IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

# Project title: Assessing total error in stormwater treatment models.

**Project number:** IMURA0109


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## Research Academy theme/s

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

**Advanced computational engineering, simulation and manufacture**
**Water**

## The research problem

To protect our waterways we have to treat polluted stormwater discharges. Stormwater models underpin decision making processes in stormwater management. Runoff generation and flow routing models (i.e. stormwater quantity models) are currently well developed and widely adopted in practice. While urban stormwater quality models are less developed than quantity models and often produce poorer predictions, these types of models have received much attention in recent years in the literature. However, stormwater treatment models are only recently being developed. They currently range from simple first order decay models (such as Australian MUSIC), to complex transport models (such as Danish MOUSE). Conversely to quantity models, reliability of these stormwater treatment models is still to be investigated. In other words, we do not understand uncertainties in these models and therefore cannot realistically estimate performance of urban stormwater treatment systems. The proper assessment of uncertainties in these models will assist decision makers and will direct researchers in future data collection and modelling efforts; for instance, it is possible to determine whether the costs of additional data collection and/or model improvements are justified.

## Project aims

The aim of this project is to develop a sound methodology for the assessment of uncertainties in the performance of urban stormwater treatment systems. The objectives are:

1. Improve further the Total Error Framework for cost effective assessment of uncertainties in complex treatment models.
2. Quantify uncertainties in modelling of stormwater quantity (flow and volume) and quality (concentrations and loads of the key pollutants).
3. Quantify uncertainties in modelling of stormwater treatment and harvesting, and assess implications of climate change on the design of treatment systems.

The impact of uncertainties due to climate change will be examined to some extent.

## Expected outcomes

The final deliverable output of this project is a robust and generalised methodology for the assessment of uncertainties in stormwater treatment systems, which could be directly implemented in the practical design of stormwater treatment systems.

There are two key outcomes from this project, as explained below.

1. Improved Total Error Framework methodology that can be used for complex water quality models. This is a generic outcome that could be valuable in assessing uncertainties in a wide range of models.

2. Quantified uncertainties in current stormwater treatment models for a wide range of stormwater treatment systems. The most popular modelling approaches used for prediction of stormwater treatment in the key stormwater treatment structures (e.g. wetlands, biofilters, swales, etc) will be examined and their uncertainties quantified.

## Which of the above Theme does this project address?

The project mainly deals with **water** related issues.

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

The project will bring highly needed improvements in both stormwater pollution control management and stormwater harvesting. For example, stormwater treatment systems are currently designed using historic climate data; a highly doubtful practice, since the main reason for the rapid uptake of these systems is the prolonged drought which suggests a change in the historic climatic pattern used in their design. The outcomes of this project will help resolve this paradox, as well as pave the way for reliable implementation of WSUD systems for years to come.