Revetments

Challenge: Sea level rise **Adaptation response:** Built infrastructure for shoreline protection

Description

Revetments are sloping shore-parallel structures constructed landward of the beach to dissipate and reduce wave action at the boundary between the sea and land. They typically protect a soft landform such as a dune area or coastal slope, or provide supplementary protection to existing defences such as a dike or sea wall. They are generally very solid, durable structures and are used mainly to address erosion hazards.

Implementation

Revetments are typically built on exposed and moderately exposed sedimentary coastlines. Though their main purpose is usually to address erosion hazards, they can also have secondary effects on flooding and gradual inundation hazards, depending on what they are designed to protect (Rosendahl Appelquist and Halsnæs 2015). The structures fix the location of the shoreline and help limit damage to vulnerable back-beach environments. They do not, however, address sediment deficits, which are the root cause of erosion.

Structures are typically installed on the seaward edge of coastal features vulnerable to erosion, such as dunes and soft cliffs. They are usually built from rock armour, dolos, tetrapods, asphalt blankets or gabions, and designed as sloping permeable structures where waves break on their seaward face, which maximizes energy dissipation in the gaps between each structure (Masselink and Hughes 2003). Revetments are often combined with other protection measures, including breakwaters, groynes, beach nourishment and dikes.

Environmental Benefits

- Limits interference with longshore sediment processes and can maintain coastal stability while still allowing some natural coastal processes to occur.
- Combines with soft engineering approaches such as beach nourishment to maintain the natural coastal appearance.

Socioeconomic Benefits

- Provides a robust, long-lasting structure that fixes shoreline location in a similar way to the use of seawalls. Use can be critical for the protection of dunes, cliffs, dikes or seawalls from wave action.
- Applies alongside other adaptation responses such as seawalls and dikes as toe protection and minimizes wave reflection at the seaward side. The structures have also been shown to contribute to beach nourishment, which addresses the root cause of shoreline erosion.
- Makes it possible to incorporate a promenade in the structure to improve amenity value, even though it can impair beach access. Access points can also be built into the structure to allow recreational beach use without significantly reducing its function.

Opportunities and Barriers

Opportunities:

- Large rock revetments will typically have a longer life than those constructed of gabions, and are also likely to have lower maintenance requirements
- The structures are relatively simple to construct and do not cause major interference with longshore sediment transport
- They are strong structures that can be used for long-term coastal stabilization (provided they are constructed and maintained properly).

Barriers:

- While they are effective at dissipating wave energy and therefore reducing erosion, they do not address its root cause, which is sediment loss
- Because revetments are static structures, they conflict with natural coastal dynamics and may cause accelerated erosion of adjacent unprotected coastlines
- They can be difficult to build due to construction costs, material availability, and lack of data for the initial design

Implementation considerations*

Technological maturity:	4-5
Initial investment:	3-5
Operational costs:	1-3
Implementation timeframe:	1-3

* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:
Technological maturity: 1 - in early stages of research and development, to 5 – fully mature and widely used
Initial investment: 1 – very low cost, to 5 – very high cost investment needed to implement technology
Operational costs: 1 – very low/no cost, to 5 – very high costs of operation and maintenance
Implementation timeframe: 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity
This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

Sources and further information

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