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## What value do mangroves have in reducing the cost of storm surges?

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With coastlines becoming increasingly urbanised worldwide, the economic risk posed by storm surges to coastal communities has never been greater. Given the financial and ecological costs of manmade coastal defences, the past few years have seen growing interest in the effectiveness of natural coastal “defences” in reducing the risk of flooding to coastal properties, but estimating their actual economic value in reducing storm surge risk remains a challenging subject.

In this study, we estimate the value of mangroves in reducing annual losses to property from storm surges along a large stretch of coastline in Florida (USA), by employing a catastrophe modelling approach widely used in the insurance industry. We use a hydrodynamic coastal flood model coupled to a property loss model and a large property exposure dataset to estimate annual economic losses from hurricane-driven storm surges in Collier County, a hurricane-prone part of Florida. We then estimate the impact that removing mangroves in the region would have on average annual losses (AAL) caused by coastal flooding. We find that mangroves reduce AAL to properties behind them by over 25%, and that these benefits are distributed very heterogeneously along the coastline. Mangrove presence can also act to enhance the storm surge risk in areas where development has occurred seaward of mangroves.

In addition to looking at annual losses, we also focus on the storm surge caused by a specific severe event in Florida, based on Hurricane Irma (2017), and we estimate that existing mangroves reduced economic property damage by hundreds of millions of USD, and reduced coastal flooding for hundreds of thousands of people.

Together these studies aim to financially quantify some of the risk reduction services provided by natural defences in terms of reducing the cost of coastal flooding, and show that these services can be included in a catastrophe modelling framework commonly used in the insurance industry.