

Coastal management – What are the options?

Our thoughts about the suitability of different types of coastal management have changed over time. The full spectrum of options is listed in *Table 1*, together with some examples. **Hard engineering** (e.g. seawalls) with its high construction and maintenance costs is only used where there is no choice but to protect valuable buildings or business.

So-called **soft engineering** tries to cope with coastal processes using techniques like beach nourishment. It has lower costs and often some environmental benefits. Very few strategies are truly **sustainable** or future-proof, and currently tend to be small scale or only tried where land values are low.

Table 1 The spectrum of Coastal Management options.

Strategy	Purpose or description	Strengths	Weaknesses	Yorkshire coast examples
HARD ENGINEERING	<i>This approach involves CONTROL. Traditionally (Victorian) used to overcome natural processes</i>			
1. Cliff-foot strategies	To protect the beach from sea erosion			
Sea walls	Massive, made of rocks or concrete, used to absorb waves. Some types can act as Baffles	Traditional solution to protect valuable resources, high-risk property or densely populated areas	Very costly, foundations easily undermined if built on beaches, or where LSD operates	Holiday resorts, e.g. Hornsea and Withernsea
Revetments	Massive, made of concrete, used to reflect rather than resist waves	As above though relatively cheaper	Costly and do not cope well with very strong waves	Easington gas terminal
Gabions	Wire cages holding smaller rocks	Cheaper version of above	Relatively lightweight and small scale solution	Skipsea
Groynes	Rock or wooden types, hold beach material threatened by LSD erosion	Low capital costs and repaired relatively easily	Need regular maintenance. Cause scour downdrift and have wider impacts	Hornsea, Withernsea and (famously) at Mablethorpe
Offshore bars (artificial reefs)	Reduce power of waves offshore	Mimic natural bars and reefs. Can be built of waste material	Possible ecological impacts and may not work at large scale	Only used as small scale pilot study so far
Rip-rap (rock armour)	Very large rocks in front of sea walls or cliffs to absorb waves	Effective and prevents large-scale undermining	No longer a relatively cheap option. May move in severe weather.	Withernsea and Easington
2. Cliff-face strategies	To reduce damage from sub-aerial erosion			
Cliff drainage	Removal of water prevents landslides and slumping	Cost effective	Drained cliffs can dry out and lead to collapse (rockfalls)	Small scale project at Easington
Cliff regrading	Lower the angle of cliffs to stabilise ground	Works on clay or loose rock where little else will	Retreat of cliff line uses up valuable land	Mablethorpe
SOFT ENGINEERING	<i>This approach involves ACCOMMODATION, working with natural processes</i>			
Beach nourishment	Sand pumped or transported to replace losses by LSD	Appears 'natural looking' process	Expensive and may soon erode. Possible ecological effects	Hornsea and Mablethorpe
'Do nothing'	Land no longer worth defending	Saves expenditure on defence	May allow problems to get worse.	Neck of Spurn head
'Red-lining' or zone management	Withdrawal or prevention of planning permission for new development	Cost effective in long term	Unpopular with residents and business. Politically tough	
SUSTAINABLE MANAGEMENT	<i>This approach involves ADJUSTMENT, working to secure the future of a coastline</i>			
'Managed retreat'	Incentives given through grants/buyouts to encourage re-location and 'set-back' schemes	Cost effective (as it saves construction costs) in longer term. May help reduce tides in estuary environments	Difficult to argue politically if residents involved	Suggested in 1994 for Hornsea but not implemented. Ideal for estuary around Sunk Island.
Coastal resilience (ecosystems)	Partial flooding allows salt marsh and wetlands to adjust to sea water. Allowing erosion in some places helps sand dunes develop in others	Very cost effective and environmentally valuable. Allows conservation of bird life especially	Loss of agriculturally productive land. Does this work on a large scale?	Plans to flood Sunk Island and plant in sand dunes south of Hornsea
Shoreline management plans	Detailed consultation getting local groups to work together to find best solution for each littoral sub-cell	Solutions tailored to specific places and particular needs of local community	May be seen as delaying tactic by those who want action now	Applied to coast further north in the Scarborough and Whitby areas