research partnership

Project title: To study the effects of mining induced subsidence, changes in deformation of coal and interburden rock strata and water flow

Project number: IMURA0073

Monash University supervisors: Dr Ranjith PG

Monash University contact: Dept of Civil Eng, Monash University,

Email:ranjith.pg@eng.monash.edu.au

IITB supervisors: A/Professor Deepankar Choudhury

IITB contact: A/Professor Deepankar Choudhury, Associate Professor, Department of Civil Engineering; Email: dc@civil.iitb.ac.in, dchoudhury@iitb.ac.in

Research Academy theme/s

List only the research academy theme/s that is relevant to the project

1. Infrastructure engineering
2. Clean coal technology
3. Advanced computational engineering, simulation and manufacture

The research Problem Project Title

Stress-strain characteristics of coal can vary significantly over short distances within a coal seam, due to the presence of features such as bright and dull bands, cleats and fractures at various length scales, and variation in the degree of fracture infill with gouge materials. In addition, mining induced stresses can produce new cracks in the working seam and adjacent and overlying coal seams and rock strata. These cracks may form new flow paths allowing water migration to the other coal seams and rock strata. Furthermore, deformation of the fractured rock may cause significant ground movement at the surface, causing infrastructure damage. Underground longwall mining can also reactivate some major sealing geological structures such as faults. This can cause severe damage existing infrastructures in the area.

Project aims

The main aims of the project

1. To apply a 3-dimensional model to model mining induced deformations in over- and underburden rock strata and associated water flow.
2. To study the effects of mine layout and surface topography on subsidence profiles.
3. To study the effects of mining induced subsidence on groundwater flow in river systems.

Expected outcomes

The expected outcomes and benefits include:-

1. A better understanding on how fractures can be induced in the under- and over-lying rock strata during longwall mining.

2. A better understanding on how mine water from the aquifers can migrate within the working seam and through other rock strata.
3. To be able to better predict the extent of the collapsed zone above the goaf area.
4. To be able to model more accurately the impact of longwall mining on subsidence, change in water flow in river systems, and water flow.
5. To develop a numerical modelling tool which can assist the mining industry to minimize the environmental impact of longwall mining through mine design or other preventive measures.

Which of the above Theme does this project address?

This project will address the main research themes on (1) Infrastructure engineering - the design and model behaviour of underground longwall mining as well as tunnelling projects, (2) Clean Coal technology-reduction of environmental pollution during the coal extraction process, and (3) Advanced computational engineering – through the development of numerical tool to model and analyse the problem.

How will the project address the Goals of the above Themes?

This proposal is directed mainly towards the following categories: Underground and Environmental. It comes under the themes of infrastructure engineering, clean coal technology and advanced computational engineering. The prediction of inflows to an underground cavity under different boundary conditions and understanding the effects of stress field on fluid flow in fractured rock media are of highest importance in underground excavation works including mining, civil and petroleum engineering.