

Improving our understanding of connections between the catchment and sediment dynamics (quality and quantity) in UK estuaries.

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Introduction: In England and Wales, the Environment Agency (EA) is the competent authority for implementing the EC Water Framework Directive. The research department of the EA is currently undertaking work to help ensure that we can comply with various aspects of the Directive. It is apparent both in the EA and beyond, that there is an urgent and acute need to better understand relationships between catchment land use activities and sediment fluxes to estuaries. This is particularly important as fresh water flows [1] and fluvial sediment supply to estuaries is often in decline – at the same time as climate change related issues such as sea-level rise necessitate greater supplies of sediment for estuarine habitats to adapt to rising sea-levels [2]. Furthermore, management initiatives such as ‘catchment sensitive farming’ may further reduce the amount of catchment-derived sediment in rivers and ultimately, could have knock-on effects for the amount and/or provenience of sediment entering estuaries via fluvial conduits.

Methods: This paper focuses on one of the major deposition zones in estuaries – saltmarshes and newly re-aligned saltmarsh habitats. At a broad-scale this paper provides a synthesis of current global understanding of the sediment sources, sinks and residence times of sediments in saltmarshes and the sediment-related ecosystem services that saltmarshes provide. In an UK context, it illustrates the temporal and spatial variations in estuarine sediment and saltmarsh dynamics and outlines the range hydromorphological pressures affecting sediment connectivity from catchment-coast and estuarine dynamics. Specifically, it demonstrates, using a few case studies, how estuarine sediment system responses to human disturbances in rivers vary in space and time. For example, some UK estuaries such as the Dee are still responding to riverine flow regulation measures that were built nearly a century ago [3]. Scaling down even further, the effectiveness of sediment fingerprinting to apportion source materials on managed realignments is outlined. This research has demonstrated that fingerprinting can be successfully used to apportion sediment sources in a statistically robust manner [4]. Through the course of

this work, it is increasingly apparent that many human activities interact with natural system processes, whereby it is challenging to determine the relative impact any given hydromorphological pressure has on the sediment fluxes in estuaries. Some of the complex interactions between human and natural processes and the importance of understanding estuarine dynamics at appropriate scales are exemplified.

Lastly, important policy implications that have arisen from this research will be discussed. These include whether both direct and indirect effects of hydromorphological pressures on sediment and saltmarsh dynamics can be evaluated as part of WFD and what is an appropriate lag-time between a system perturbation and quantifying its impact on sediment and/or saltmarsh processes.

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