Studland Bay

Enquiry 6: How is Studland Bay likely to change in the future?

Context and Learning Aims

Pupils will be supported in and outside of the classroom to:

• Consider the main physical coastal processes at work along the coast at Studland Bay.

• Extend their knowledge and understanding of the implications of coastal change for the future. Firstly, the pupils reflect upon the general implications of climate change for the remainder of this century.

• Understand the implications for Studland Bay of the rise in sea levels combined with the likelihood of the impacts increased frequency of severe winter storms that might also cause sea surges such as those that happened along the east coast of England in December 2013.

• Undertake a detailed study is made of the prospects for the coast at Knoll Beach and the implications of a possible breaching of the coast by the sea which could lead to a merging of the open sea with the freshwater lake of Little Sea.

• Participate in a role play to appreciate the views of different stakeholders with regards to Knoll Beach.

• Summarise their learning about stakeholders through production of a piece of discursive writing.
Learning and teaching activities and curriculum progression

Key Question 6.1: What does the future hold for Knoll Beach?

Refer back to the summative annotated diagram of coastal processes in Studland Bay that the pupils produced at the end of the previous enquiry. Look first at Knoll Beach at SZ035836 on the Ordnance Survey map together with the satellite image in Resource 6.1. Support the pupils to identify the car park, visitor centre and sand dunes to the north. Remind them that they have already discovered that the average erosion rate of the beach here is 0.5m a year.

Explain to the pupils that as well as this annual erosion rate there are now two other things caused by climate change that could make beach erosion at Knoll Beach much more serious in the next 70 years or so. What are they?

Give each pupil a copy of the graph in Resource 6.2. Questions and tasks:

- Since 1900 what has been the average rise in global sea levels?
- Between 1900 and 2000 what was the average annual rise in global sea levels?
- Based on this average annual figure draw a line graph to show what is projected to happen to average global sea levels between 2000 and 2100.
- By how much are average global sea levels projected to rise by 2100, compared to 1990 levels?

Take time to discuss with pupils the implications of their work for Studland Bay. How is this likely to make managing the coast more challenging in the future? The key implication is that along the southern coast of Britain relative sea levels could rise by as much as 86cm by the 2080s.

The second implication of climate change is made apparent in the two films in Resource 6.3 and Resource 6.4 which should be shown consecutively. Ask the pupils to make a note of what the two films are telling us in terms of the future. Because of climate change what weather events will become more common in Britain in the future? What are the implications of this for people living along the coast in places such as Studland? The second key implication of climate change will be more extreme and dangerous winter weather storms with heavy rain and strong winds which will sometimes cause storm surges.

The flooding along the eastern coast of Britain on December 5th 2013 was the result of a storm surge caused by very low atmospheric pressure. Working individually the pupils can access the Met Office website at http://www.metoffice.gov.uk/learning/learn-about-the-weather/weather-phenomena/storm-surge and produce their own annotated diagram of the main features of a storm surge using the series of maps provided.

Before moving on it is important to summarise for the pupils some key things which are expected to happen in the next 80 years or so at Knoll Beach:

- Normal annual average erosion rates are 0.5m a year, but this is likely to increase;
- Weather changes resulting from climate change will mean an increasing rate sea level rises combined with more frequent and severe winter storms with the possibility of associated storm surges.
- Sea levels will rise by 110 - 200mm by the 2030s, 230 - 400mm by the 2060s and 400 - 950mm by 2100.
Next, focus the pupils on grid squares SZ0383 and SZ0384 on the Ordnance Survey map and Resource 6.5 which is a satellite image of the same area. Tell the pupils that with normal erosion plus sea level rises and more frequent and severe storms there is a possibility that at some point during the next 80 years the coast at Knoll Car Park will be breached by the sea probably at the point shown in the photograph in Resource 6.6. If this occurs then what could happen as the sea floods inland? The photographs in Resource 6.7 will help to focus the mind here i.e. beach huts; shops; car park; visitor centre; study centre etc. What will be the consequences for local people if this floods regularly? Encourage discussion about the key stakeholders – not just those who have a business stake in the area but what about visitors and holiday makers?

There will be another possible serious effect of the sea breaching the coast at Knoll Beach. Can the pupils identify what this might be from the map and satellite image in Resource 6.5? The pupils may identify this quickly but if not then prompt them to look at Little Sea on the map and which is also shown in the collection of photographs in Resource 6.8. Using the map, how far is the southernmost point of Little Sea from the beach at Knoll? What would happen if the flooding from the sea reached this point? After 200 years the shape of the coast would change again. How? The pupils can now be supported to draw a ‘new and updated’ Ordnance Survey map of the Studland Peninsula to show what it might look like in 2080 if the sea breaches the beach and joins up with Little Sea. If the inundation by the sea continued what might happen eventually at Bramble Bush Bay at 030860? If Ferry Road was breached by the sea at some point in the future and Little Sea joined with Poole Harbour at Bramble Bush Bay, then what would the shape of the coast look like then? Support the pupils to draw another ‘new and updated’ Ordnance Survey map of Studland Peninsula for say 2180 showing this merging. How would the coastline then compare with the one that Treswell drew in 1586 in Resource 6.9?

But what would the impact on Little Sea be if the sea water reached it? At the moment Little Sea is a shallow acidic freshwater lake that is part of the Studland Heath National Nature Reserve (NNR). Little Sea has been a NNR since 1946 and is also on English Nature’s list of the 31 most important nature reserves in England – the spotlight reserves. As well as this it is a Site of Special Scientific Interest (SSSI) and in an Area of Outstanding Natural Beauty (AONB). So it is amazingly important for biodiversity and wildlife – as important as any place can be in this country with top level protection under European law and international conventions! Little Sea is particularly important for migrating wildfowl birds such as Pochards; Teal; Goldeneye; Pintails; Tufted ducks; Shoveler; Gadwall and Coots who over winter on the lake. If the Little Sea became salt water then its ecosystem would change completely especially if it eventually became part of the open sea.
As is apparent from the projections above, the natural coastal processes of erosion occurring at Knoll Beach in Studland Bay, combined with the likely implications of climate change in the next 70 years or so, have resulted in a number of management implications and challenges for the future. These have been identified and studied by the Living with Changing Coast (LiCCo) project.

Explain to the pupils that a public meeting with the Environment Agency is going to be held to enable everyone to have their say about what action, if any, should be taken. As a group the pupils are going to undertake a role play of this meeting. The pupils will be divided into small groups and given the role of one of the people or organisations listed below – the key stakeholders - which all members of the group must represent for the duration of the meeting. It will be important for the pupils to take on the persona of different characters with names, jobs and personalities that they can create for the stakeholders they represent. Each group will be given time to research and prepare a short statement which highlights its views about what should be done in the future. These statements are important and will need to be duplicated at the end of the meeting and given to all other groups so that every pupil has a full set to take away. The teacher can act as the Chair of the meeting and will need to introduce the meeting and the different parties present as well as organising a running order. The Chair will also draw the meeting to a conclusion by summing up the key points raised.

Dorset District and County Councillors

Studland is in the District Council of Purbeck. Councillors are people who are elected to the local council to represent their community. They must either live or work in the area. People elect Councillors to represent them and make decisions on their behalf. District Councillors are ordinary people from the area, elected to represent one of the Wards for a term of four years. Depending on its size, each Ward has one, two or three Councillors to represent the interests of the residents. Councillors act as the link between the public and the Council as a whole. Much of a Councillor’s time will be spent dealing with problems and questions from the community. Councillors work to improve the quality of life for people within their area and make decisions about local issues. They have to decide what is in the public interest amidst a range of conflicting issues and views. Councillors usually represent a political party however they can be independent. All Councillors represent all the citizens in their Ward not just the people who voted for them. For the three financial years 2014-2015; 2015-2016 and 2016-2017 Purbeck District Council will have a budget to spend of £5,500,000 on all services for the local community including the local hospital and fire services. Of this total just £100,000 has been allocated in each of the three years for the costs of coastal protection including expenditure to protect against sea erosion and sea encroachment for the whole of the Purbeck District. If the councillors were convinced that coastal defences were needed they would have to try to persuade Dorset County Council to provide more money or approach the government directly for a grant. It is very unlikely that money will come from either source. At present the government wants County and District Councils to spend less not more and the County Council is already increasing Council Tax on homes in Dorset by 2% a year for the next three years to cover the cost of running local services. This group will be able to gather further information from

http://www.dorsetforyou.com/media.jsp?mediaid=148661&type=pdf
and http://www.dorsetforyou.com/coastalmanagement

Key Question 6.2: What should be done about Knoll Beach?

As is apparent from the projections above, the natural coastal processes of erosion occurring at Knoll Beach in Studland Bay, combined with the likely implications of climate change in the next 70 years or so, have resulted in a number of management implications and challenges for the future. These have been identified and studied by the Living with Changing Coast (LiCCo) project.
Studland Parish Council
The nine elected members (or councillors) of Studland Parish Council represent the interests of the 450 residents (60 of which are children). Almost all of the residents who work locally are employed in tourism related jobs and several are employed directly by the National Trust. There is a very strong sense of community in the parish and the village contains a village shop and post office; two hotels and a pub. On a sunny August day as many as 25,000 visitors and tourists might pass through the village. Although traffic congestion and parking problems caused by these visitors and tourists are frustrating issues for the residents they realise how important they are in terms of bringing money into the community and helping to secure jobs. The village has already lost two other shops and a petrol station which have closed. The Parish Council and village residents are therefore very much in favour of building defences at Knoll Beach to prevent a break through by the sea. Further information at http://www.dorsetforyou.com/media.jsp?mediaid=152056&filetype=pdf

Knoll House Hotel
Is the closest hotel to the beach and one of its unique selling points is that it currently has direct access for residents to Studland’s three miles of beautiful beach. It has been a family run hotel since 1931 with 80 rooms and can sleep 180 people during the high season. The hotel also boasts a health spa, an outdoor heated pool and a 9 acre golf course. With 25 permanent members of staff and up to 65 temporary staff who are brought in during the season March 25th – January 2nd, it is the most important employer of local people. The two directors believe that coastal defences at Knoll are essential for the long term prosperity of their hotel and for the security of the jobs of the people who work for them. If the beach is breached at Knoll then the three miles of Studland beaches to the north would no longer be accessible to their residents. They argue that this would mean that the hotel would be much less attractive to visitors if they could not get to the beach, meaning that fewer would come resulting in local people losing their jobs. For more information see: http://www.knollhouse.co.uk/

Knoll Beach café and shop/National Trust Managers
Situated right on the beach and beside the car park the café and shop is owned and run by the National Trust and is an important source of income from visitors and tourists. In fact in the last few years all of the buildings have been modernised and an outside eating area added. The café has built up a good reputation for serving breakfasts; lunches; afternoon teas and early evening meals. It prides itself from sourcing food from local producers especially the seasonal vegetables it requires. The small shop in the same buildings offers visitors glassware; rugs; china and books. If the beach is breached by erosion at Knoll then the café and shop will be flooded and unusable. The choice would be either to abandon the building or move it inland away from the sea. This would be very expensive and the café would lose the attraction of being right on the beach. If less customers come then the jobs of the workers in the café and shop will be at risk. The loss of the car park will also have serious consequences. If it is to be replaced inland then where will it go? How could a new car park be located without impacting negatively on the environment of Studland Bay which, after all is a National Nature Reserve and of international ecological importance? If it is not to be replaced then how will visitors get to Knoll Beach? Additional bus services will almost certainly be required (and who will pay for these) perhaps linked to a park and ride car park much further away in say
the town of Swanage. Members of the District Council and County Council will not have the budget for this and so the cost will have to be covered by the visitors themselves. They will have to start paying for something that previously they received at no cost. What will their reaction be? Further information see: http://www.nationaltrust.org.uk/studland-beach/eating-and-shopping/

Second home owners
In Purbeck parish over 20% of all the homes are second homes. A second home is a property owned by someone whose main house is somewhere else such as in London. Second homes are bought by wealthy people as an investment and as a holiday home which they may visit at weekends or for longer periods such as during the summer. Second home owners will not want to see anything happen in the local area that would result in the value of their properties dropping. Many second homes are a financial investment that the owner will want to increase in value. At the moment Studland Bay is a very popular place for people to buy second homes and so prices are high. However letting the beach erode and flood waters join up with Little Sea at Knoll could potentially lower the amenity value of the area and make it less attractive as a place for other people to look for second homes in the future. The second home owners will also want to emphasise that they pay council tax just like anyone else and so are entitled to their rights even though they are not in Studland for all of the time. They will also want to make sure people know that some of their second homes are rented out to holiday makers each year who then spend money in the community such as in local shops and restaurants. In addition they will also say that they employ local people to take care of their properties for them when they are not there e.g. security, maintenance and cleaning services and that this is good for the community.

Engineers
This group are all experts in coastal management. The other stakeholders at the public meeting will be looking to the engineers not only to provide advice on the range of possible approaches to dealing with the issues at Knoll Beach but also the likely costs of each approach. This group will need to be very clear about the implications of each solution that may be proposed along with other measures that could be implemented which might prove to be more effective. However, the engineers will need to be very aware of the budget constraints operating on the National Trust who is the land owner. If expensive measures are recommended where is the money going to come from to finance it? The National Trust will not be able to afford it. The engineers will also need to advise stakeholders that a decision to do nothing is still a decision to do something and will not be ‘free’. For example if the National Trust has to either abandon or move its buildings and car park at Knoll Beach to further inland then this is going to result in real costs either in terms of lost assets or in terms of having to relocate them. The Engineers will find the table in Resource 6.10 useful.

Dorset Local Enterprise Partnership
This group of stakeholders is made up of business men and women from across Dorset. The group aims to support businesses across the county, and encourage new business development. The board also includes the leaders of Bournemouth, Dorset and Poole Councils and a representative of the District Councils. The Board is convened by Bournemouth University and Bournemouth and Poole College on behalf of colleges across
Dorset. The LEP works towards creating new jobs in Dorset, improving the skills of the existing workforce in businesses across the county and improving communications and connectivity across all local industry. At its first meeting the Chairman said: “We have a strong team in the new board of the LEP, and we will need it to provide the leadership required to see Dorset’s economy develop in these difficult times. Dorset faces many challenges, but we have a lot going in our favour and it is up to us to make the most of the opportunities and assets we have to provide jobs and prosperity for Dorset.” Local Enterprise Partnerships contribute to the Government’s agenda for rebuilding and rebalancing the economy. The Government recognizes that local businesses and local authorities together are best placed to understand the needs and opportunities of their community. Further information at: http://www.pooletourism.com/go

National Trust and Environment Agency representatives
Members of this group support the policy of no active intervention of the coast at Knoll Beach. They feel that continually building and maintaining costly defences is a losing battle and that the coast should be allowed to erode and flood naturally – a ‘soft’ engineering rather than a ‘hard’ engineering approach to management. The policy of no active intervention is one of working with natural processes rather than against them and adapting to the consequences over time. Both the Environment Agency and the National Trust have responsibilities to protect and enhance the natural environment of places such as Studland Bay unless there are very real economic reasons for not doing so e.g. a situation where the flooding of a factory would result in people losing their jobs and a company going out of business. At some places such as along the south coast of Brownsea Island in Poole Harbour they also like to see any existing hard engineering schemes such as gabions and sea walls actually removed to support their policy of no active intervention. They argue that allowing the beach and dune system to move landwards naturally is the best way of ensuring there will still be a beach at Studland in the long-term. Removing hard defences removes the possibility of losing the beach as sea levels rise and it is squeezed up against hard structures. This method will not only be really important for Studland’s wildlife such as the migrating birds but also help to absorb future wave energy as sea levels rise over the next 80 years. So the loss of Knoll Beach in the short term will safeguard the rest of the coast at Studland Bay in the long term. Managed realignment therefore allows the shoreline to advance inward unimpeded. As the shore erodes, buildings and other infrastructure are either demolished or relocated inland. A very important consideration for both the National Trust and the Environment Agency is that the policy of no active intervention enables shoreline habitats to migrate inland as the shoreline erodes to prevent the loss of ecologically important heathland.

The National Trust is a registered charity that was founded in 1895 to preserve places of historic interest or natural beauty permanently for the nation to enjoy. It protects and opens to the public historic houses, gardens, industrial monuments & mills and looks after forests, woods, fens, farmland, moorland, nature reserves, coastlines and old villages. The National Trust owns more than 248,000 hectares (612,000 acres) of countryside and 600 miles of coastline. Further information at: http://www.nationaltrust.org.uk
The Environment Agency is funded mostly from the government through its Department for Farming and Rural Affairs (DEFRA) and employs 11,400 people in England. It is responsible for, amongst other things, coastal risk management and climate change. The Environment Agency advises the government on the best policies to follow when it comes to coastal management in places such Poole Harbour. It is also responsible for implementing government policy once it has been decided upon. Further information at http://www.environment-agency.gov.uk/aboutus/

Natural England
Natural England is the government’s advisor on the natural environment and has a strong commitment to taking all necessary steps to protect and maintain areas of the country which are very important from an ecological point of view i.e. the wildlife to be found there. This is particularly the case if a place has been designated a RAMSAR site; a Special Protection Area (SPA) or a Site of Special Scientific Interest (SSSI). There would have to be compelling evidence of a serious negative economic impact on the local area for the government to agree to ‘hard’ engineering approaches to protecting the coast at Knoll Beach. Even if Natural England did agree to hard engineering schemes, any habitat lost as a result through coastal squeeze at Knoll and Studland in general would have to be created somewhere else close to Knoll through a habitat compensation programme. What this means is if a hard engineering structure such as a sea wall is created at some point inland to stop the sea inundating the coastline, then inexorably over the years with sea level rise caused by climate change, the sea will come to cover the entire intervening inter-tidal habitat between its present position at high tide and the new sea wall. It is this lost inter-tidal habitat (lost through coastal squeeze) that by law has to be re-created somewhere else as close as possible to the habitat which has been lost.

Following participating as different stakeholders in the public meeting the pupils can present the whole issue of What should happen at Knoll Beach? as a piece of extended discursive writing using the audience; purpose and text, sentence and word level conventions as outlined in Resource 6.11; the essay planning guidelines contained in Resource 6.12 and the examples of complete essays in Resource 6.13 as models.
Sample Resources from Enquiry 6. The complete set of resources supporting learning in this enquiry are available on the accompanying DVD and online at www.licco.eu

Resource 6.1

Credit: www.google.com/earth/

Resource 6.2

Credit: LiCCo
Resource 6.7

Credit: David Weatherly
<table>
<thead>
<tr>
<th>Type of coastal management</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Costs</th>
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<tbody>
<tr>
<td>Vertical sea wall</td>
<td>Can withstand strong waves</td>
<td>Expensive to install and maintain</td>
<td>£400,000 per 10m</td>
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<td></td>
<td></td>
<td></td>
<td>Design life 35-45 years</td>
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<tr>
<td>Groynes</td>
<td>Slows down long shore drift and is relatively cheap</td>
<td>May trap too much sand in the south beach of Swanage with too little reaching the north beach</td>
<td>£30,000 per 10m</td>
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<td></td>
<td></td>
<td></td>
<td>Design life 30-40 years depending on material used in construction</td>
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<tr>
<td>Gabions</td>
<td>Rocks and pebbles in cage absorb wave energy and relatively cheap</td>
<td>Not as strong as sea walls and do not withstand the most destructive waves</td>
<td>£35,000 per 10m</td>
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<td>Design life 15-20 years</td>
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<tr>
<td>Rock armour</td>
<td>Efficiently spreads out the wave’s energy as boulders cover a large surface area</td>
<td>Expensive to transport large very heavy boulders from inland quarries. During large storms individual boulders may be displaced so regular ‘top ups’ required</td>
<td>£200,000 per 10m</td>
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<td></td>
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<td>Design life 45-55 years</td>
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<tr>
<td>Beach replenishment</td>
<td>Adds sand to the beach which absorbs the energy of incoming waves and protects the coast</td>
<td>Adding sand from elsewhere may affect the balance of the natural environment e.g. by introducing alien marine species. ‘Top ups’ required on average every 10 years.</td>
<td>£250,000 per 10m</td>
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<td>Design life 20-30 years</td>
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<tr>
<td>Offshore rock armour islands (revetments)</td>
<td>Placed about 100m off shore so away from the beach and can absorb most of the incoming wave energy before it reaches the shore</td>
<td>May alter the direction and fetch of incoming waves and cause erosion in places not currently being effected. Relatively expensive. Design life 30-35 years</td>
<td>£400,000 per 10m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Design life 30-35 years</td>
</tr>
<tr>
<td>Managed realignment</td>
<td>No direct costs and works with the natural coastal processes rather than against them. The coast is allowed to change naturally and no attempt is made to prevent this occurring.</td>
<td>May require the planning and relocation of ‘fixed assets’. This could involve the movement of buildings such as visitor centres; toilets; shops as well as car parks inland.</td>
<td>No direct costs but often ‘hidden costs that will need to be taken into account and paid for e.g. relocation of ‘fixed assets’</td>
</tr>
</tbody>
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