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Geomorphic change as a driver of flood risk in a tropical gravel bed river

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River morphology results from sediment transport and deposition, which are both a consequence of water flow. Episodic variation in natural (e.g. typhoons, earthquakes, volcanoes) and anthropogenic (e.g. gravel mining, river bank protection) sediment supply drives changes in riverbed levels and planform morphology of rivers. These geomorphic changes determine channel capacity and flow routing, and thus associated flood risk to surrounding people and property.

Despite the significance of variation in riverbed levels and channel position for flood risk, geomorphological processes are commonly overlooked in flood risk mapping. Tropical gravel bed rivers, like those observed in the Philippines, are particularly dynamic; flood risks arising from sedimentation and erosion should be assessed and incorporated into flood risk management to mitigate the impact of flooding on welfare and the economy.

Here we use new high resolution (0.5 m) repeat topographic surveys from 2014, 2019 and 2020 of the Bislak River in northwest Luzon Island to quantify annual and multi-year sediment budgets (i.e. erosion and deposition) and geomorphic change over single and multiple wet seasons.

Changes in flood risk related to geomorphic change (natural and anthropogenic) is tested using repeat two-dimensional hydraulic modelling to see whether observed geomorphic changes result in altered discharge routing and flood inundation extent in the region.

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