CONSERVING INTERTIDAL HABITATS: WHAT IS THE POTENTIAL OF ECOLOGICAL ENGINEERING TO MITIGATE IMPACTS OF COASTAL STRUCTURES?

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Growing human coastal populations and increasing urbanisation are concurrent with climate change which brings stormier seas and rising tides. These trends create a strong and sustained demand for land reclamation and coastal protection, requiring coastal engineering such as seawalls. In response, research examining the ecological impacts of coastal engineering and potential mitigations has increased over the past 15 years. Through review, we synthesise current understanding of three key areas of this burgeoning research field: i) ecological impacts of coastal engineered structures on intertidal ecosystems ii) current status of ecological engineering to mitigate such impacts iii) effectiveness of mitigation as a tool to contribute to conservation of intertidal habitats. Engineered structures alter important physical, chemical and biological processes of intertidal habitats, and strongly impact community structure, inter-habitat linkages and ecosystem services while also driving habitat loss. Such impacts occur diffusely across localised sites but are significant at regional and global levels. Ecological engineering includes small-scale artificial habitat provision on hard structures; the inclusion of natural materials, species or processes in hybrid 'soft' structures; and increasingly, large-scale habitat restoration or managed realignment that delivers natural coastal protection services. Soft solutions and natural habitats maximise multiple services, providing greater economic benefits for society and resilience to climatic change. Currently however, under-inclusion and economic undervaluation of intertidal ecosystem services may undermine best practice in coastline management. Importantly, reviewed evidence shows mitigation and even restoration do not support intertidal communities or processes equivalent to pre-disturbance conditions. Crucially, a lack of ecological baseline data (including ecosystem functions and services) prohibits quantification of relative and absolute impacts to intertidal habitats from coastal structures and the effectiveness of mitigations, restricting development of conservation policy. To improve mitigation design and effectiveness, a greater focus on *in-situ* research is needed, requiring timely collaboration between government, construction partners and scientists.