

PHYSICAL



HUMAN



- **IDEA QUESTION**

Do the wooden groynes at Hornsea indicate the direction of longshore drift on the Holderness coast, and does the sand help defend the coast from erosion?

- **THEORY / HYPOTHESIS**

Hard coastal engineering, through groynes, builds up sand on the updrift side of the groyne, preventing longshore drift from removing sand to the south. This builds up a larger wave energy absorbing beach.

- **WHERE / WHY**

Hornsea on the Holderness coast of Yorkshire has several wooden groynes, this is to protect the town/resort, and provides a large sample size. The beach is wide, gently sloping and relatively safe.

- **DATA NEEDED**

The distance from the top of the groyne to the surface of the sand at 2m intervals out to 20m for a sample of groynes.

Wave direction data from the Hornsea Buoy to relate to wave approach on the beach.

- **DATA COLLECTION (PRIMARY / SECONDARY)**

- Primary : A ruler was used to measure the distance from the top of the groyne to the surface of the sand each side of the groyne (north and south), at 2 m intervals out to 20m (sample size 10).

This is a systematic sampling system, and it was undertaken on 10 groynes chosen for convenience.

- Data was collected at low tide (using tide tables - a secondary source) and the weather forecast (secondary source) was investigated to help inform staff and students about clothing choices.

- Risk assessment : Weather forecast gave information on wind/rain, all students wore warm, waterproof clothing and footwear, wind data informed about the possible storminess and height of waves (danger).

- Secondary : Coastal Explorer website gave access to the Hornsea Buoy wave data to determine the prevailing wave approaches.

• **DATA PRESENTATION**

- For each groyne the average distance from the top of the groyne to the surface of the sand was calculated for the north and south sides.
- The average for north and south sides were calculated for all groynes.
- Located proportional bars were drawn on a map of the beach and groynes to illustrate the build up of sand on each side of the groynes.
- Dispersion diagrams were drawn for each groyne (north and south sides) to show the median distance of the sand below the top of the groyne. The diagrams also showed the spread of data on the north side compared to the south (inter-quartile range).
- A rose diagram drawn from the Hornsea buoy wave data to determine the dominant wave approach direction.

• **DATA ANALYSIS**

- The average distance form the top of the groyne to the surface of the sand was compared for the north and south sides of the groynes, to see if sand is accumulating more on the north side of the groynes, indicating longshore drift is predominantly from north to south. For example :-
- | | | | | | | | | |
|----|----------|------|-----------------|------|--|------|-------------|--|
| | groyne 1 | | groyne 210 | | | | all groynes | |
| | N | S | N | S | | N | S | |
| av | 15mm | 25mm | 12mm | 28mm | | 14mm | 26mm | |
- The median distances to the top of the sand from the top of the groyne compared for the north and south sides, bearing in mind that this measure ignores odd, extreme values.
 - The range of data (inter-quartile range) fro north and south sides of groynes compared.
 - Mean wave approach calculated from the Hornsea buoy data to see if it fits with the observed longshore drift direction.

• **RESULTS**

- You will need to add your own results from the data that was collected.
 - More sand accumulated on the north side of the groynes.
- North side average / mean mm top of groyne to sand
- South side average / mean mm
- North side median mm
- South side median mm
- The dominant wave approach using the Hornsea Buoy data was NNE to NE, the same direction as the longest fetch.

- **CONCLUSIONS (RELATE TO IDEAS/ QUESTIONS / HYPOTHESIS)**

- The dominant direction of longshore drift is from north to south as more sand is piled up on the north side of the groynes indicating that the groynes are impeding longshore drift and building up the beach.
- This coincides with the dominant wave approach which is from the north north east and north east.
- Hard engineering (wooden groynes) is an effective way of preventing longshore drift from north to south to some degree, to build up a more substantial beach that will absorb more wave energy and prevent coastal erosion.

- **EVALUATION (OF ALL THE ABOVE) STRENGTHS / WEAKNESSES**

- Strengths :-
- A large sample of 10 groynes was chosen so that the data collected had more credibility.
- Using the systematic sampling system of every 2 metres up to 20 metres showed less bias and was again a relatively large sample of 10 on each groyne.
- The data collection techniques was simple, easy to learn and use meaning there was less chance of error between the groups of students.
- Wave data from the Hornsea buoy was looked at for the whole year and over several years to produce a reliable measurement of the dominant wave approach.
- Using both medians / dispersion diagrams as well as means for the distance from the top of the groynes to the sand surface excludes odd extreme values from the calculation and allows the spread of data to be examined.
- Using located bars on a map to show the height of the sand at each groyne enabled variation in the effectiveness of groynes along the beach to be studied.
- Weaknesses
- The groynes were in different states of disrepair and in places it was difficult to assess exactly the top of the groyne.
- Only 10 of the groynes were measured, and the 10 that were measured were chosen for pragmatic / convenience reasons rather than through a sampling system.
- The measurements were taken on only one day in one season which gave no insight into the season variations that might occur in longshore drift, drift direction and sand accumulation.