IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project Title:	Designing inclusive and adaptive early warning systems for disasters	
Project Number	**IMURA1151**	
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IITB Department:	Climate Studies	

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? *(Please nominate JUST **one.** 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	*Material Science/Engineering (including Nano, Metallurgy)*	***1***	*Artificial Intelligence and Advanced Computational Modelling*
2	*Energy, Green Chem, Chemistry, Catalysis, Reaction Eng*	2	*Circular Economy*
3	*Math, CFD, Modelling, Manufacturing*	3	*Clean Energy*
4	*CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control*	4	*Health Sciences*
5	*Earth Sciences and Civil Engineering (Geo, Water, Climate)*	5	*Smart Materials*
6	*Bio, Stem Cells, Bio Chem, Pharma, Food*	6	*Sustainable Societies*
7	*Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng*	7	*Infrastructure*
8	*HSS, Design, Management*		

The research problem

Anthropogenic Climate Change has increased climate extremes of disasters like floods, heatwaves, droughts, and forest fires. Early warning systems (EWS) help communicate about these oncoming disasters and are critical in building resilient communities. However, only half of the countries (97) worldwide report having adequate multi-hazard early warning systems. This has led to 'Early Warning for All by 2027' initiative by World Meteorological Organization (WMO) and the United Nations Office for Disaster Risk Reduction (UNDRR).

Currently the EWS are built using 'one size fits all' approach and do not cater to the different human aspects such as age, disabilities and living conditions. For example an older adult may find an EWS too complicated, a person with motor impairment may find it hard to use, and the information needed during a flood can change from slum dwellers to residents of a high-rise building. This project aims to explore the requirements of these different human aspects from an EWS and build a more inclusive and adaptable EWS. Particularly it plans to focus on two case studies: monsoon rain impacts in India and bushfires in Australia.

Project aims

The aims are:

1. *Understand the requirements for an EWS from different stakeholders with different human aspects*
2. *Design of adaptive early warning system for climate disaster*
3. *Evaluation of the system using real work scenarios of monsoon rain impacts in India and bushfires in Australia*

What is expected of the student when at IITB and when at Monash?

The student will develop expertise in climate and disaster management when at IITB and work with real world stakeholders. At Monash, he will develop the software engineering expertise to translate the knowledge into meaningful systems that can address climate challenges.

Expected outcomes

1. *Design of an adaptive early warning system for climate disasters*
2. *Guidelines on developing more inclusive early warning systems for different sectors of the society*

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

By developing guidelines and design for more inclusive and adaptable early warning systems, it helps to create more ***resilient and sustainable communities*** *and protect existing* ***infrastructure****, which ultimately leads to climate sustainability.*

Potential RPCs from IITB and Monash

From IITB: Prof. Raghu Murtugudde
From Monash: Prof John Grundy

Capabilities and Degrees Required

Masters in Software Engineering
Masters in Climate Science is also welcome.

Necessary Courses

Ecohydroclimatology (CE 608)
Rest will be decided based on student expertise

Potential Collaborators

Prof. Vishal Dixit and Prof. Subhankar Karmakar from IITB
A.Prof Jonathan Abrahams from Monash University Disaster Risk Initiative

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.

Climate; Extremes; Disasters; early warning; AI/ML