Assessing sea level-rise risks to coastal floodplains in the Kakadu Region, northern Australia, using a tidally driven hydrodynamic model

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Marine and Freshwater Research - http://dx.doi.org/10.1071/MF16049
Submitted: 16 February 2016 Accepted: 18 April 2016 Published online: 20 July 2016

Abstract

The low-lying coastal floodplains of the Kakadu Region in tropical northern Australia encompass World Heritage Kakadu National Park and are highly vulnerable to future sea level-rise (SLR) and extreme weather events, yet there are no modelling tools to assess potential impacts of saltwater inundation (SWI) on freshwater ecosystems and to evaluate future management options. A tidally driven hydrodynamic model was developed to simulate the frequency and extent of SWI in the Kakadu Region for the following four mean SLR scenarios: 0 m (present-day, 2013); 0.14 m (2030); 0.70 m (2070); and 1.1 m (2100). Simulations were undertaken at 60-m spatial resolution using October dry-season tides, and a digital elevation model (0.10-m vertical resolution) constructed from LiDAR point cloud data was used to resolve coastal and river-system terrains. Model outputs (maximum extent and frequency of SWI) were used to assess potential loss of freshwater floodplains for each scenario at a park-wide scale and for three case-study areas that differ in tidal influence. Results show little loss by 2030 (–3%), a possible threshold effect by 2070 (–42%) and ameliorating after 2100 (–65%). Although freshwater floodplains further from the coast showed least exposure to simulated SLR, indicating potential refuge areas, all floodplains on Kakadu will be exposed to SWI by 2132 (+117 years).

Additional keywords: Ramsar, salinity, storm surge, vegetation, wetlands, World Heritage.

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