Building with nature: using natural infrastructure for coastal adaptation

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Globally, estuaries and coasts are under pressure as coastal human population growth and urbanization continues, while climate change leads to rising tides and increased storminess. In many locations, conventional coastal engineering solutions with hardened structures such as sea walls, bulkheads and revetments are increasingly challenged by these changes and their maintenance may become unsustainable. Instead, 'soft' engineering options using green infrastructure and eco-engineering, are increasingly recognized as more sustainable, adaptive, cost-effective (on a life cycle basis) and ecologically sound alternatives to conventional engineering solutions.

The restoration of estuarine ecosystems such as marshes, tidal wetlands, mangroves, biogenic reefs etc. offer increased protection against flooding and erosion, while simultaneously delivering many other essential ecosystem functions and services. Healthy, well-functioning ecosystems will offer risk reduction and enhance natural resilience to the adverse impacts of climate change and reduce the vulnerability of people. Extensive experience with eco-engineering has been achieved in the Dutch Building with Nature program (www.ecoshape.nl), in which existing concepts and ideas have been further developed and tested in a number of full-scale pilot experiments, including sand engines, oyster reefs, mangroves and wave-attenuating forests.

A number of these experiments will be shown along with results and lessons learned, as well as other examples of eco-engineering in estuarine and delta environments worldwide. These ecosystem-based examples show promising opportunities, however, large-scale application and implementation in policy and management of our estuaries and deltas will require greater focus on in-situ research and a better mechanistic understanding of the long-term ecosystem dynamics.