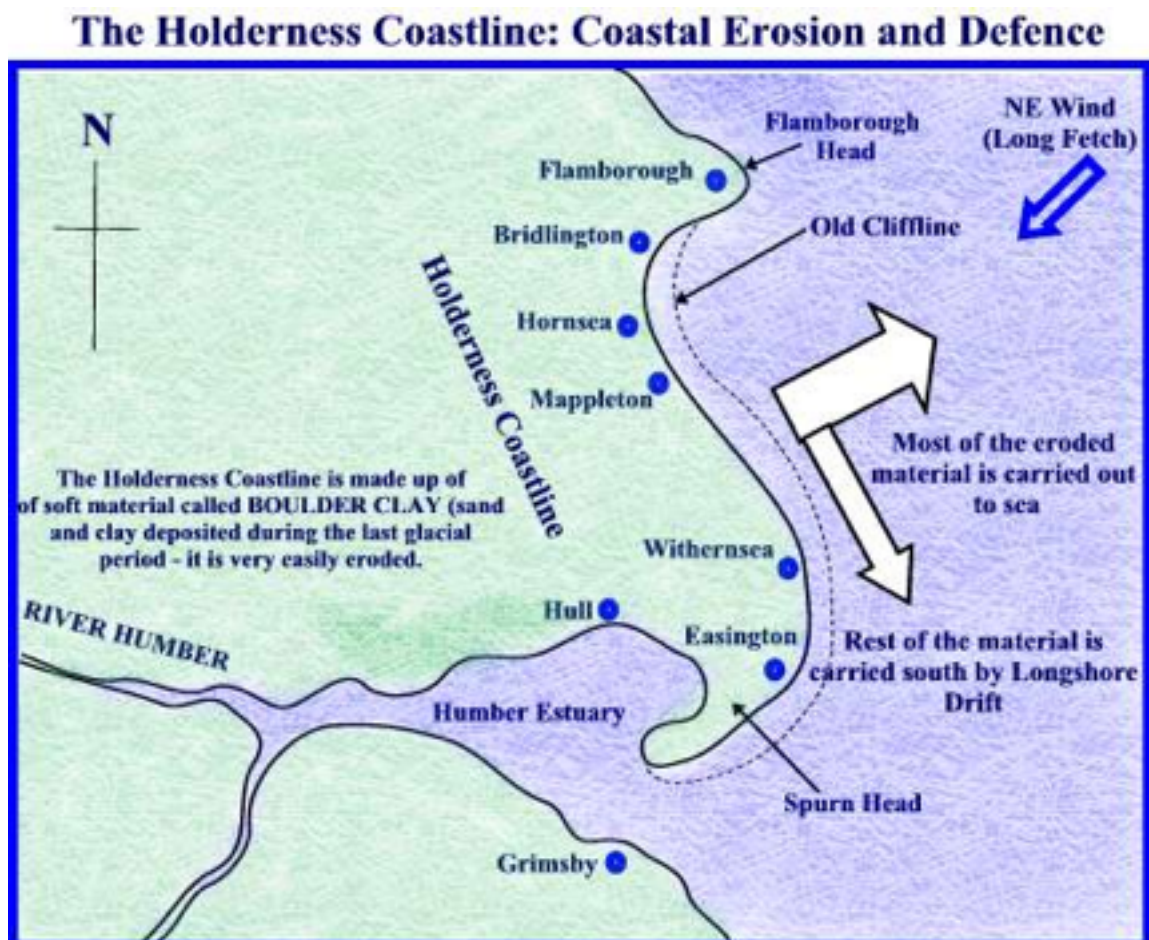


Case Study of Coastal Erosion - Flamborough Head and Holderness Coast

Background and the Problem of Erosion

- The Holderness Coast is on the **NE coast** of the UK, facing the North Sea.
- It extends 60km from Flamborough in the north to Spurn Point in the south.
- Coastline mainly made up of cliffs (20-30m high), made of **soft, easily eroded boulder clay**.
- Where the cliff line meets the Humber Estuary, a spit has formed due to the change in the direction of the coastline - **Spurn Head**.
- The **cliff line is retreating** at an alarming rate - greater than 1.5m/year (fastest rate in Europe) around 2 million tonnes of material every year
- 4km of land have been lost since Roman Times, including villages + farm buildings
- **Easington Gas Station** (N Sea Gas terminal) is located on cliffs top, its position under threat.

- **Spurn Point**, a spit in the S, is increasingly at risk (erosion) and is 5km long and covers 1.5km²
- Spurn Point is important to protect from erosion, because it is a designated **National Nature Reserve, Heritage Coast and Special Protection Area**.
- The landward-side **mudflats** are an important **feeding ground** for wading birds
- The **RNLI lifeboat station** at Spurn Point, built in 1810, is very important for the safety of shipping in the area and is at a vital location along the **Humber Estuary**, which is a busy shipping route.
- **Humber Vessel traffic service** located on the spit, operates 24-hour service for river users.
- major function is to monitor and regulate navigation of those parts of the Humber Estuary and Rivers Ouse and Trent.



Causes of Coastal Erosion

Physical Causes:

Beaches:

- Only **narrow beaches**, so there are no beaches to reduce the erosive power of the waves.
- The chalk headland of **Flamborough Head prevents transport of materials** from the north, thus little beach material is transported southward to the beaches of Holderness.
- Coast is subject to full force of the waves from the North Sea with little reduction in wave energy before they reach the cliff line
- The sea is continually able to reach the base of the cliff

Lithology:

- Lithology: cliffs made up of **boulder clay** and **chalk** - both easily eroded by abrasion and hydraulic action and are non-resistant
- This boulder clay is also **prone to mass movement** in the form of landslides and rotational slumps, when the rock becomes saturated
- The chalk rock has **many joints and bedding planes** which are easily eroded by wave action to form caves, arches and stacks on the headland

Powerful Waves:

- **Powerful destructive waves** often attack the coast, as the waves have a **long fetch**, all the way across the Arctic Ocean, allowing them to build up energy as they are blown by the wind.
- The coast also **faces the dominant wind and wave direction** (from the NE), so most powerful waves have little to reduce and dissipate their energy before they erode the cliffs
- **Frequent storms** from the NE provide the most powerful wave action
- Tides **carry away sediment** from the North to the South where it is deposited.

Rising Sea Levels:

- Increasing volume of water in the oceans, **greater power to erode** the coastline
- Allows water to reach further inland without losing as much energy, allows greater erosion of retreating cliff faces.

Human Causes:

Beaches:

- Beaches are also kept narrow due to **coastal defences**, such as the groynes at Hornsea, **starve down-drift beaches of sediment** resulting in thinner and narrower beaches which don't protect cliffs as well, greater rate of erosion

Offshore Dredging:

- **Dredging reduces the amount of sediment** available to build up beaches, nearly 4 000 000 tonnes of material was removed during 2000 under licence
- It is thought that unlicensed dredging occurs closer to the shore, which would have an even worse effect than licenced dredging occurring further offshore.

Development:

- Many settlements + buildings built, due to low value of land, on **areas at risk** and are now at threat from erosion, worsening the effect of erosion and increasing loss of infrastructure.
- **Building** on cliff tops has **increased runoff** and may have made the **cliffs more unstable**

Consequences of Coastal Erosion

Social Impacts:

- **Property prices** along the coast have **fallen sharply** for those houses at risk from erosion
- Around **30 villages** have been lost since Roman times
- People have **lost homes** to erosion; farmers have **lost farmland** and a **dairy farm** has been lost
- Loss of homes leaves home owners with **negative equity** (their homes are worth much less than they paid for them or still owe on mortgages)
- **Difficult to get insurance** or a **mortgage** for housing
- People **cannot afford to repair** or even demolish damaged property

Economic Impacts:

- 80 000m² of good quality farmland is lost each year, huge effect on farmers' livelihoods
- **Visitor numbers dropped** in Bridlington by over 30% between 1998-2006
- Many coastal towns (such as Mableton, Bridlington and Hornsea) **rely on tourism** for income, should these towns not be protected from erosion using expensive coastal protection schemes, their **trade would diminish** and **facilities would close down**.
- With loss of jobs, the **migration of young people** from these coastal towns and villages to areas with higher employment is more likely
- **Shops + schools will close** as there is little or no new investment to sustain local communities

- Many caravan parks are at risk from erosion eg. **Seaside Caravan Park** at **Ulrome** is losing an average of 10 pitches per year!
- **Loss of infrastructure** (roads, communications, houses, drains), still losing at fast rate.

- £2 million was spent at Mableton in 1991 to protect the coast: involved building 2 rock groyne, 500m long rock revetment, cliff reprofiling (prevents slumping)
- Many settlements **have had to install expensive hard engineering schemes** to prevent the retreat of cliff edges into settlements (eg. in Withernsea, a **sea wall with rip-rap** has been installed to protect the tourist town)
- Newly built **defences will impact on other areas** of the coast
- **Existing coastal defences have been damaged** by increasing erosion, for example the wooden groyne at Mableton have been severely damaged by erosion by wave action.

- The **Gas Terminal** at Easington is at risk (only 25m from the cliff edge), important energy source as it supplies 25% of Britain's gas supply

Environmental Impacts:

- SSSIs (sites of special scientific interest) are threatened
- eg. **The Lagoons** near **Easington** are part of an SSSI and has a colony of over 1% of the British breeding population of **little terns**
- Lagoons are separated from the sea by a narrow strip of sand and shingle, erosion of this would connect the lakes with the sea, and the Lagoons would be lost.
- **Freshwater mere** at Hornsea - problems with occasional sea water inundation due to breaching of existing flood defences have arisen
- **Dunes and wetlands** at Spurn Point are also threatened