Brownsea Island

Enquiry 4: When is doing nothing actually doing something?

Context and Learning Aims

Pupils will be supported in and outside of the classroom, through an in depth investigation of Brownsea Island in Poole Harbour to:

• Understand that climate change has occurred in the past and also that sea level rise is happening now and will continue to happen into the future;
• Know how and why people impact upon and shape the natural environment around them;
• Explain why some environments are identified as being of great ecological value and worthy of the highest protection by the government;
• Identify, describe and explain different strategies for managing a changing coastline, including working with natural processes;
• Justify their own views and opinions as to the best options for managing coastal areas of high ecological value;
• Understand the concept of adaptation and that there is no ‘one size fits all’ solution to coastal erosion and flooding;
• Appreciate that coastal adaptation solutions need to suit the location as they can differ from one area of the coast to the next and from one community to the next.
Learning and teaching activities and curriculum progression

Key Question 4.1: How are these four people connected to Brownsea Island?

Provide the pupils with the Ordnance Survey map extract of Poole Harbour (Resource 4.1) showing the central location of Brownsea Island. Now show the pupils the photographs of the four people in Resource 4.2 and explain who they are. Do any of the pupils recognise any of the individuals or have perhaps heard of them:

- Hermann Goering – Head of the German air force (Luftwaffe) during the Second World War;
- Canute the Viking
- King Henry VIII of England
- Robert Baden Powell – founder of the Boy Scouts movement (and later Girl Scouts)

Spend some time discussing each of the people and what they did. Goering led the Luftwaffe on bombing raids over Britain during the Second World War 1939 - 1945. Canute was a Viking King of Denmark who invaded England in 1015, conquered the country and became King of England 1016 - 1035. King Henry VIII ruled England from 1509 - 1547 and is famous for his six wives! General Robert Baden Powell was a former soldier who when fighting in South Africa had used boys as messengers or ‘scouts’.

Are there any clues on the map to link any of these people to the island? Yes, one. The Baden Powell Outdoor Centre (Resource 4.3) This was where the first ever scout camp was set up in 1907 and this event on Brownsea Island marks the beginning of the Scouting movement. Banksea Castle is the link to Henry VIII as Henry had this castle built on Brownsea Island to help protect the coast from the threat of invasion by the Spanish. His original Tudor castle however is no longer standing and Resource 4.4 shows the twin towers of the more modern replacement. Canute the Viking anchored his ships (Resource 4.5) and rested his men at Brownsea Island before attacking the town of Wareham and then moving on to conquer all of England. In the village of Maryland in the west of Brownsea Island, during the Second World War the army lit decoy flares to trick German bombers into dropping their bombs on Brownsea Island rather than the very important docks at Poole. It worked and Poole docks were saved from the impact of 1000 tonnes of bombs during the course of the Second World War. The village of Maryland however was completely destroyed and all that remains today are the ruins of some of the buildings and craters left by some of the German bombs (Resource 4.6).

Key Question 4.2: What is an island?

Ask the pupils what the definition of an ‘island’ is? Generally speaking this is any piece of continental land surrounded by water – just like Brownsea. Now print off an A4 copy of Resource 4.7 which clearly shows the island of Brownsea surrounded by the sea water of Poole Harbour. Now tell the pupils to stick the photograph in the middle of an A3 sheet of plain paper. Using the Ordnance Survey map in Resource 4.1 support the pupils to annotate with arrows and labels from around the outside, the following things:

- Brownsea Island
- Sandbanks
- Poole Harbour
- The narrow entrance to Poole Harbour
- Cross channel ferry terminal
- Studland Heath
- The town of Poole
- Marina
- Furzey Island
- Green Island
Begin this enquiry by showing the pupils the animated film Changing Coasts - a tremendous tale at https://www.youtube.com/watch?v=i-tPOlMeWbi. Provide the pupils with an A3 sheet of plain paper and have them lay it out landscape wise on the table in front of them. Now they can divide the paper into two and draw a line down the middle from top to bottom. Along the top of the left-hand side they can write the title Brownsea Hill 13,000 years ago and along the top of the right-hand side they can write Brownsea Island 9,000 years ago. Tell the pupils that Brownsea has not always been an island. For most of its life it was a hill right up to the end of the last Ice Age about 12,000 years ago when the climate began to get a lot warmer and sea levels rose considerably as the ice melted. On the left hand side support the pupils to draw a picture from this description:

13,000 years ago Brownsea used to be a tall rounded hill surrounded by flat treeless tundra with small lakes, rivers and areas of marshland which were frozen all year apart from short summers when the ice melted. It was similar to Siberia today (Resource 4.8). Although it would have been very cold some trees and shrubs such as birch would have grown on the sheltered lower part of the hill. It would almost certainly have been too cold for humans to have lived here around the hill but they may have passed by occasionally as they trailed after animals to hunt such as Red Deer and even Mammoth and collect shellfish for food along the shore.

On the right hand side of their paper the pupils can now draw exactly the same outline of the hill (but no surroundings yet) which they drew on the left-hand side. They now need to complete their picture of Brownsea Island 9,000 years ago using the following description:

About 12,000 years ago the climate of the UK began to get warmer. Winters shortened and summers lengthened. As it got warmer huge ice caps and glaciers began to melt and the water flowed into the sea. The land around Brownsea Hill began to flood as water rushed in from the English Channel which was forming to the south. By 9,000 years ago all of the land around Brownsea Hill had been flooded and only the very top of the hill (about 25m) remained above the water which now created Poole Harbour all around the island. Between high and low tide levels beaches made of sand and mud formed around the edge of the island. Saltmarsh and reed beds also formed around the edge of the island. Because it was much warmer now most of the top of the island was covered in trees such as Scots Pine; Alder; Birch; Oak and Beech.

By 9,000 years ago then Brownsea was an island but did not float away, because like all continental islands it is connected to the sea floor! To further explain the process of the flooding of Poole Harbour show the pupils the animation in Resource 4.9 by Vivid Websites: http://vimeo.com/50983094 and also the series of three diagrams in Resource 4.10.

**Key Question 4.3: Why doesn’t Brownsea Island float around?**

**Key Question 4.4: How and why did someone change the shape of Brownsea Island?**

Show the pupils the map of Brownsea Island in Resource 4.11. It is one of the oldest existing maps of the island and probably dates from about 1780 – certainly over 200 years old. How does this map of the shape of the island compare with the shape of the island today? During the 1850s the then owner of the island Colonel Waugh built a shingle and brick wall all of the way around what was then called St Mary’s Bay (marked as 21 on the map) and referred to a Brownsea Road on the modern map, although it’s not a road at all but a sea wall. Why do the pupils think he went to all of the expense and effort of doing this? Encourage discussion and speculation. The sketch in Resource 4.12 was drawn in 1888. How does it help us to answer
the question? The next thing he did after building the wall was to install a wind pump such as the one shown in Resource 4.13 at OS Grid Reference SZ 031 883 along the wall. What do the pupils think the purpose of doing this was? This is an opportunity for the pupils to undertake some research into how wind pumps work. Through investigating at sites such as http://www.lowimpact.org/factsheet_wind_pumps.htm http://www.aermotorwindmill.com/how-a-windmill-works.html and http://www.wikiwater.fr/e42-wind-powered-pumps.html

The wind pump was used to draw water up and out of the enclosed St Mary’s Bay and into Poole Harbour. In time the enclosed salt marsh land of St Mary’s Bay became dry enough to be used as a water meadow for grazing cattle. New land created in this way by pumping out water from an enclosed area of sea is called reclaimed land. An extract from the Brownsea farm estate records of 1857 is included in Resource 4.14. How do the records show the newly reclaimed land being used in 1857? What are Oats and for what would they have been used (winter feed for livestock)? What does fallow mean? Why did fields in the 19th century have to be left fallow? Why is it much less common now? On farms in the 19th century fields were left fallow every 3-4 years to enable the nutrient levels of the soil to build up again with the application of natural fertiliser such as animal ‘muck’. Nowadays most fields have regular applications of chemical fertilisers every year so generally do not need to be left fallow any more. The reclaimed land of St Mary’s Bay added 88 acres to the farm estate. By what percentage did the farm estate increase then? (52%). How else was the new reclaimed land being used in 1857? Clover was often grown in fields left as fallow – why? Clover is a leguminous crop which means that it has root nodules that ‘fix nitrogen’ back into the soil. Barley would also have been grown mostly as a winter ‘fodder’ crop for animals that would have had to have been kept in sheds for long periods during the winter. What were wurzels? Wurzels or Mangelwurzels are root vegetables which can be eaten by humans when young but which were grown primarily as winter stock feed for pigs and cattle – see Resource 4.15.

Taken as a whole ask the pupils to consider what the farm records tell us about the challenges of farming on Brownsea Island in 1857. Animals such as cattle would have grazed on the pasture land of the newly reclaimed land but what was almost every other crop grown used for e.g. barley; wurzels and oats? For winter feed when the cattle had to be in stalls and cattle sheds throughout the cold and wet winters when the grass pasture could not grow and the ground would have been too wet or frozen for the animals to be outside.

Key Question 4.5: So what happened to the reclaimed land then?

Project the aerial photograph of Brownsea Island in Resource 4.16 and point out the area of reclaimed land within the embankment. Is it fields of pasture still? No, it’s mainly open water with scattered mud banks. So what has happened since 1857? Encourage the pupils to speculate – why has the water reappeared? Direct them to the map of Brownsea Island. Explain that there are two answers to the question. Look at the two lakes in the centre of Brownsea Island – West Lake and East Lake. What do the pupils notice about what links West Lake to East Lake? A small stream. What happens to the water from East Lake – it’s draining via a stream into the large area of water that was once the reclaimed land. This is one reason. The other involves the sea wall that was built in 1857 around St Mary’s Bay. Ask the pupils to consider what might now be happening to the brick wall built over 150 years ago – it is now leaking!
In fact because it did not ever have real foundations the sea wall was always porous almost from the moment its construction was finished. So St Mary’s lagoon is filling up with water again – a mixture of fresh water draining down from West and East Lake and salt water leaking in from Poole Harbour. This creates what is known as brackish water.

Key Question 4.6: Why is the brackish water of St Mary’s Bay so important?

Ask the pupils to look closely at the interpretation map of Brownsea Island in Resource 4.17. Why is the lagoon so important? It forms part of a Site of Special Scientific Interest (SSSI) and has other important wildlife designations as well. It is run as a nature reserve by Dorset Wildlife Trust. At http://www.dorsetwildlifetrust.org.uk/brownsea_island_nature_reserve.html the pupils can view the lagoon webcam to gain an idea of the extent of the area. Resource 4.18 contains an extract from the Birds of Poole Harbour website at http://www.birdsofpooleharbour.co.uk/dwt-webcam This extract mentions 26 birds commonly seen on the lagoon and 6 very rare birds that have been seen there over the years. Distribute the birds amongst the pupils so that each pupil has a bird to research. The objective of the exercise is for each pupil to produce a bird profile to include:

- General description
- Photograph
- Food
- Population number in the UK
- What they sound like
- Distribution in the UK (the will require an outline map of the UK for this)
- Status – red, amber or green and what this means.

An excellent place for the pupils to begin their research is http://www.rspb.org.uk/wildlife/birdguide/ The outcome is to use their profiles to create a large wall display with a map of the Brownsea lagoon at its centre with each of the bird profiles posted around the outside. A title could be: The wildlife importance of Brownsea lagoon.

Key Question 4.7: Why did the geology of Brownsea Island bankrupt Colonel Waugh?

In 1857 Colonel William Petrie Waugh bought Brownsea Island. One of the things that he was most interested in was the geology of the island. Write the word geology on the board and ask the pupils what the word means? Encourage discussion. Whereabouts may they have come across this word before? It means ‘the study of the history, structure and origin of the Earth i.e. the study of how the Earth was formed and the rocks that make up the Earth today. Now direct the pupils to study again the map in Resource 4.17. Think about rocks. Are there any clues from the map as to the types of rocks which make up Brownsea Island? There are two big clues: site of 19th century pottery and pottery pier. Both of these were built by Colonel Waugh. What do you need to make pottery? Clay! So clay will be one material that is abundant under the surface of Brownsea Island. Between 1860 and 1887 Colonel Waugh built a very large pottery on the south shore of the island. There were also brickworks and a horse drawn tram to bring clay from the north of the island where it was dug (from the two locations shown as shafts dis). For the workers the Colonel constructed a village called...
Maryland on the west of the island – named after his wife and later to be the decoy target for Luftwaffe bombers! Colonel Waugh’s pottery is shown in Resource 4.19 with Furzey Island and Green Island in the background but signs of the pottery have now almost disappeared. What remain are a number of kilns on the south shore – Resource 4.20 and tens of thousands of broken pipes and chimney pots – Resource 4.21. Colonel Waugh soon discovered that the clay on Brownsea Island was not of high enough quality to make the fine (and expensive) quality porcelain china he had dreamed of. Rather it was only of use to make low priced and poor quality terracotta chimney pots, brick and pipes but even then, the clay was not good enough and there was massive wastage. He quickly went bankrupt and eventually left the island.

Key Question 4.8: In what ways is the geology of Brownsea Island a problem today?
Give each pupil a copy of the photograph in Resource 4.22. The geological structure of Brownsea Island is a simple one – just three main layers. Can the pupils identify them in the photograph? Onto the photograph draw lines separating one layer from another. At the very top there is a dark layer of gravels in which plants are growing – Pleistocene gravels. Across the middle of the photograph is a line dividing the lighter yellowy sands above from the darker browner clay below – Branksome Sands and Parkstone Clay. In basic terms for the pupils the geology is a layer of gravel above layers of sand and clay. Ask the pupils to consider what they know about sand. Would they say it is hard or soft – easy to wear away (erode) or difficult? All of the photographs in Resource 4.23 were taken along the south coast of Brownsea Island. What is happening to the sand? Why is this happening do they think? This is the process of coastal erosion. Two processes of erosion are in operation along the south coast of Brownsea as shown in the diagram in Resource 4.24. Waves approaching the land wear away hollows and caves into the sand at the base of the cliff, causing an overhang to form which eventually collapses down onto the beach. Heavy rain falling from above quickly drains through the gravels and sand (which are both permeable – i.e. allow water to pass through them) – until the rain water meets the clay (which is impermeable and will not allow water to pass through it). When the rainwater reaches the layer of clay it cannot descend any further and flows out as a spring or stream. This makes the sand above waterlogged and very unstable by creating a slippery layer between it and the clay below. As a result the sand slumps or slips down onto the shore, causing a landslide.

Key Question 4.9: What is the land owner doing about the erosion along the south coast?
The National Trust acquired Brownsea Island in 1962. In 2010 it made an important decision about the erosion taking place in the southern half of the island. Show the pupils the film in Resource 4.25. It tells the story of the Brownsea Island Shoreline Restoration Project. It may be necessary to show the film to the pupils a number of times. Ask them to answer the following questions:

- What did the National Trust decide to do about the old defences put in along the coast in the 1970s and 1980s?
- By how much does the National Trust expect sea levels to rise around Brownsea Island in Poole Harbour over the next 100 years?
- What did the National Trust replace the old coastal defences with?
- The policy of the National Trust is to restore natural coastal processes wherever practicable and not intervene to stop erosion – how do you think that this will help us to cope better with sea level rise caused by global warming? For more information see the National Trust's Shifting Shores document at http://www.nationaltrust.org.uk/document-1355834809529/
Key Question 4.10: What has the National Trust decided to do about the quay?
The quay area of Brownsea Island can be found in the top left hand corner of grid square SZ8703 between Branksea Castle and the Piers. Having identified this area on the map, show the children the photograph in Resource 4.26 which shows the quay area. In which direction was the camera pointing when this photograph was taken? What is the name of the town in the distance? It is worth emphasising here that the quay and pier is the only access point to the island by boat from Sandbanks – transporting over 100,000 visitors a year to the island. Tell the children that with the sea level rising in Poole Harbour and more frequent winter storms and tidal surges a problem is fast developing for the quay area of Brownsea Island. Show the children the photographs in Resource 4.27. What's the problem then? Next encourage discussion about how the pupils might think that the problem at the Quay area is different from the problem along the southern shoreline of the island where the Natural Trust decided not to intervene and allow the natural processes to take over? The issue is that here we have people living and working in homes and offices and the pier is essential for the life of the island as it is the only place that boats from the mainland arrive and leave from. Given this what do the pupils think should happen as sea levels continue to rise and flooding gets worse? Explain that the National Trust has made a decision. What do they think the decision is? Why do you think the National Trust has made this decision?” The photographs in Resource 4.28 all include clues. Are the flood barriers going to be a permanent solution to the problem? Some of the pupils may have already thought about what the National Trust has decided to do about the quay. The flood barriers are a short term solution to the problem (called Holding the Line) for the next few years whilst plans are made to relocate the facilities inland and improve the landing pier area. The existing quay side buildings will be made safe but will eventually have to be abandoned.

Key Question 4.11: So what should the National Trust do about the Brownsea lagoon then?
Summarise with the pupils that we have already seen two different approaches to adapting climate change including rising sea levels, more severe winter storms, increasing coastal erosion and tidal surges on Brownsea Island and more erosion. A third problem presents itself at the Brownsea lagoon. Remind them that the lagoon was originally enclosed and drained (reclaimed) of water to create pasture for grazing cattle about 175 years ago. A 2 metre sea wall was built around it and a wind pump pumped out the water into Poole Harbour. Pumping was eventually abandoned in about 1900. Slowly but surely salt water began to leak through the wall and mixed with fresh water from streams flowing down from East Lake and West Lake to create a lagoon of brackish water, a mixture of salt and fresh water, see photographs in Resource 4.29.

Project the photograph of Poole Harbour and Brownsea lagoon in Resource 4.30. It was taken at high tide in Poole Harbour. What do the pupils notice about the height of the water in Poole Harbour compared with the level of the water on the other side of the sea wall in Brownsea lagoon? At high tide the level of water in the harbour is higher than the level of the water in the lagoon. Discuss with the pupils what could happen in the future if there was a severe storm with strong winds in the harbour at the same time as a high tide? The sea wall will be overwhelmed by the water from the harbour and might even collapse in places. The salt sea water will swamp the lagoon.
Remind the pupils that the lagoon is very important for birds – take time to revisit the birds that individual pupils researched earlier. In fact it is not just important locally or in the UK. The lagoon is a RAMSAR site (see the map in **Resource 4.31**). There are only 2171 RAMSAR sites in the world! It is incredibly important as a waterfowl habitat and as a stop-over point in winter for migrating birds (flying from one place to another). In addition to being a RAMSAR site the lagoon is also a European Special Protection Area (SPA) (**Resource 4.32**). This means that it is of international importance for the breeding, feeding and wintering of rare and vulnerable species of birds – in particular the *Mediterranean Gull*; *Black Tailed Godwit*; *Avocet*; *Common Tern* and *Shelduck*. Photographs of all of these appear in **Resource 4.33** – can the pupils distinguish one from another?! It is important to emphasise to the pupils that because the lagoon is both a RAMSAR site and a Special Protection Area, **the British government is committed to taking all steps necessary to protect and maintain its unique ecological character**.

So what should the National Trust do about the lagoon? Present to the pupils the following scenarios:

1: Repair the wall to stop the leakage of salt water into the lagoon from Poole Harbour and then add 1.5 metres to its height all the way around. This is known as *holding the line*;

2: Work with the natural processes and allow the wall to slowly disintegrate and be over topped by salt water during storms and then perhaps collapse altogether – This is known as *no active intervention*;

3: Carry out enough repairs to the sea wall to stop it collapsing altogether in the near future whilst an alternative brackish wetland habitat is created somewhere else in Poole Harbour to replace the habitat when it is eventually flooded by the sea – this is called identifying a *compensatory habitat*.

Discuss the advantages and disadvantages of each of the scenarios. Pupils need to think about the cost implications (the National Trust is a charity), what is required by law and the stated policy position of the National Trust as landowner, in its Shifting Shores document. Which do the pupils think would please the National Trust most? What approach would the government be most likely to approve of? Which would make Dorset Wildlife Trust who manages the bird reserve happiest? Make summary notes on the board. As an outcome to this final key question the pupils can write a 500 word discursive narrative considering both sides of each possibility and in the conclusion include their own opinion as to what should happen at the lagoon in the future. **Resources 4.34 – 4.37** provide support for this literacy activity. **Resource 4.34** summarises the main text’ sentence and word level conventions of discursive writing. **Resource 4.35** is a template used for writing about the pros and cons of animal experimentation which could easily be adapted to this exercise and **Resource 4.36** is an annotated example of a more advanced piece of discursive writing about Amazonia. Finally **Resource 4.37** is a spelling map containing a large number of starters and connectives which can be effectively applied to a discursive narrative by the pupils.
Sample Resources from Enquiry 4.
The complete set of resources supporting learning in this enquiry are available on the accompanying DVD and online at www.lcco.eu

Resource 4.11

Credit: National Trust