

**Project Title:**

**Project Number**

**Monash Main Supervisor**  
(Name, Email Id, Phone) chris.rudiger@monash.edu"/> *Full name, Email*

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

**Monash Head of Dept/Centre** (Name,Email) jeff.walker@monash.edu"/> *Full name, email*

**Monash Department:**

**Monash ADGR**  
(Name,Email)  *Full name, email*

**IITB Main Supervisor**  
(Name, Email Id, Phone) basudev@iitb.ac.in"/> *Full name, Email*

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

**IITB Head of Dept**  
(Name, Email, Phone) hod@civil.iitb.ac.in"/> *Full name, email*

**IITB Department:**

### Research Clusters:

### Research Themes:

<b>Highlight which of the Academy's CLUSTERS this project will address?</b> <i>(Please nominate JUST <u>one</u>. For more information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a>)</i>		<b>Highlight which of the Academy's Theme(s) this project will address?</b> <i>(Feel free to nominate more than one. For more information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a>)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	<b>Artificial Intelligence and Advanced Computational Modelling</b>
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	<b>Earth Sciences and Civil Engineering (Geo, Water, Climate)</b>	5	Smart Materials
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	<b>Sustainable Societies</b>
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Infrastructure
8	HSS, Design, Management		

## The research problem

*Define the problem*

It is essential to obtain quantitative characteristics of river channels for many engineering applications such as prediction of flood. Obtaining river channel characteristics through field investigation is practically very difficult, which is why remote sensing images are widely used for large-scale studies. However, remote sensing-based images are often associated with significant observational uncertainties. Generally, water resources engineers use remote sensing data in combination with hydraulic-scaling laws to obtain river channel information. Nevertheless, a reliable river channel dataset is not available for many parts of the world. This study will attempt to develop an accurate dataset for river channels in India and Australia. The study will particularly focus on the Mahanadi basin in India and the Hawkesbury-Nepean basin in Australia. For every channel reach of the two basins, slope, bankfull-width and bankfull-depth will be determined. The dataset will be tested using a flood-inundation model developed at IITB-Monash Research Academy (SCI-FRIM).

## Project aims

*Define the aims of the project*

The main aim of the project is to develop a dataset of channel characteristics for the Mahanadi basin in India and the Hawkesbury-Nepean basin in Australia. The dataset will be used to implement the conceptual flood-inundation model (SCI-FRIM) developed at IITB-Monash Research Academy.

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

*Highlight the purpose of the collaboration and/or the complementary skills/experience that you bring to the project. Do you have any joint or independent publications in the area of the proposed project?*

Both Prof. Christoph Rudiger and Prof. Basudev Biswal have worked on subject areas related to flood inundation in the past. Prof. Rudiger has extensive experience with remote sensing data analysis. Prof. Basudev Biswal's research has largely focused on the links between hydrology and geomorphology. The collaboration is thus expected to result in the development of a reliable river channel characteristics dataset.

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

*Highlight how the project will gain from the students stay at IITB and at Monash*

At IIT Bombay, the candidate is expected to: perform literature reviews; set-up the flood inundation model (SCI-FRIM); analyse remote sensing images; and develop a working model to obtain river-channel characteristics. At Monash University, the candidate is expected to analyse the results, refine the model and write manuscripts/thesis in the final year.

## Expected outcomes

*Highlight the expected outcomes of the project*

A river channel characteristics dataset for the Mahanadi basin in India and the Hawkesbury-Nepean basin in Australia.

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

*Describe how the project will address the goals of one or more of the 6 Themes listed above.*

The proposed research will address the concerns raised by the IITB-Monash academy (themes 1 and 6) by some of the scientific as well as engineering challenges related to flood-inundation modelling. In addition, the outcome of the project (river characteristics dataset) may find its use in ecological studies.

## 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*

Prof. Bellie Sivakumar and Prof. Edoardo Daly

## Capabilities and Degrees Required

*List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.*

The proposed research project needs a highly motivated PhD student with strong aptitude and fundamental knowledge (basic physics and mathematics). Experience with projects related to hydrological modelling/open channel hydraulics is an added advantage. The candidate must have experience in computer programming, and he/she should have a masters' degree in any subject area related to water resources engineering and remote sensing and geoinformatics.

## Necessary Courses

*Name three tentative courses relevant to the project that the student should complete during his/her coursework at IITB (the student will require to secure 8 point in these courses)*

Hydrogeomorphology (CE658), Eco-hydroclimatology (CE 608) and Mechanics of fluid flow (CE731).

## Potential Collaborators

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

Prof. Raaj Ramasankaran and Prof. Valentin Pauwels

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.

Modelling and simulation (37); Data Science, optimisation, algorithms (6); Geo Science, geotechnical, geomechanics (7); Maths (8).