Hypothesis:
The coastal management techniques along the Cleveleys promenade are effective.

Theory:
Longshore drift acting along the Fylde coast is taking away the beaches, the beach acts as a natural barrier to erosion and therefore Groynes are put in place to protect them. Sea defences often change depending on the land use behind them.

Location/Background:
Cleveleys is located along the Fylde coast and has facilities and beaches that would attract tourists. It’s close proximity to Blackpool (to the south) makes it an ideal spot for people stopping overnight.

Cleveleys was an ideal spot for our fieldwork as it has an easily accessible beach, it has a variety of coastal defences, small area of coast to study and is close to the school for access.

Methodology and Justification:

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
<th>Justification</th>
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</thead>
<tbody>
<tr>
<td>Groyne height</td>
<td>We measured the difference in the height of the sand to the top of the groyne on both sides, we did this at 5 meter intervals at 3 different types of groyne.</td>
<td>To see if there is a difference in the amount of sand deposited on either side of the groyne, as this would indicate if it is preventing longshore drift.</td>
</tr>
<tr>
<td>Bipolar survey</td>
<td>A personal analysis of the sea defences scored on eight different criteria e.g. Vulnerability to erosion. Scores from -2 to +2.</td>
<td>To enable us to differentiate between the different management strategies and evaluate their effectiveness.</td>
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<tr>
<td>Land use transect</td>
<td>Walked along the beach to see how the land use behind the sea defence change, we categorised the building into different categories e.g. Leisure, Hotel etc.</td>
<td>To see if the sea defences are different for different types of land use.</td>
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Strengths and Weaknesses of the Methods

<table>
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<tr>
<th>Method</th>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>Groyne height</td>
<td>Easily accessible to measure the height of the sand, lots of sample opportunities</td>
<td>Rock groynes were more difficult to measure than wooden as the top could not be clearly identified</td>
</tr>
<tr>
<td>Bipolar survey</td>
<td>The eight different categories were easy to follow and provided qualitative data.</td>
<td>Life expectancy was hard to measure without visiting the area again to see changed.</td>
</tr>
<tr>
<td>Land use transect</td>
<td>Land use map provided clear division between the buildings and each building was in clear sight</td>
<td>Determining between low, medium and high density residential buildings.</td>
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Risk assessment

1 - Tides - consult tide timetables, particularly along cliff sections, headlands and wide beaches. Every year people get cut off in this way.
2 - Avoid walking near the sea. Students warned of this and kept well away from sea and when moving staff can observe the whole beach.
3 - Watch out for and avoid slippery rocks on the foreshore at low tide. Students advised to wear sensible footwear and warned of the risks.
4 - Weather - cold/windy weather. Students advised to bring warm clothing and sensible footwear.

Data presentation

How did you present your results, why where they useful?

- Groyne - We plotted graphs either side of an aerial sketch of the groyne, we then graphs the results as bar graphs on either side (one for the north, one for the south) at 2 cm intervals. This was useful because it is a very visual way to see height changes and you can compare several heights at once.
- Radar diagram - We plotted the results of the eight different characteristics on a radar diagram and used 3 different colours to represent the defences. It was useful as it allowed us to plot several different variable at once and was a very visual way to compare them and identify strengths and weaknesses.
- Pie chart - We added up the results from a land use map and produced a pie chart. This allowed us to see the differences in the proportion of different land uses.
**Results:**

*Use your data to describe your results*

**Groyne data** - The general trend was that the on all three groynes the south side is higher than the north side. For example, on groyne 1, there is a difference of 25cm between the north and south side, the south side being taller. However there were a few anomalies, further down groyne 1 the north side measure 12cm higher which was outside the original trend.

**Bi-polar survey** - From the results of the bi-polar survey we could see that the sea walls were ranked as the most effective, scoring an average of +1 and there was little differences between the rock and wooden groynes, and scored an average of 0. Looking at ‘vulnerability to erosion’ we can see this difference as the sea wall scored +2 compared to the wooden groyne scoring 0.

**Land use survey** - We found that mid density housing is the largest proportion at 35%, low density housing and high density housing were the second largest proportions at 20% each. We can also see that offices are least common as they have smallest percentage at 8%.

**Conclusion:**

*Are the coastal defences at Cleveleys effective? If so why? If not, why not? Use evidence to back it up!*

Having analysed the results we can see that the sea defence at Cleveleys are effective at preventing coastal erosion. Longshore drift is evident in the area, and this was shown when undertaking the groyne study. An average difference of 25cm between the south and north side shows that sediment is being trapped. This is effective because the beach will act a natural barrier to coastal erosion and therefore protect the land behind it, also this will have a secondary impact on the local area as the beach could act a possible tourist destination and boost the local economy. We did come across some anomalies where the there was a difference in groyne height, this was most noticeable on older groynes which were further away from the town centre, and seen as less of a priority. Cleveleys has a variety of sea defences, and our bi-polar survey allowed us to easily compare the effectiveness of them. Our results indicated that the sea wall most effective, as it was less vulnerable to erosion, had a longer life expectancy and had greater protection to flooding, whereas the wooden groyne was more vulnerable and had less protection to flooding. This links to our land use survey as we found that more of the higher value properties were protected by a new sea wall and the lower value and green space was protected mainly by wooden groynes, therefore the sea wall must be effective at providing protection against the sea as the higher value properties could result in the loss of millions of pounds for the local area.

**Interpretation:**

*Explain what your results show, give reasons for the trends/patterns*

**Groyne data** - As the south side measured a higher height we can assume the direction of longshore drift is moving from the south to the north and that the groynes are effective at trapping sediment and building up the beach which will act as a natural sea defence to the waves. The anomalies could be due to a lack of maintenance of the groynes, which was evident the further away from the town centre we went.

**Bi-polar survey** - The results show that sea wall is the most effective and would be the best method of coastal defence. The rock groyne scored the middle score and the wooden groyne scoring the lowest by a margin. Reasons for these differences come down to the construction of the sea defences, a sea wall made out of concrete is much more effective at providing protection than groynes as it is made out of stronger material, it can also reflect wave energy back out to sea. Rock groynes have the slight edge over wooden groynes as they will have a longer lifespan and be more resistant to the waves. However, without regular maintenance the groynes can be an ineffective defence as the sand at the high water mark can cover the groyne and longshore drift will not be prevented.

**Land use survey** - The results show that mid and high density housing are the most protected areas along the coastline, but are mainly protected by an older sea wall. The newer sea wall is protect more leisure and tourism facilities, for example, the 'vue cinema' which would be more high value to the local economy. This multi-million pound development of the coastline therefore requires more protection.

**Evaluation:**

*Explain how problems with your methods could affect the validity of your results and conclusions.*

**Groyne study** - Rock groynes were difficult to measure as the top was not always clear due to the nature of the defence. This could affect my results as the data could not be reliable and therefore the effectiveness of the defence may be more or less. Therefore inaccurate results could affect my conclusion that the defence are not effective whereas the results show that they are.

**Land use survey** - It was hard to distinguish between certain categories, some building were not clearly identifiable and therefore could of resulted in different proportions of land use. This could have affected my results as these high value properties could be protected by less effective sea defence methods and therefore the defences at Cleveleys would not be effective.

**Bi-polar survey** - The survey was subjective and relied on individual opinion (qualitative data) rather than numerical (quantitative data) some of the measure such as life expectancy were hard to rank and peoples opinion on the look and effectiveness could vary. This would have affected my results as some of the defences could be ranked as effective and long life, whereas quantitative data might have shown it to be ineffective.

**Explain 2 ways that the reliability of your results and conclusions could be improved**

**Groyne study** could have been improved by repeating the tests again to see changes over time as this will allow us to see how much the beach is changing and give us a more accurate picture of how well the groynes are trapping sediment and the extent of longshore drift.

**Bi-polar survey** could have been improved by collating every pupils results and gaining an average so that the results are not as subjective and become more reliable and also use a benchmark or examples to compare with.