

An Indian-Australian research partnership

Project Title: **CO₂ storage site characterization and development in enhanced coalbed methane recovery**

Project Number **IMURA1157**

Monash Main Supervisor
 (Name, Email Id, Phone) Prof. Ranjith PG
ranjith.pg@monash.edu Full name, Email

Monash Co-supervisor(s)
 (Name, Email Id, Phone)

Monash Head of Dept/Centre (Name,Email) Prof. Ha Bui
ha.bui@monash.edu Full name, email

Monash Department: Civil Engineering

Monash ADGR
 (Name,Email) Prof. Susan McKemmish
Sue.McKemmish@monash.edu Full name, email

IITB Main Supervisor
 (Name, Email Id, Phone) Prof. V. Vishal
v.vishal@iitb.ac.in Full name, Email

IITB Co-supervisor(s)
 (Name, Email Id, Phone) Full name, Email

IITB Head of Dept
 (Name, Email, Phone) Prof. M. Radhakrishna
head.geos@iitb.ac.in Full name, email

IITB Department: Earth Sciences

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? (Please nominate JUST <u>one</u> . For more information, see www.iitbmonash.org)		Highlight which of the Academy's Theme(s) this project will address? (Feel free to nominate more than one. For more information, see www.iitbmonash.org)	
1	Earth Sciences and Civil Engineering (Geo, Water, Climate)	1	Advanced computational engineering, simulation and manufacture
		2	Clean Energy

The research problem

Responsible domestic coalbed methane (CBM) development in India offers a potential path to utilize low carbon fossil fuels and could also help address CO₂ emissions through carbon storage in depleting CBM reservoirs. Storage site selection and characterization are essential in the CCS project life cycle, including that in CO₂ storage in coal with or without CBM recovery. The site characterization caters to various elements of sub-surface scenarios to build a proper CO₂ injection plan. Capacity, containment, and risk analysis are key elements in ensuring safe and secure storage of CO₂. A three pronged methodological approach that includes field investigation/data gathering, experimental characterisation and numerical modelling will be implemented to resolve issues surrounding the key elements in such a pilot. The

thorough study will connect to the considerable knowledge gap in subsurface reservoir conditions in an Indian context.

Project aims

The project aims are as follows:

- To investigate the deformation, shrinkage-swelling and pore attributes of coal under various phases of the CO₂.
- To establish correlation between pore attributes of coal and the molecular dynamics (MD) of the components w.r.t. flow and storage of CO₂.
- Development of complete numerical modeling platform using CMG-GEM or COMET3 for reservoir scale simulation of the performance of the CO₂ enhanced CBM recovery.
- To provide a comprehensive assessment of risks surrounding CO₂ storage in coal.

How skills/experience of the IITB and the Monash supervisor(s) support the proposed project

The research groups at IITB and Monash host well equipped laboratories and simulation capabilities to carry out the research work. ONGC has provided approval for sharing the data and samples for carrying out the research work.

Expected outcomes

The present study would help understand the geomechanical response of the reservoir under subsurface P-T conditions for CO₂ sequestration associated with enhanced CBM recovery. This would assist in assessing the potential risks involved and ways to mitigate them during CO₂ injection. It would also help develop workflows for storage site selection and CO₂ storage capacity estimation from the field scale to the basin scale. Consequently, the study would help evaluate the feasibility of the technology as a carbon sequestration tool in the future.

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

This project addresses the themes like reservoir characterization, numerical simulation and risk assessment for development of cleaner energy fuels.

Potential RPCs from IITB and Monash

Provide names of the potential research progress committee members (RPCs) and describe why they are most suited for the proposed project

Capabilities and Degrees Required

Master degree in Geology/Geophysics OR Bachelor/Master degree in Petroleum/Civil/Chemical/Mining Engineering would be preferred, apart from other necessary criteria for the course.
Should demonstrate capability in numerical simulation and computational fluid dynamics.
Experience and knowledge in petroleum engineering and CO₂ enhanced CBM recovery is preferable.

Necessary Courses

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Carbon Sequestration, CBM recovery, porosity, permeability, storage site selection