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Attenuation of high water levels over restored saltmarshes can be limited. Insights from Freiston Shore, Lincolnshire, UK

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The creation or re-creation of intertidal saltmarsh habitat in the context of managed realignment (MR) has, for a range of conditions, been shown to help protect coastal infrastructure and communities against the impact of storm waves and surges. However, evidence has largely come from empirical and modelling studies of natural marshes, while the effectiveness of specific MR schemes has rarely been proven in the field. Environmental monitoring has generally been limited to the first few years after implementation and has focussed on surface elevation change, vegetation establishment and habitat utilization. So far, the study of biophysical processes such as high water level (HWL) attenuation has commonly been neglected. We address this knowledge gap by analysing HWL attenuation rates from saltmarshes within (restored marsh) and in front (natural marsh) of the open coast MR site of Freiston Shore (Lincolnshire, UK). For this purpose, a suite of 16 pressure transducers was deployed along four sections (two within and two outside the MR) to measure water level variations during the highest spring tides of the year 2017.

The results show that for the conditions encountered during the measurement period, the capacity of the Freiston Shore MR site to provide HWL attenuation was limited and significantly lower than that of the adjacent natural marsh. In the case of the latter, HWL attenuation rates ranged between 0 and 101 cm km-1 (mean 46 cm km-1). Within the MR site, rates varied between -102 and 160 cm km-1 (mean -3 cm km-1), with even negative attenuation (i.e. amplification) for about half of the measured tides. These results show that the range of observed attenuation rates was much higher inside the MR compared to the adjacent natural marsh, but also much higher than previous field studies had reported. Furthermore, in contrast to the adjacent natural marsh, HWL attenuation rates inside the MR were not significantly different from zero. This finding suggests that the existing simple relationship between HWL attenuation and bottom friction may be more complex in smaller enclosed basins, such as MR sites.

We therefore suggest that MR internal hydrodynamics, caused by scheme design and meteorological conditions, may have counteracted the HWL attenuating effect induced by the drag forces of the re-created saltmarsh inside the Freiston Shore MR.