Session Plan - Changing coastline (KS1 & KS2)

This session lasts one hour and is suitable for a maximum of fifteen children.

Learning outcomes

- Children understand that the coast is dynamic and constantly changing through three main processes: erosion, transportation, deposition
- Children understand that this change requires energy inputs and reflect on where the energy comes from
- Children understand that changes in the coastline interact and conflict with human interests
- Children understand that coast management decisions must balance natural changes in coastline, human needs and the amount of money available

Personal Development Outcomes

- Children feel empowered to engage with the debate on coastal erosion and defence

Curriculum Links

KS1 – Geography

Pupils should be taught:

- 3c. to recognise how places have become the way they are and how they are changing
- 5b. to recognise how the environment may be improved and sustained

KS2 – Geography

Pupils should be taught:

- 1d. to identify and explain different views that people, including themselves, hold about topical geographical issues
- 3d. to explain why places are like they are
- 3e. to identify how and why places change
- 3g. to recognise how places fit within a wider geographical context
- 4a. to recognise and explain patterns made by individual physical and human features in the environment

- 4b. to recognise some physical and human processes and explain how these can cause changes in places and environments

- 5a. to recognise how people can improve the environment or damage it and how decisions about places and environments affect the future quality of people's lives

- 5b. to recognise how and why people may seek to manage environments sustainably, and to identify opportunities for their own involvement

Safety Considerations

Refer to relevant risk assessments for session and site. In particular bear the following points in mind:

- During two of the exercises children are encouraged to pick up stones from the beach. When doing so they must *only* pick up stones (no organic materials or materials of human origin). They may never throw stones and must be careful to put them down again carefully.

- Children are encouraged to run up the beach during some of the exercises. They must understand that they may never run towards the sea.

- Children must clearly understand that they may never be closer to the sea than the leader.

- Adults accompanying the group must ensure that children stay in a close group at all times and listen very carefully to the leader as communication on the beach can be very difficult.

Introduction

Explain the session to the group, covering safety considerations, especially those mentioned above. Explain that the children are going to act out the roles of the waves, the cliffs, the sea defences in order to understand the forces at work in our changing coastline.

Key information transferred via the role play activities

- The coastline is constantly changing.

- The changes require energy and the chief sources of energy that change the coastline are the sea, the wind and people.

- The sea's energy comes ashore in the form of waves. Further out than the breakers the water does not move towards the shore; it moves up and down in an oval shape and the energy moves through it. [To illustrate this the children can do a Mexican wave up the beach.]

- Waves are caused by the wind blowing over the surface of the sea. The energy of a wave increases with increasing distance of open water over which the wind blows. This distance is called the wave's fetch.

- When the waves strike the coast they can erode, transport or deposit materials. Erosion occurs in several ways and in Norfolk it's most obvious in relation to the cliffs which run from Weybourne (visible from Cley on a clear day) to Happisburgh.

- These cliffs (and much of the landscape of Norfolk) are made of rubble that was pushed here by an ice sheet up to 1,000m deep advancing from the north when the Ice Age began between 400,000 and 300,000 years ago. As a result they are soft and crumbly.

- When waves strike soft, crumbly cliffs they erode them. [To illustrate this, the children stand in lines of four, one line behind the next, facing the sea and two of the adults pretend to be waves, rolling up the beach and successively eroding the lines of children.]

- The materials dumped in the sea by the erosion of the cliffs, and others like them, are transported elsewhere by the waves and deposited.

- The main process by which materials are moved and deposited along our stretch of coast is called long-shore drift. It occurs because the prevailing wind onto the North Norfolk coast is from slightly to the east of due north. This means that the waves strike the shore slightly diagonally and continue flowing up the beach at the same angle. When they run out of energy they run straight down the beach, pulled by gravity. Thus there is a westwards movement of waves, and the materials they carry, round the coast. [To illustrate this, the children can act out the zigzag movement of the waves along the beach, each carrying a stone.]

- There is a tremendous amount of investment (money, businesses, homes, lives) on the top of the cliffs in Norfolk and the people who live and work there are very worried about erosion. They say something needs to be done.

- The things that can be done are:

    - nothing

    - managed retreat

    - resist change and hold the line

    - advance the line

- Building sea defences costs huge amounts of money so governments/authorities want to make sure they are going to protect more (in terms of investment) than they spend.

- Sea defences essentially work by deflecting the energy of the waves from the cliffs (sea walls, barrier reefs, revetments) or interrupting long-shore drift and forcing the waves to drop the materials they are carrying (groynes). By interrupting long-shore drift, they keep materials on the beach and this also indirectly removes energy from the waves making them less effective at eroding the cliffs. [To illustrate how waves run out of energy when travelling up the beach, the children can run from close to the sea to the top of the beach. To illustrate the role of groynes in stabilising beaches, the children can

stand in a line at right angles to the sea and interlink arms to form a groyne. The adults then try to carry stones past them, as long-shore drift would, but can't.]

- Sometimes, when onshore gales and very high tides arrive together, even sea defences can't resist the storm surge and in low-lying areas there are floods. This is becoming increasingly common with rising sea levels, causing authorities to reconsider their sea defence strategies. This is what has happened at Cley. In the past up to £40,000 a year has been spent on re-profiling the shingle ridge but it is clear that this is no longer sustainable. In November 2007 a huge storm came over the ridge, buried fences, flooded the reserve with salt water and destroyed Arkwright's café.

- Now the policy is to allow the shingle ridge to return to its natural profile because it is hoped that the broader expanse of shingle will remove sufficient energy from the waves to protect property further inland. The marshes may gradually become more saline and the new saltmarsh itself would act as a natural sea defence. [To illustrate this, the children can stand in a scattered pattern on the beach, imagining that they are a saltmarsh and in between them are the channels. The adults then pretend to be the waves but get lost, losing their energy, in the network of channels.]

Conclusion

Encourage the children to sum up what they have learned. Ask them whether they have changed their views on coastal erosion. Repeat that coastal erosion is a very complicated issue involving forces of nature, large amounts of money and people's homes and livelihoods.

<u>Updated 25/2/10</u>