Project Title: **Parametric Flood modelling for vulnerable populations in Southeast Asia**

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Summary

With rapid claims payment and low administrative costs Parametric Flood Insurance can provide an effective form of alternative risk protection for many developing nations in the world where traditional insurance is unaffordable to homeowners. Working in close collaboration with industry partners including Gallagher Re and its clients, including resilience risk pools such as SEADRIF (South East Asian Disaster Risk Insurance Facility based in Singapore), this research project will explore the efficacy of using alternative available remote sensing datasets (satellite optical / radar/ drones but possible social media too) and hydrological methods to establish when pluvial and fluvial flood levels have impacted vulnerable populations in Lao PDR and the Southeast Asian region (including the Philippines, Indonesia, Vietnam and other neighbouring countries).

Methods

Flood inundation models provide simulations of flood dynamics, depths and inundation extent, which is key for the management of pluvial/fluvial floods in urban areas. However, these models are computationally expensive to run and require high-resolution data sets that may not be available for real-time applications especially in data-scarce regions. Advances in satellite remote sensing has enabled the near-real-time monitoring of flood events on a global scale. Some of the freely available satellite products for flood mapping include SAR (Synthetic Aperture Radar) (Sentinel-1) and optical sensors (Sentinel-2, Landsat-8/9). SAR sensors can penetrate clouds making them suitable for flood monitoring in any conditions (dry/wet, day/night), whereas optical sensors detect visible/infrared light and therefore limited by cloud cover. Both sensors have their own spatial/temporal resolutions (e.g. Sentinel-1 is 10m/6-12days) suitable for near-real-time flood mapping. This project will investigate how suitable are the above satellite products for flood mapping in the Southeast Asia. A model will be developed to merge the different satellite products to estimate flood extent and flood depths (with additional satellite DEM data). Flood losses will be computed using depth-damage functions. A flood inundation model (driven by satellite rainfall) will be implemented for specific flood cases to validate the results.

Background reading and references

- *Matheswaran, K., Alahacoon, N., Pandey, R., & Amarnath, G. (2018). Flood risk assessment in South Asia to prioritize flood index insurance applications in Bihar, India. Geomatics, Natural Hazards and Risk, 10(1), 26–48. https://doi.org/10.1080/19475705.2018.1500495*
- *Tellman, B., Lall, U., Islam, A.K.M.S.,& Bhuyan, M. A. (2022). Regional index insurance using satellite-based fractional flooded area. Earth's Future,10, e2021EF002418. https://doi.org/10.1029/2021EF002418*
- *Olcese, G., Bates, P. D., Neal, J. C.,Sampson, C. C., Wing, O. E. J., Quinn, N.,et al.*

(2024). Developing a fluvial and pluvial stochastic flood model of Southeast Asia. Water Resources Research, 60,e2023WR036580. https://doi.org/10.1029/2023WR036580

How to Apply: The deadline for this position is 8th January 2025. The studentship will begin in September 2025. Please apply to the “Geography- PhD” at https://www.bristol.ac.uk/study/postgraduate/apply/