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# Flood Hazard Modelling in Small Island Developing States using GIS-based geomorphological analysis techniques and LiDAR datasets

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Due to accelerating climatic and environmental changes (and associated uncertainties), flood hazard modelling and mapping are becoming increasingly important and, at the same time, complex tasks. Traditional hydrological and hydraulic modelling approaches to flood hazard mapping, which rely on the successful characterisation of climatic and environmental conditions, are inherently affected by these increasing uncertainties; furthermore, these require a large number of datasets to be calibrated upon, which often incurs high associated costs. These are important limiting factors, especially when flood hazard mapping is to be undertaken at the national scale. Consequently, flood hazard mapping in developing nations is often restricted to few areas and rarely available for national-scale infrastructure risk assessments and spatial planning. To overcome this difficulty, we propose a simple GIS-based geomorphological approach to flood hazard mapping, using Samoa – a Small Island Developing State in the Pacific Ocean – as a case study.

A LiDAR-derived high-resolution Digital Elevation Model and GIS-based geomorphological analysis techniques were used to model and map coastal and fluvial flood hazards in Samoa, covering 3,500 km2. Risk analyses of key infrastructure assets (i.e. national roads and associated drainage infrastructure) were subsequently completed. GIS apps (ArcGIS Collector) were used during the completion of field activities, which included validating GIS-derived flood hazard products and producing a database of drainage infrastructure. A cloud-based GIS platform (ArcGIS Online) was used to deliver flood hazard products and improve risk communication to relevant stakeholders, including the Government of Samoa, the World Bank, and United Nations Development Programme.

The geomorphological approach to flood hazard and risk mapping developed in this study and piloted in Samoa has proven to be cost-effective and has led to consistent results across the country. Furthermore, it has enabled identification of high hazard areas requiring further, more detailed, flood modelling efforts to better understand risk at the local scale. Finally, this approach leads to easy-to-interpret results, and it therefore has potential for improving risk communication strategies.