

We are pleased to announce that an exciting opportunity has arisen for a fully funded, three year PhD studentship to start in February 2019 on the following topic: **Rainfall runoff modelling for flood forecasting in Indonesia**

Primary Supervisor: Prof Simon Mathias, Department of Earth Sciences At Durham, you will join the newly established Global Challenges Research Fund Centre for Doctoral Training (CDT). The CDT will support a cohort of around 20 students working on a specific challenge in one or more of the areas of the UN Sustainable Development Goals with all PhD students coming from a DAC nation. All PhD projects are interdisciplinary and will be supervised by academic staff from different departments in partnership with an academic institution in an overseas DAC nation.

Eligibility and How to Apply

This PhD studentship will provide full payment of international tuition fees and a tax-free maintenance grant set at the UK Research Councils' National Rate, which is £14,777 per year for 2018/19. In addition, the studentship includes funds for return travel and visa costs for the applicant's home nation, an allowance to cover research costs and training, and support for an overseas placement during the PhD at the DAC nation partner institution (ITB, Indonesia).

Funding is available to an overseas candidate based in a [DAC nation](#), with preference given to candidates from Indonesia. Applicants must meet the university's academic PhD entry requirement which is a 2:1 honours degree or equivalent in a relevant subject. Non-native English speakers require an [English language qualification equivalent to IELTS 6.5 with no element less than 6.0](#). Durham University is an equal opportunities employer and we welcome applicants from diverse backgrounds and with diverse life experiences.

Students must begin their research on February 1st 2019. There is an application deadline of **17:00 (GMT) Friday 8th November 2018**.

Applicants will need to apply via the online application form and submit all the requested documents listed

here: <https://www.dur.ac.uk/earth.sciences/postgraduate/applying/>

Interviews will take place in early-December.

Please contact the Postgraduate Secretary for questions about the application process: Department of Earth Sciences, Durham University, DH1 3LE earthsci.pgadmissions@durham.ac.uk +44 (0)191 334 2198.

For technical questions about the project, please contact Prof Simon Mathias (s.a.mathias@durham.ac.uk)

Project brief:

Flooding represents the most frequently occurring hydrometeorological hazard in Indonesia, contributing to around 31% of all disaster events recorded by the National Disaster Management Agency (BNBP, 2017, <http://dibi.bnbp.go.id>). Impacts from fluvial flooding in Jakarta cost USD 321 million per year [A] and massive economic and social impact of flooding is also experienced in many other Indonesian cities. Due to Java's topography, climate, dense urbanisation and inadequate infrastructure, improvements to structural flood defences alone are unlikely to prevent flooding in these areas. Instead, an integrated and interdisciplinary approach is needed to build resilience through other mechanisms, including flood management information systems and greater public awareness [B].

To this end, there has been significant effort invested to develop fluvial flood risk maps of Jakarta and the associated Ciliwung catchment [C]. These involve the application of standard rainfall runoff models (RRM) to estimate design floods, which are routed through hydraulic inundation models to develop contours of flood level.

RRMs employ empirical parameters obtained by calibration to observed river flow data and hence can only make predictions for these locations. It is possible to develop statistical relationships, often termed regionalisation relationships, between model parameters and physically measurable characteristics of the river catchments, such as drainage network distances, soil cover etc. Parameter values for ungauged catchments can then be estimated and hence flood hazard predictions can be made for any location or community within the country, giving local and relevant predictions to stakeholders.

However, regionalisation relationships currently used in Indonesia are derived from non-tropical settings and hence are not effective, leading to greater uncertainty in the predictions. A recent study in Thailand found standard regionalisation methods to be insufficiently accurate at the daily time-scale in a similar hydrological context to Java and therefore unsuitable for flood studies [D]. There is also the issue that limited rainfall runoff model development has been undertaken in tropical climates. Therefore, rainfall runoff modelling of ungauged tropical catchments is an area where significant improvement is needed [E] to improve the flood prediction and warning.

This project will analyse river flow data from 700 river gauges (managed by the Directorate of Water Resources, Indonesia) to develop more appropriate RRM and regionalisation relationships to estimate design floods at ungauged locations in Java. The developed model will be applied to two catchments in Java, Ciliwung and Citarum, to test its effectiveness as a flood early warning system.

The project is interdisciplinary, bringing together expertise in remote sensing, catchment hydrology, meteorology, mathematical modelling and statistical analysis. Outputs from the project will provide more reliable design floods for existing flood risk tools, leading to a reduction in the flood hazard experienced by the population within Java and a framework for the development of similar approaches elsewhere in tropical countries.

[A] Budiyo et al. (2015) *Natural Haz.*, 75:389.

[B] Akmalah & Grigg (2011) *Water Int.*, 36:733.

[C] Mishra et al. (2018) *J. Flood Risk Man.*, 11, S1105-S1115.

[D] Visessri & McIntyre (2016) *J. Hydrol. Eng.*, 21:04016036.

[E] Beck et al. (2016) *Water Resour. Res.*, 52:3599.