



A new wave in coastal protection

Teign estuary case study

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The South Devon **THESEUS** study site encompasses both coastal and estuarial areas and provides a good representation of a range of coastal environments found across Europe. The site includes industrial, residential, touristic and agricultural elements as well as a diversity of marine habitats that comprise exposed rocky shores, shingle beaches, sheltered mud flats and a flooded ria. Coastal defence structures have the potential to impact significantly on the economic, social and ecological environments within the region.

Key challenges and main activities

❖ In England flood protection and coastal defence are the responsibility of the Environment Agency (EA). Within the Teign Estuary and on the nearby coast the EA has a policy to "hold the line". That policy ensures the maintenance of existing flood defences and the continued operation of an exposed section the main railway line serving the regions of Devon and Cornwall.

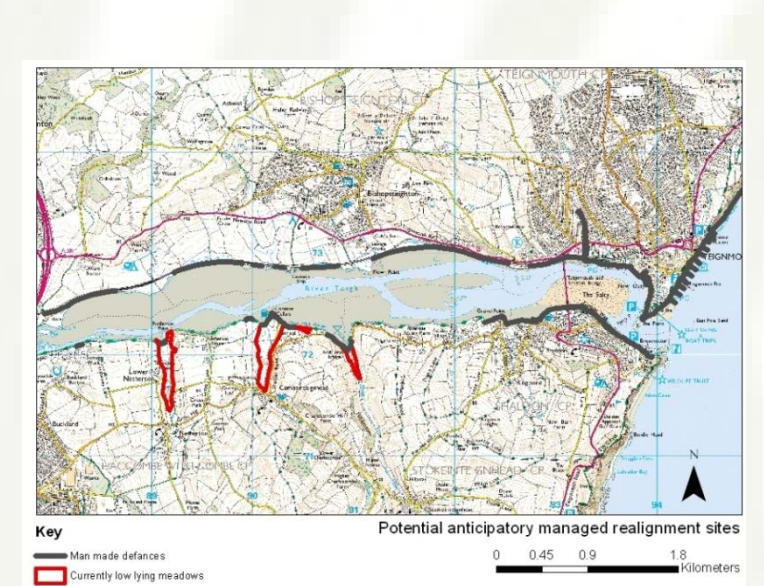
- ❖ In order to assess the environmental impact of coastal hazards in the **THESEUS** study site, a SOURCE-PATHWAY-RECEPTOR-CONSEQUENCE (SPRC) methodology was used. The SPRC approach enabled different climate scenarios to be modelled, mapped and evaluated using the **THESEUS** - DSS.
- ❖ The **THESEUS** - DSS was developed as a tool to help illustrate the risks to a coastal region that arise from decisions made in relation to coastal zone management. The DSS is a multidisciplinary tool that combines

- engineering, social, economic and ecological data about the region. Using the DSS policy-makers can acquire a deeper understanding of the sensitivity to environmental conditions and appreciate the impact of different climate scenarios.
- ❖ The utility of the **THESEUS** - DSS is demonstrated by the ability to model the effects of different engineering measures aimed at the reduction of the risk of flooding and erosion along the coast and within the estuary. Importantly, the DSS

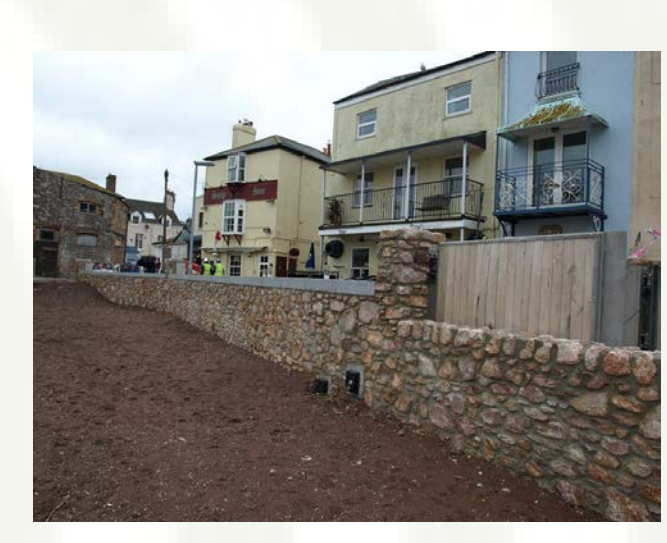
- combines these engineering measures with social and ecological criteria to allow a range of management options to be evaluated.
- ❖ Hazard mitigation options within the DSS: Wave energy devices, breakwaters, bespoke localised protection, spatial planning options, flood storage areas and realignment of existing defences.
- ❖ Flood hazard damage indicators: Economic, social and ecological impacts aligned to each flood risk scenario.



Flood storage – Race Course & Clay pits: Reduce risk of flooding to Newton Abbot from extreme events through storage of flood water. The creation of wet areas in the clay pits could also offer ecological benefits.



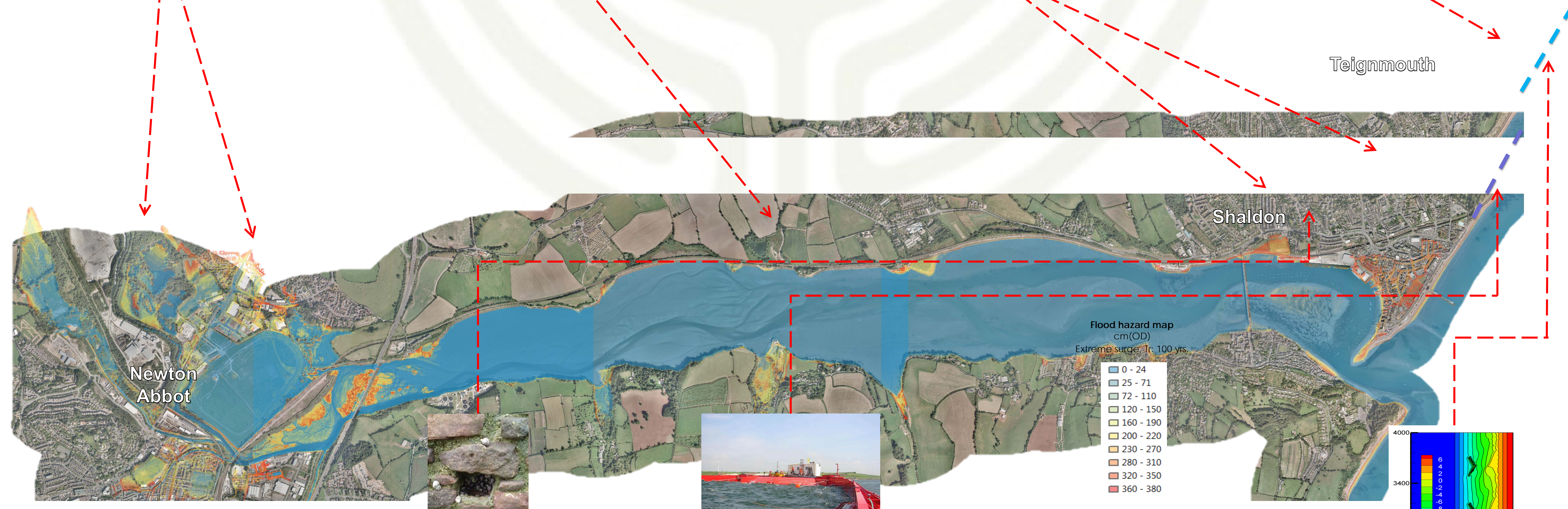
Managed realignment: Involves identifying a section of coastline where a deliberate abandonment or degradation of the line of defence creates a more sustainable, but defendable coastal margin. This may impact upon the sediment pathways, but creates new habitats.



Bespoke protection: Prior to the construction of the "Tidal Flood Defence" Scheme, Teignmouth was at a risk of flooding one in every 20 years. The risk at Shaldon/Ringmore was even greater. A novel adaptive and consultative approach to scheme development has been adopted.



Railway on open coast / Modify wall: This option focuses on a re-design of the historic Brunel seawall to mitigate against extreme overtopping (although, in the longer term, abandonment and/ or re-routing of the line on an inland route may become viable).



Ecological Niches: At Shaldon simple modifications to the flood wall have little impact on performance or cost, but can enhance acceptance of the new defence through provision of intertidal habitats.

Wave energy converters: The design considers a farm of wave energy converters providing a similar shoreline response to that of shore parallel breakwaters. A reduction of erosive wave action at the shoreline would be effected, whilst benefiting from a clean source of renewable energy.

V-shaped breakwaters: Novel breakwater planforms have been shown to provide improved performance for a range of wave approaches, lower visual impact and lower construction costs than more traditional configurations.

