

Groynes

Challenge: Sea level rise

Adaptation response: Built infrastructure for shoreline protection

Description

Groynes are narrow, shore-perpendicular hard structures designed to interrupt longshore sediment transport by trapping a portion of the sediment that would otherwise be transported alongshore. By doing so, groynes help to build and stabilize the beach environment. Groynes are generally solid, durable structures and are considered a hard-engineering protection measure.

Groynes are normally built on exposed and moderately exposed sedimentary coastlines to address erosion hazards. They can be constructed from a wide variety of materials including rock armour, concrete, dolos, tetrapods, steel piling and hardwood timber.

Implementation

Groynes have traditionally been constructed of hardwood timber, but in recent years, those made from rubble rock are more widely used. The rock versions have greater energy dissipation characteristics and are more aesthetically pleasing in relation to the surrounding landscape. Groynes are often in fields, which allows longshore drift while retaining a sufficient volume to minimise erosion.

The ideal groyne field allows sediment to accumulate and eventually bypass the buried groynes without causing significant down-drift erosion. However, this is rarely achieved due to a lack of data on wave climate and long-shore sediment transport rates (Davis Jr and Fitzgerald 2004).

Environmental Benefits

- Fosters beach widening, which helps maintain an attractive beach environment that is valuable for recreation and tourism. This is particularly the case when applied along with beach nourishment.

Socioeconomic Benefits

- Traps sediment, leading to beach widening, reduced erosion and greater wave energy dissipation.
- Serves as a robust structure (if designed and maintained properly) that can be used for long-term stabilization of coastlines used for societal activities.

Opportunities and Barriers

Opportunities:

- They can be combined with a number of other approaches, including beach nourishment and hard engineering measures
- They have been widely applied around the world for many years and consequently there is broad global experience with their design and construction

Barriers:

- Though they effectively trap sediment, using them in conjunction with artificial nourishment only fills the beach area between them and reduces positive impacts on coastlines down-drift

- Problems can occur from formation of rip currents adjacent to groynes. This presents a hazard to bathers and other users, and may lead to sediment loss from the coastal system, with it being transported to deep water during storm events (Masselink and Hughes 2003)
- They can negatively impact coastline appearance due to their unnatural, shore perpendicular structures

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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