Cliff stabilisation

European Environment Agency

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Adaptation option

Cliff stabilisation (2015)

Coastal cliffs can be differentiated according to their morphology and structure: cliffs can be loose – sand, silt, clay, marl and chalk – or hard, made of limestone, sandstone, granite or other rocks. Loose cliffs are more prone to erosion and landslide than rocky cliffs, more characterised by rockslides or block fall. Cliff erosion in coastal areas is almost always the result of structural erosion, resulting in a gradual retreat of the coastline because the amount of sediment that eroded (rocks, cobbles or sand) exceeds the amount deposited.

Coastal cliff stabilisation techniques are 'green' measures to reduce cliff erosion and its consequences – landslide, collapse, falling of rocks – compared to cliff strengthening techniques that are 'grey' measures (these are described in a separate fact sheet). In practice, the two approaches are often combined. Stabilisation techniques include methods to increase the stability of the slope and measures to reduce marine erosion at the foot of the cliffs:

- Littoral strip reloading: compensate littoral imbalance caused by marine erosion by placing sand or pebbles at the foot of the cliff. Littoral strip reloading is similar to beach nourishment (see the separate fact sheet). It is generally suited for areas with insufficient littoral transit.
- Re-vegetation: managing existing vegetation to regain damaged areas or establishing a vegetation cover on the slope to limit the risk of instabilities. This can be applied by creating forested berms or water draining ditches. The nature of the vegetation planted varies according to the level of instability of the slope. On very mobile slopes, fast growing and deep rooted species are preferred as they grasp the soil and prevent movement. On more stable slopes, a plant ground-cover can be effective as it acts like a protective skin. This technique is particularly suitable to loose rocky cliffs and sandy cliffs.
  These techniques are usually combined as revegetation alone is only a short term solution, which does not stop the erosion of the coastline. If structural erosion is not countered it will eventually lead to the steepening of the cliff and negate the effects of stabilisation measures.

Additional Details

- Life Time

Reference information

- Websites
- Source

Adaptation Details

Category
Green

Stakeholder participation

If a project creates a significant impact on a Natura 2000 site, the required 'appropriate assessment' (see legal aspects, below) can include a public participation process, though this is not mandatory. Moreover, public participation may be required under national procedures.

Success and Limiting Factors

Littoral strip reloading:

- Reloading sand cliffs limits erosion and has a stabilising effect for the foot of the cliff. It does not impact landscape.
- This technique has similar shortcomings as beach nourishment: a good quality sand or pebbles matching the characteristics of the original is needed, the source area must be sufficient and close enough from the area to reload, repeated reloading is usually required as it does not stop ongoing erosion.

Revegetation:

- Revegetation is an effective technique to prevent movements on the slope as it encourages the accumulation of sediments, and runoff water. It has little impact on landscapes and is usually supported by littoral users. However, vegetation will only stabilise the upper layer of sediments.
- Revegetation usually can only be applied to small areas.
- The type of vegetation planted has to be chosen carefully according to the nature of the soil or the rock surface. Local species can be preferred as they are more suited to the soil and the general visual aspect of the landscape.
- If not well managed, the growth of the roots can have the reverse effect of causing instability by causing rock fracturation.
- Revegetation alone will in most cases be only a short term solution, as structural erosion will significantly diminish its benefits, unless littoral strip loading is simultaneously applied.

Costs and Benefits

The benefits of cliff stabilisation techniques must be balanced with the costs of the measures. Letting the cliff erode has been considered in some areas as more cost-efficient than stabilisation or reshaping measures. In Norfolk and East Anglia (UK), a policy of 'no active intervention' for some small communities has been adopted through the Shoreline Management Plan, after cost-benefit analyses indicated that compensation costs for residents were lower than active management

measures.

Legal Aspects

If a project would create a significant impact on a Natura 2000 site, an 'appropriate assessment' of its implications for the site will be required. Certain types of cliffs are considered as habitats of community interest under Annex 1 of the Habitat Directive. In some cases, cliff stabilisation projects could be part of the management plans for Natura 2000 sites with these habitats. Additional national legislation may apply, such as permitting requirements.

Implementation Time

Variable.

Life Time

Variable.

Reference information

Websites:

http://www.eacg.org.uk/default_smp.asp

Source:

Fact sheet provided by the OURCOAST II Project

Share your information

Keywords

Cliff, coast, littoral realoding, re-vegetation

Sectors

Coastal areas, Disaster Risk Reduction

Climate impacts

Storms

Governance level

Local (e.g. city or municipal level)
Sub National Regions

Geographic characterisation

Global

Case studies related to this option

Addressing coastal erosion in Marche region, Italy