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.

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