

Coastal management engineering options and strategies

Coastlines naturally move and change in response to coastal processes. However, erosion over time can change the profile of the coastline and cause issues to the land behind it. The coastline therefore needs to be managed and protected from the relentless pressures imposed by the sea. This document summarises the different options and approaches for coastal management, explaining the engineering options, along with the advantages and disadvantages of different beach management strategies.

Soft engineering vs hard engineering

Soft engineering options are often less expensive than hard engineering options. They take a more sustainable and natural approach to managing the coast and therefore have less impact on the environment. They are usually more long-term and may incur less upfront cost.

Hard engineering options involve building artificial structures which try to control natural processes. They tend to be expensive and may also have a high impact on the landscape or environment.

Each engineering strategy has its advantages and disadvantages and the best type to use can vary on a case-by-case basis.

Soft engineering strategies

Beach nourishment

Sand is pumped onto an existing beach to build it up / replaces beach material that has been removed by erosion or longshore drift.

Advantages

Blends in with the existing beach.

Larger beaches appeal to tourists.

It is relatively inexpensive in the short-term.

Disadvantages

Needs to be constantly replaced/maintained and at a cost.

The sand has to be brought in from elsewhere.

Can damage biodiversity.

Reprofiling

The sediment is redistributed from the lower part of the beach to the upper part of the beach.

Advantage

Cheap and simple.

Reduces the energy of waves.

Disadvantages

Only works when the wave energy is low.

Needs to be repeated continuously.

Dune management

Marram grass planted on sand dunes stabilises the dunes and helps to trap sand to build them up.

Advantage

Relatively cheap.

Maintains a natural looking coastline.

Disadvantages

Can be damaged by storm waves.

Areas have to be zoned off from the public.

Managed retreat

Managed retreat is allowing the flooding of low-lying coastal areas. Usually this will be areas considered to be of low value – e.g. places not being used for housing or farmland.

Advantage

This is comparatively cheaper than paying for sea defences.

Creates a salt marsh which can provide habitats for wildlife and act as a natural defence against erosion and flooding. Salt marshes are diverse ecosystems supporting many species.

Encourages development of beaches which are natural defences.

Disadvantages

Land is lost as it is reclaimed by the sea.

Hard engineering strategies

Sea walls

Concrete and granite walls that are placed on areas of exposed coastline to prevent erosion. Some are curved to reflect the energy back into the sea.

Advantages

Effective at protecting the base of the cliff, or the land behind. Can prevent coastal flooding in some areas.

Sea walls sometimes have promenades so people can walk along them.

Disadvantages

Waves are still powerful and can break down and erode the sea wall.

A vertical structure with an area of high energy can result in loss of materials from the beach.

Expensive to build. Curved sea walls reflect the energy of the waves back to the sea. This means that the waves remain powerful. Over time the wall may begin to erode. The cost of maintenance is high.

Aprons

Aprons are usually added to a seawall to protect the foot of the seawall.

Advantages

Protects against damage to the wall.

Can dissipate incoming wave energy.

Disadvantages

Vertical aprons can cause a reduction in beach levels in front of a structure, which increases the chances of undermining (loss of material from beneath the structure).

Loss of beach area.

Rock armour

Large boulders placed at the foot of a cliff. They break the waves and absorb their energy.

Advantages

Cheaper than a sea wall and easy to maintain.

Can be used for fishing.

Absorbs wave energy.

Disadvantages

Loss of beach area.

Can be expensive to obtain and transport the boulders.

May lose aesthetic appeal of the beach area.

Gabions

Rocks are held in mesh cages and placed in areas affected by erosion.

Advantages

Cheap.

Absorbs wave energy.

Disadvantages

Not very strong.

Looks unnatural.

Groynes

Wooden or rock structures built out at right angles into the sea.

Advantages

Allows the build-up of a beach. Beaches are a natural defence against erosion and an attraction for tourists.

Prevents the movement of beach material along the coast by longshore drift.

Disadvantages

By trapping sediment, it starves beaches further down the coastline, increasing rates of erosion elsewhere. The structures increase the amount of material collected on the beach and may need continual, long term management.

They look unattractive.

Costly to build and maintain.

For more information contact coastaldefences@gov.gg.