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Barrier dynamics in Disaster Risk Reduction: storm impacts and recovery assessment from Remote Sensing

Sue Brooks (1), James Tempest (2), Mark Schuerch (3), and Tom Spencer (3)

(1) University of London, Birkbeck, Geography, Environment and Development Studies, London, United Kingdom (s.brooks@bbk.ac.uk), (2) CH2M Jacobs, Burderop Park, Swindon, SN4 0QD, United Kingdom, (3) Cambridge Coastal Research Unit, Department of Geography, University of Cambridge, United Kingdom

Soft mobile sediment shorelines with barrier island systems, such as are found around East Anglia, UK, are highly vulnerable to storm impacts, yet play a vital role in protecting the immediate landward zone. Barriers composed of sand and gravel typify the North Norfolk coast and while they have their own internal dynamics in relation to storms and recovery, they also interact with changes in the back-barrier marshes to landward and the dynamics of seaward-located onshore migratory inter-tidal bars. Over the past 20 years, system interactions and dynamics has been assessed solely using 2-dimensional airborne aerial photographs, tracking changes in the vegetated edges of the barriers and marshes. This has been supplemented with cross-shore profile data to provide patchy but useful 3-dimensional insight into the interactions of the different cross-shore settings. More recently, however, a considerably enhanced 3-dimensional picture of storm impacts and barrier/marsh recovery is made possible using airborne and terrestrial LiDAR. Monitoring the nature and extent of changes to barrier and marsh systems during and following a major storm (occurring in December 2013) is now possible at a high level of spatial coverage, as well as through time. With this capability we can now unravel in greater detail than ever previously possible the capacity for natural barrier systems to grow to withstand the impact of high magnitude events that are likely to occur in future under changing storminess. This paper uses the example of Holkham, North Norfolk (a strong sediment sink or region of positive diffusivity) to explore and quantify these natural shoreline defence dynamics.