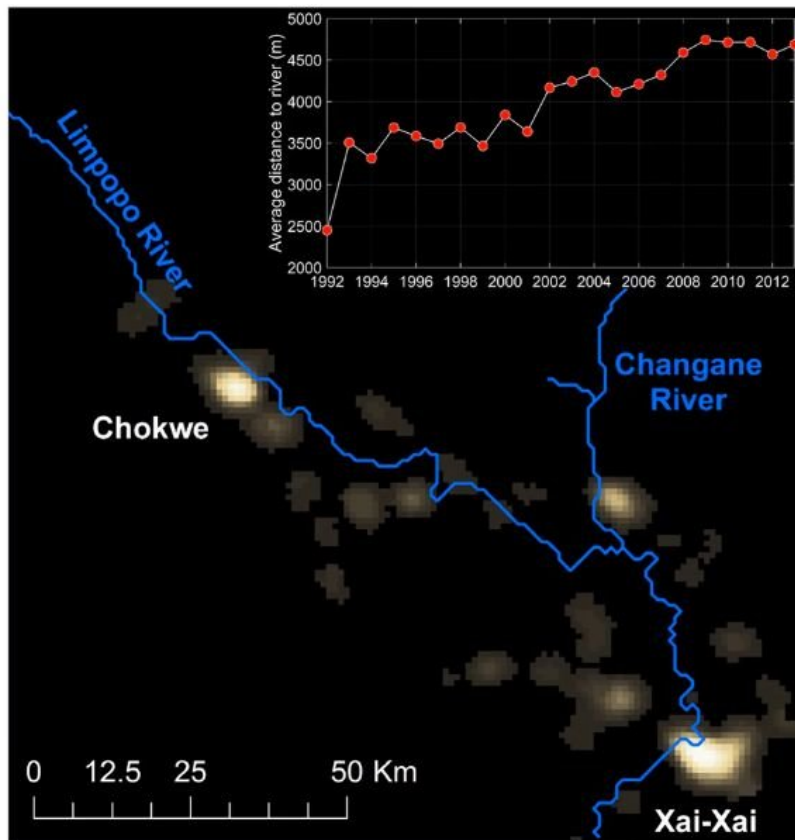


Catastrophic floods can trigger human resettlement away from rivers

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A new study by researchers at Uppsala University, published in the journal *Science Advances*, uses satellite nighttime light data to reveal how flood protection shapes the average distance of settlements from rivers.

Flooding is one of the most damaging natural hazards, and its negative impacts have markedly increased in many regions of the world in recent decades. In the period 1980-2014, floods generated economic losses exceeding USD \$1 trillion and caused more than 226,000 casualties. The increasing trend of global flood losses has mainly been attributed to the increasing exposure of people and assets due to rising populations in flood-prone areas.

To understand (spatiotemporal) changes in flood risk, researchers must determine the ways in which humans adapt and respond to flood events. For example, societies can cope with floods by reinforcing structural [flood protection](#), implementing early warning systems and building codes, or by moving away from flood-prone areas.

By using satellite nighttime light data, a group of researchers at Uppsala University has been able to discern the relationship between long-term changes in human proximity to rivers (that is, the average distance of human settlement from rivers) and the occurrence of catastrophic flood events, with reference to different levels of structural flood [protection](#) (for example, levees and reservoirs/dams). This type of analysis has not been feasible previously because traditional census data are typically aggregated at administrative levels and available on decadal time scales. Thus, census data do not provide useful information needed to explore these relationships.

By focusing on the occurrence of catastrophic flood events (inferred from flood damage) in 16 countries across the globe, with different hydroclimatic and socioeconomic contexts as well as different levels of structural flood protection, the research group found that flood fatalities and economic losses on the country scale are both positively correlated with changes in human proximity to rivers. However, such tendencies are reduced when high levels of flood protection are in place.

More detailed analysis in four hotspot areas confirms these tendencies. Catastrophic flood events may trigger changes in human proximity to rivers.

"We found that societies with low protection levels tend to resettle further away from the river after catastrophic flood events, and that the decrease in human settlements close to the river may have contributed to reduced exposure to future flood events. Conversely, societies with high protection levels show no significant changes in human proximity to rivers," says Johanna Mård, researcher at the Department of Earth Sciences, Uppsala University.

Societies with high protection levels continue to rely heavily on structural measures, reinforcing flood protection and quickly resettling in flood-prone areas after a flooding event. Although they will be protected from frequent flooding, total protection is not possible, and therefore they remain exposed to low-probability but catastrophic-impact events.

The study reveals interesting aspects of human adaptation to [flood risk](#), and offers key insights for comparing different risk reduction strategies. The analysis indicates that [flood](#) occurrences can trigger decreasing human proximity to rivers, but mainly if societies do not strongly rely on structural protective measures. In addition, this study provides a framework that can be used to further investigate human response to floods, which is relevant as the urbanisation of floodplains continues and puts more people and economic assets at risk.

More information: J. Mård et al., "Nightlight data unravel how flood protection shapes human proximity to rivers," *Science Advances* (2018). DOI: [10.1126/sciadv.aar5779](https://doi.org/10.1126/sciadv.aar5779) , advances.sciencemag.org/content/4/8/eaar5779

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