Starcross

Enquiry 3: Why does the Parish Council at Starcross want people in the village to develop more of a “Dutch mentality”?

Context and Learning Aims

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

- Identify, describe and explain the site and situation of a settlement and apply this to the village of Starcross on the Exe Estuary;
- Understand the ways in which settlements change as they grow or decline over time and recognise these on maps, photographs and satellite images;
- Know that the function of a settlement may change over time also and that the present purpose of a place is commonly not that which originally defined it;
- Describe and explain the likely implications of climate change in the next century for communities such as Starcross along the Exe Estuary;
- Appreciate the ways in which Starcross currently depends on both the main line railway embankment which borders the estuary and the sand spit at Dawlish Warren for flood protection and shelter from southerly storms and associated tidal surges;
- Comprehend what is being done in relation to coastal management at Dawlish Warren in the short to medium term which will help to maintain its sheltering function for the Exe Estuary;
• Understand and explain the difference between ‘soft’ and ‘hard’ engineering management solutions when it comes to the coast and be able to provide examples of each;
• Understand that in the long term the management of Dawlish Warren will focus more on managed realignment and no active intervention rather than hold the line and that this will have significant implications for flood control and the resilience of Starcross to climate change;
• Acknowledge that one way in which coastal communities will increase their resilience to the implications of climate change and the risk of flooding is to agree and implement a local Flood Resilience Plan;
• Plan and draft their own individual and community flood plans and evaluate them against the draft Flood Resilience Plan drawn up by the Parish Council at Starcross.
Learning and teaching activities and curriculum progression

Key Question 3.1: Where is the settlement of Starcross situated and how has it changed?

Explain to the pupils that a settlement is a place of any size where people live. A settlement may be as small as a single house or farm in a remote area, a village with a population of 1780 people such as Starcross or a conurbation or megalopolis with 10 million or more residents. The piece of land upon which a settlement is built is the settlement’s site. The situation of a settlement is its position relative to the surrounding physical features of the landscape. Divide the pupils into pairs and distribute copies of the maps and photographs in Resource 3.1 and encourage them to speculate as to:

The site of Starcross i.e. why was this place chosen originally by people as somewhere to live? Encourage the pupils to think back before the railway arrived in the 19th century. The painting of Starcross by Charles Joseph Hullmandel in 1820 in Resource 3.2 will help and also support them to consider the pedestrian ferry to Exmouth shown on the map (the lowest crossing point on the Exe Estuary (Resource 3.3)).

The situation of Starcross i.e. where is Starcross located in relation to the surrounding area? Clearly the village stands on the West bank of the Exe Estuary but what is its position relative to the city of Exeter and the neighbouring communities of Dawlish and Exmouth? What is found to the west of Starcross?

The village has changed greatly over the past 200 years. In 1870 John Marius Wilson’s Imperial Gazetteer of England and Wales described Starcross like this:

The village stands on the estuary of the River Exe 8 miles SSE of Exeter. It was until about 1820, a pretty hamlet, known only for its cockles and its oysters. It is now a large and well-built watering – place; and has a head Post Office, several respectable inns and lodging – houses and a fair on Whit – Wednesday. Its population is 1192 and there are 282 houses. The church is good and there is a national school.

Ask the pupils what they think changed Starcross so dramatically? There are two maps in Resource 3.4. One of the maps is the Don map of 1765 and the other is an Ordnance Survey map of 1945. What has arrived in the village? The railway was opened in 1846. Today the line is operated by First Great Western. Express trains pass through Starcross on the London Paddington to Penzance service and stopping trains link Starcross locally to Exeter, Exmouth and Paignton.

Now ask the pupils to examine the five aerial photographs of Starcross in Resource 3.5. These were taken progressively in 1945; 2003; 2006; 2010 and 2013. Using a copy of the 1945 aerial photograph as a baseline image the pupils can add changes identified in subsequent years in four colours to gain a greater awareness of how the settlement has grown through development over the past 70 years. Following this the pupils can stick the completed image in the centre of an A3 piece of plain paper and annotate with labels key changes they have identified e.g. new housing estate; new link road; enlarged fields; hedgerow removal; expanded farm buildings etc.
Key Question 3.2: How does Starcross depend on the railway?

Project the images in Resource 3.6 which shows a First Great Western train passing through Starcross and also a stopping train from Paignton via Starcross to Exeter and Exmouth. Working in groups of three or four, ask the pupils to discuss and list all of the ways in which the people in Starcross might depend on the railway? Encourage them to think about holiday makers and day visitors who arrive in Starcross using the train. How is this link important for people in the village who might own and run hotels, restaurants, bed and breakfast establishments, boat trips, fishing and bird watching outings etc? In addition what about the accessibility that the train provides for local residents who may commute daily to Exeter? Take feedback and summarise on the board.

However, the residents of Starcross also depend on the railway line in another very important way. The images in Resource 3.7 all provide clues for the pupils to work out the answer. What is the relationship do they feel between the raised sea wall on which the railway sits and protection from floods at high tide and during severe storms? The railway embankment protects over 600 properties and infrastructure (e.g. roads; electricity, gas and water supplies; sewerage pipes etc.) in Starcross. At its highest point the railway embankment reaches 4m and to the south of the village the additional protective measure of adding rock armour along the wall has been taken.

Key Question 3.3: What are the possible implications of climate change for Starcross?

Over the next 100 years settlements along the shore of the Exe Estuary are going to have to face the challenge of rising sea levels and the increased incidence of severe winter storms which sometimes will coincide with high tides. The Environment Agency predicts that sea levels based on ‘still water’ will rise by 110-200mm by the 2030s, 230-400mm by the 2060s and 400-950mm by 2100. These figures are given as ranges because the amount of sea level rise that happens in the future depends on how much greenhouse gases we emit between now and then. If there is a high incoming spring tide, storm conditions including tidal surge and very strong winds can lead to extreme flooding events like those seen in December 2013 and January and February 2014. Show the pupils the photographs in Resource 3.8 which were all taken on February 4th and 5th 2014. This is when high tide coincided with a severe winter storm which caused a tidal surge to occur. What do they show happening? The waves from the estuary are overtopping the 4m sea wall to the north of Starcross. During the same high tide event water from the estuary also overtopped the flood gates which had been closed at Generals Lane Slipway, a low spot in the village (Resource 3.9) and also entered the village via the slipway at the Starcross Fishing and Cruising Club, another low point in the village (Resource 3.10) and up the Estuary Road Slipway (Resource 3.11). Here, at the corner of the A379 on Estuary Road water flowed up the slipway flowing across the road to pool at the corner of the A379. The extent of the high tide on February 5th can be assessed by comparing the height of the estuary water in the two photographs of the ferry pier at Starcross in Resource 3.12 – one taken at the height of the high tide on February 5th 2014 and the other two on May 24th 2014. Before moving on take time to discuss with pupils what implications of this flooding are for Starcross? How does it impact on residents, visitors and commuters. Who might be most affected and why?
Key Question 3.4: Why did one resident of Starcross say on Facebook: “we had better pray that Dawlish Warren is not breached in our lifetime?”

Ask the pupils to examine closely the Ordnance Survey map of the Exe Estuary in Resource 3.1 and locate on the map both Starcross and Dawlish Warren spit which is situated across most of the mouth of the Exe Estuary to the south of the village and which can also be seen in the aerial photographs in Resource 3.13. Discuss with the pupils why the resident might have said what she did and what does ‘breached’ mean anyway? Dawlish Warren is a sand spit which shelters the mouth of the Exe Estuary. It is at risk of coastal erosion. The storms and high tides of February 5th 2014 eroded 5m of sand from the face of sand dunes at places along the spit as seen in Resource 3.14. If the pupils lived in Starcross what would they not want to happen to Dawlish Warren spit? The Exe Estuary Flood and Coastal Erosion Risk Management Strategy identified that the narrow part of Dawlish Warren spit is at risk of being broken through as a result of storms and sea level rise. If this happened, it would increase the risk of flooding to estuary communities such as Starcross, as well as Lympstone, Topsham and Exmouth and the mainline railway. Provide pupils with the 8 maps of Dawlish Warren spit (dating from 1853) in Resource 3.15 and the photograph in Resource 3.16. Which map and date corresponds to the photograph? Why? 1946 was the last occasion when the Dawlish Warren spit was breached when its eastern arm was eroded away. Over the next hundred years and with rising sea levels and increased regularity of severe storms and tidal surges there will be a real danger of the Dawlish Warren spit being broken through again with the possibility of large parts of it being eroded away entirely. The photographs in Resource 3.17 show a possible scenario. These can be printed off for the pupils to arrange in the correct order. They can then describe the changes predicted to occur and what the effects on communities along the estuary such as Starcross might be. Resource 3.18 shows the area of Warren most vulnerable to erosion.

Key Question 3.5 What is being done at Dawlish Warren in to ensure that it continues to protect the Exe Estuary in the medium term for the next 50 years?

The strategy suggested that a range of works are needed at Dawlish Warren to allow the sand spit to continue to act as a barrier to storm waves. Give a copy of the photograph in Resource 3.19 to each pupil and support them to produce an overlay identifying where they consider the Warren is most at risk of being breached by storm events. Since 2012 storms and high spring tides have resulted in damage to the sand dunes in the central part of the spit. A few metres of sand were washed away from the seaward face of the sand dunes, which exposed the wire baskets of stones (gabions) buried beneath. This backbone of gabions beneath the dunes was installed in the late 1960s/early 1970s to fix the position of the spit in place and so strengthen the role of the spit as a flood defence, providing shelter to the inner Exe Estuary (Resource 3.20). The government is going to pay £8.6 million towards the cost of intervention works along the middle section of the spit where the sand is already most depleted and where a combination of rising sea levels and more frequent storm events this century are creating conditions for a potential breach in the sand spit. It is worth emphasising that the government is prepared to pay this large amount of money for the works because The Exe Estuary Strategy estimated that the monetary value of the Warren in protecting homes and businesses as well as infrastructure e.g. roads and railways from storms and tidal surges
that might cause flooding is at least £80 million. However, the works in the middle section of the spit will involve soft engineering and not hard engineering methods. What do the pupils understand by ‘soft’ and ‘hard’ engineering? Print off a copy of Resource 3.21 and ask the pupils to colour in red each of the ‘hard’ engineering methods which could be used to help prevent erosion of the Warren and in blue all of the ‘soft’ engineering approaches. Encourage feedback and discussion and summarise key points e.g. ‘soft’ engineering approaches tend to work with natural processes rather than against them. Of the seven approaches detailed, five are ‘hard’ and two are ‘soft’ methods of coastal management. In the middle section of the Warren the gabions (wire baskets full of stones) will be removed and the beach will be recharged or renourished with sand and sediment dredged up from Pole Sands, offshore from the mouth of the Exe and then deposited on the Warren to create a much more erosion resilient beach and a naturally functioning habitat. This medium term strategy is known as managed realignment and work will begin in 2015. For more information on the proposed beach management scheme see https://www.gov.uk/government/publications/dawlish-warren-and-exmouth-beach-management/dawlish-warren-and-exmouth-beach-management

Key Question 3.6: What is likely to happen at Dawlish Warren in the long term after 2060 and what will this mean for Starcross?

It is predicted that by the end of 2060 continued engineering control of the sand spit will become too difficult and costly and as a result the Warren will begin to lose its sheltering function during southerly storms. In other words there will be no active intervention anymore and the Warren will be allowed to change naturally over time, which could at some point involve the spit being breached. Divide the pupils into groups of four and using the photograph in Resource 3.22 and the table of alternative management approaches outlined in Resource 3.21 challenge them to think about what approach will be most suitable for the community of Starcross given that climate change will mean higher sea levels and more frequent southerly storms occurring sometimes in conjunction with high spring tides. Encourage them firstly to decide whether the approach should be hold the line; managed realignment or no active intervention? After that they can decide upon the detail and the implications of the strategy they have chosen. Take feedback from each group and stimulate discussion. Has every group come up with the same approach? What are the costs and benefits of each? It is worth reminding the pupils that to justify holding the line i.e. building ‘hard’ engineering defences, then the investment must pass the monetary value test i.e. each £1 spent on coastal defences must be protecting at least £8 of property, businesses and infrastructure. If not then the government won’t allow it. So, for example a raised sea wall costing £5 million will only be justified if on completion it is protecting at least £40 million pounds worth of property, businesses and infrastructure.

Key Question 3.7: What is a “Dutch mentality”?

Welcome the set of images in Resource 3.23 to pupils working in pairs. Explain to them that they are all pictures of flooding in The Netherlands, the earliest picture being painted in 1421 and the most recent photographs are of the devastation caused in 1953 by a combination of a high spring tide and a severe European windstorm over the North Sea. This combination of wind, high tide, and low pressure led to a water level of more than
5.6 metres above mean sea level in some locations. The flood and waves overwhelmed sea defences and caused extensive flooding and 1836 deaths. Over 20% of the land area of The Netherlands is below sea level (shaded in dark blue on the map in Resource 3.24) with another 50% of its land less than 1m above sea level (shaded light blue in Resource 3.24). Thousands of years living behind dykes (embankments and barriers) on land reclaimed from the sea (called polders) lower than sea level has certainly affected Dutch culture. As a result close co-operation between members of communities is essential if they are to prevent flooding. The smallest mistake can result in disaster because a dyke is only as strong as its weakest point. Agreements are drawn up which must be strictly followed by everyone. Most communities have flood committees which are constantly on the lookout for dykes which need repairing or weather conditions which might result in a flood. Members of the committee also ensure that in the event of flood warning being given everyone living in the settlement is told well in advance. In addition to every settlement having a Flood Resilience Plan every member of the community has their own personal flood preparedness plan, whether they are individuals or members of families. Following the floods of 1953 The Netherlands began to construct the Delta Works. The works consist of dams, sluices, locks, dykes, levees and storm surge barriers which have the effect of shortening the Dutch coastline and making less vulnerable to storms and high tidal surges such as that which occurred in 1953 (Resource 3.25).

Key Question 3.8 How are the people of Starcross developing a ‘Dutch mentality’?

Developing a Dutch Mentality: We need to try to ensure that every resident in Starcross is aware of the risks of flooding, both from the high tide, and from surface water during exceptionally heavy rainfall, and the importance of our flood defences and water management systems in keeping us dry and safe


Before looking at the draft plan for Starcross divide the pupils into groups of four and explain that, in the event of a possible flood, the Environment Agency releases flood warnings online at http://www.environment-agency.gov.uk/homeandleisure/floods/31618.aspx?term=All&type=Warnings Warnings can also be sent by phone and directly to individuals via text messages to mobiles, as well as via the television and radio. As the likelihood of flooding increases in places around the coast of the United Kingdom so it becomes more important for individual households and whole communities to become more resilient. Resilient means to recover or bounce back quickly from a difficult situation, such as ill health or flooding. If someone is resilient then they are not changed by anything unless they choose to be. Take time to discuss with pupils the concept of adaptation. Support them to understand that making physical changes to property is only one part of building resilience. Resilience can also be built up through establishing closer and co-operative community links and networks which are mutually supportive.

Pupils can access advice about making a personal flood plan at http://www.environment-agency.gov.uk/homeandleisure/floods/38329.aspx An activity here is for the pupils to consider the top ten most important things they would put into their own flood kit and then to compare it with the advice of the Environment Agency at http://apps.environment-agency.gov.uk/flood/151256.aspx. How many things that they selected were the same?
Now ask the pupils how they think the community members of the village of Starcross could work together to respond quickly and be more resilient to the possibility of flooding? Divide the pupils into groups and encourage them to discuss all of the things that people working together might decide to do e.g. elect a flood committee for the village with particular responsibilities such as getting messages to people quickly; monitoring pumps, sluices and flood gates and making sure that the most vulnerable people e.g. the disabled living alone are known about and taken care of. There is a Community Flood Plan template that pupils could use in the drafting of their plan at http://apps.environment-agency.gov.uk/flood/151256.aspx and further guidance can be found at https://www.gov.uk/government/policies/reducing-the-threats-of-flooding-and-coastal-change and at http://www.local.gov.uk/flood-resilience

Using the template encourage and support the groups of pupils to draft their own flood resilience plan. When all the groups have completed their draft plans introduce the proposals drawn up by the Parish Council at Starcross (Resource 3.26). The pupils can read this carefully and evaluate it against their own ideas. What has the Parish Council included which they omitted to consider and what ideas did they generate that they feel would be of value
Sample Resources from Enquiry 3.
The complete set of resources supporting learning in this enquiry are available on the accompanying DVD and online at www.lcco.eu

Resource 3.1
Resource 3.6

Credit: David Weatherly

Resource 3.6

Credit: David Weatherly
Resource 3.8

Credit: Megan Debenham, Clerk to Starcross Parish Council

Resource 3.9

Credit: https://www.facebook.com/starcrossnews