



Improved understanding of coastal flood risk

The joint UKRI and Met Office led UK Climate resilience Programme (UKCR) is combining hazard, exposure and vulnerability information to allow a better understanding of future risk and help build UK capacity for resilience to climate variability and change. One of the projects within the Programme, Improving Coastal Resilience, has developed a capability that can be used to provide advice on coastal resilience to a number of sectors. This project was recently able to respond to a request from the UK Government's Ministry of Defence (MOD) to provide sea-level projections out to 2100 for several UK sites and overseas territories and assess implications for extreme water levels at several UK sites. These estimates have helped inform an assessment of impacts for the defence estate, both on the UK mainland and overseas locations, and identify needs for adaptation and resilience.



Why this is important: Coastal flooding due to extreme sea levels is already resulting in major impacts worldwide, with a notable UK example being Storm Xaver on the 6th December 2013. This generated a significant storm surge that impacted the coastline of the Irish Sea, North Sea and parts of the English Channel, and coupled with exceptionally large tides caused widespread damage. An estimated 1,400 homes, 1,000 businesses and 3,200 hectares of farmland were inundated from coastal defence breaches. Insured losses including those from strong winds were estimated at €1.4 to €1.9 billion (£1.2 - £1.7 billion) (Source: <https://www.surgewatch.org/>)

The rate of global time-mean sea-level (GMSL) rise for 2006–2015 is unprecedented over the last century and was more than twice as fast as during 1902–2015, with the dominant cause since 1970 being manmade climate change through the thermal expansion of ocean water and melting of ice sheets and glaciers (Church et al, 2013). UK coastal flood risk is projected to further increase over the 21st century and beyond meaning that we can expect to see both an increase in the frequency and magnitude of extreme water levels around the UK coastline (Palmer et al, 2018). Extended projections to 2300 show long-term committed sea-level rise under all the Representative Concentration Pathways (RCPs) developed for The Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5) (Church et al, 2013).

What the UKCR programme is doing: The Improving Coastal Resilience project within the UKCR programme has further developed a relocatable sea level tool, initially developed by the Met Office under UKCP18. This tool has the ability to provide sea-level projections globally and has generated sea-level projections for a number of UK mainland and overseas sites of relevance to the MOD. For mainland UK sites these projections were combined with data supplied by the Environment Agency (Environment Agency 2019) to explore how the risk of extreme water levels (the combined impact of sea-level and storm surges) may change in the future. The methods applied for the UK sites are based on those described in the UKCP18 Marine Report (Palmer et al, 2018 and 2020) and for the overseas territories similar to the projections presented by Palmer et al (2020). The projections are also based on an ensemble of climate model simulations of the Coupled Model Intercomparison Project Phase 5 (CMIP5) which underpin much of IPCC AR5 (Church et al, 2013).

What is next: The sea-level projections produced have contributed to the recently published [Ministry of Defence Climate Change and Sustainability Strategic Approach](#) and are helping the UK Defence to meet the challenge of climate change. A peer-review paper on the relocatable sea-level tool and developed methodology is in the process of being written, and the tool will be made open source once paper is published. Further engagement will continue across multiple sectors to identify further potential users and help improve coastal resilience to climate change within the UK and beyond.

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References

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