

KS2 Circus Activity: Coastal Crumble

Topic addressed

This activity simulates the effects of wave erosion, transportation and deposition on a coastline.

National curriculum references

Geography KS2	6c	water and its effects on landscapes and people, including the physical features of rivers or coasts and the processes of erosion and deposition that affect them
Geography Scheme of Work	Unit 23	Investigating coasts

Pupil practical or teacher demonstration

Teacher demonstration with pupil input – could be run with small groups.

Time needed to complete the activity

15-30 minutes depending on extension, etc.

Preparation and set-up time

10 minutes.

Resource list

- Large tray e.g. cat litter tray or gratnell tray
- Washed sand
- Piece of wood (about 25cm x 12cm x 1cm), or a ruler
- A few marbles
- Wooden lolly sticks
- Small pebbles, approx 1cm diameter or less
- Water
- Gravel (extension)

Activity

- Set up a large tray with sand and water and fix it at a low angle (see photo).
- Make a beach using the washed sand.
- Use a piece of wood to make waves that come in parallel to the shore-line – observe what happens.
- Make waves to come in at an angle to the shore-line – observe what happens.



Figure 8: Longshore drift (Peter Kennett)



Figure 9: Cliff collapse at Barmston, Yorkshire (Peter Kennett)

The following are extension investigational ideas:-

- Try rolling a marble at an angle up a sloping bed of sand to show how it rolls straight back down the slope. You will need either another tray of sand, or this must be done before the water is added.
- Place lolly sticks at right angles to the coastline at intervals as groynes; some experimentation with the length of the sticks is needed.
- Try making cliffs of damp sand along the coastline and placing a Lego block as a house on top.
- Small pebbles can be placed at the base of the cliff to represent a coastal protection scheme.
- Try cutting away some of the coastline as though a river is entering the sea or the coastline is changing direction.

Ask the pupils

If you visited an area of crumbling cliffs like this, where would be the safest place to stand?

Possible answer

NOT on top of or beneath a crumbling cliff. Probably the safest place is as far back from the cliff edge as possible, since the beach beneath the crumbling cliff could be subjected to a storm with big waves that would erode the cliff back even more.

Results expected

Use a piece of wood to make waves come in parallel to the shore-line – observe what happens. The waves move material up and down the beach. There is a little erosion at first but no transportation. Deposition of the sand grains takes place only when the waves slow and stop.

Note: Erosion is the picking up of solid material, such as sand grains; transportation is the movement of that material, in this case by currents of water produced by waves; deposition is the laying down of the material in lower energy areas - also called sedimentation.

Make waves come in at an angle to the shore-line – observe what happens then. The waves pick up sand grains as the water flows at an angle to the beach. As the water runs back down the beach, at right-angles to the coastline, it takes some of the grains with it. These grains are then moved along at an angle again, by the next wave. Repetition of the process causes the sand grains to move along the coastline; a process known as longshore drift.

Try rolling a marble at an angle up a sloping bed of sand to show how it rolls straight back down the slope. This shows the longshore drift mechanism. Each wave that hits the beach at an angle carries sand up the beach at an angle, then drains straight back down, carrying sand with it. The sand is moved along the beach in a saw-tooth path.

Place lolly -sticks at right angles to the coastline at intervals as groyne. These reduce the process of longshore drift which otherwise moves all the sand to one end of the beach. Instead sand accumulates on one side of the 'groyne' and is eroded from the other side.

Try making cliffs along the coastline and placing a Lego block as a house on top. The waves will undercut the cliffs and cause cliff collapse with the loss of the house. This happens quickly with sand cliffs.

Small pebbles could be placed at the base of the cliff to represent a coastal protection scheme. Coastlines are often protected by placing large boulders of hard, resistant rock from somewhere else at the base of the cliffs; this is called rip-rap.

Try cutting away some of the coastline as though a river is entering the sea or the coastline is changing direction. As longshore drift proceeds along the coastline, sand grains are moved along. When the waves reach a point where the coastline disappears, either because of a river or change of direction, the speed of the waves slows down and deposition occurs. This results in the formation of a sand spit.

Pupil learning outcomes

Pupils can:

- appreciate that the coast is a zone where land and sea meet;
- see that when the waves hit a coastline, they often cause erosion;
- see that material is moved (transported) along the coast when the waves are at an angle to the coastline (groynes help to slow this movement)
- describe how land near the coast may be lost by wave erosion;
- see that cliffs are undercut by waves and buildings can be lost;
- explain how obstructions placed at the base of the cliff can protect it from the waves;
- describe how, if the wave current speeds slow at a river mouth or change of coastal direction, deposition occurs.

Ideas for leading into the activity

- Use a newspaper report/photo of dramatic cliff erosion. Ask what happened/caused this?
- See www.happisburgh.org.uk – for the latest news; campaign; blog; press releases.

Ideas for following up the activity

- Try using a sand/gravel mixture in the tray to see how the gravel can affect the results. Different pupil groups could try different sand/gravel mixes.
- Look at an Ordnance Survey (OS) map of the coastline nearest to your school – identify areas of erosion and deposition.
- Try further use of Happisburgh website (www.happisburgh.org.uk), with historical air photos and or maps.

Extension ideas for more able or faster pupils

- Investigate - groynes, coastline changing shape.
- Consider how would the tray have to be altered in order to create bays and headlands?
- On the OS map, predict how the coastline may change shape in the future.

Source of activity

From an original idea by Earth Science Teachers' Association members.

For schools with access to the Science Learning Centre in London there is a flume set up to do exactly this and other exciting activities for groups of pupils.