

**Drayton Manor High School**

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| Exam Question |
| |  |  | | --- | --- | | (a) (i) | Study Figure 1. Explain the sequence of coastal processes that have resulted in the landforms shown. *(6 marks)* | |
| |  |  | | --- | --- | | (a) (ii) | Study Figure 2. Explain the specific role that longshore drift plays in the formation of the landforms shown. *(6 marks)* | |
| |  |  | | --- | --- | | (b) | Explain the role that vegetation plays in dune successional development on sandy coastlines. *(8 marks)* | |
| |  |  | | --- | --- | | (c) | Assess the factors that are taken into consideration when making policy decisions on Integrated Coastal Zone Management via Shoreline Management Plans. *(20 marks)* | |
| **Total:** 40 marks |

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| Source |
| **Figure 1: Erosional landforms in resistant sedimentary rocks**   **Figure 2: Depositional landforms** |

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| Mark scheme |
| |  |  | | --- | --- | | (a) (i) | 6 marks (AO1 = 3 marks, AO2 = 3 marks)  Some suggested ideas are given below but you may wish to expand on these or include other relevant points.  **AO1 Demonstrating your knowledge and understanding**  • Waves are refracted around the headland, concentrating erosion here.  • Erosion can take place by three main processes: hydraulic action, corrasion/abrasion and corrosion. **AO2 Applying your knowledge and understanding**  • These erosional processes will preferentially erode places of weakness in the rock, such as a joint, bedding plane or fault.  • Where the fault runs perpendicular to the coastline, caves can be eroded, which may ultimately become blow holes and geos.  • Where the faults run parallel to the shoreline, through the headland, the caves that form there can ultimately become arches, stacks and stumps.  **Answers to this question will be given a mark within a level band  Level 1 (1–2 marks):** You show limited geographical knowledge and understanding of the sequence of coastal processes and resultant landforms. You apply your knowledge and understanding of the sequence of coastal processes and resultant landforms with limited effect, making limited connections between aspects of your answer and supporting your interpretations with limited evidence.  **Level 2 (3–4 marks):** You show mostly relevant and accurate geographical knowledge and understanding of the sequence of coastal processes and resultant landforms. You apply your knowledge and understanding of the sequence of coastal processes and resultant landforms, making some connections between aspects of your answer as appropriate and supporting your interpretations with some evidence.  **Level 3 (5–6 marks):** You show relevant and accurate geographical knowledge and understanding of the sequence of coastal processes and resultant landforms throughout. You apply your knowledge and understanding of the sequence of coastal processes and resultant landforms throughout your answer, making sound connections between aspects of your answer as appropriate and supporting your interpretations logically with evidence.  **Hints and tips** Give a clear explanation of the relevant processes here. Develop your points to show good depth of understanding. | |
| |  |  | | --- | --- | | (a) (ii) | 6 marks (AO1 = 3 marks, AO2 = 3 marks)  Some suggested ideas are given below but you may wish to expand on these or include other relevant points.  **AO1 Demonstrating your knowledge and understanding**  • Longshore drift is an important transportational process at coasts.  • It occurs when waves approach a shoreline at an angle. The swash moves up the beach at an angle, carrying sediment with it. The backwash comes back down straight, moving the sediment further along the shore with it. The sediment is moved along the beach in a zig-zag pattern. **AO2 Applying your knowledge and understanding**  • The way longshore drift interacts with a coastline is determined by a combination of prevailing wind and coastal orientation.  • Where a coast changes orientation suddenly (e.g. at an estuary), longshore drift carries on in the original direction, forming a spit (if the spit grows over the whole estuary mouth it forms a bar).  • Where two longshore drift currents approach each other from opposite directions, the waves cancel each other out, forming a triangular feature of deposition called a cuspate foreland.  • Similarly, as waves refract around an offshore island, they form a calmer area where they meet behind the island, allowing deposition to occur, forming a tombolo.  **Answers to this question will be given a mark within a level band  Level 1 (1–2 marks):** You show limited geographical knowledge and understanding of the role longshore drift plays in the formation of the landforms. You apply your knowledge and understanding of the role longshore drift plays in the formation of the landforms with limited effect, making limited connections between aspects of your answer and supporting your interpretations with limited evidence.  **Level 2 (3–4 marks):** You show mostly relevant and accurate geographical knowledge and understanding of the role longshore drift plays in the formation of the landforms. You apply your knowledge and understanding of the role longshore drift plays in the formation of the landforms, making some connections between aspects of your answer as appropriate and supporting your interpretations with some evidence.  **Level 3 (5–6 marks):** You show relevant and accurate geographical knowledge and understanding of the role longshore drift plays in the formation of the landforms throughout. You apply your knowledge and understanding of the role longshore drift plays in the formation of the landforms throughout your answer, making sound connections between aspects of your answer as appropriate and supporting your interpretations logically with evidence.  **Hints and tips** Give a clear explanation of the role of longshore drift as it relates to the various landforms. Make sure you develop your points to show good depth of understanding. | |
| |  |  | | --- | --- | | (b) | 8 marks (AO1 = 8 marks)  Some suggested ideas are given below but you may wish to expand on these or include other relevant points.  **AO1 Demonstrating your knowledge and understanding**  • Sand dunes need various conditions for their formation, including: supply of sand, onshore winds, large area of flat land behind the shore.  • However, it is the stabilising role that vegetation plays that is key in their development.  • As sand starts to build up around debris towards the backshore, it begins to be colonised by plants such as sea couch. These plants bind the sand together, stabilising its height, and allowing it to build up further from the influence of the sea.  • This encourages more and different plants to grow — these not only continue to bind the sand together with their roots, but they also add organic matter to the soil, improving its structure and making it less susceptible to wind erosion.  • As soil quality improves further, percentage vegetation cover increases and the soil is further protected from erosion from the wind.  • However, the stabilising actions of the vegetation in sand dunes can be adversely affected by various human activities, such as trampling and sand extraction.  **Answers to this question will be given a mark within a level band  Level 1 (1–2 marks):** You show limited geographical knowledge and a narrow understanding of the role that vegetation plays in dune successional development. Part of your answer may be inaccurate or lack detail.  **Level 2 (3–5 marks):** You show mostly relevant geographical knowledge and understanding of the role that vegetation plays in dune successional development. Some parts of your answer are not fully developed.  **Level 3 (6–8 marks):** You show accurate and relevant geographical knowledge and understanding of the role that vegetation plays in dune successional development. Your answer is detailed and fully developed.   **Hints and tips** 'Explain' questions require you to show good understanding of the specific role of vegetation — justify your points to demonstrate this understanding. | |
| |  |  | | --- | --- | | (c) | 20 marks (AO1 = 5 marks, AO2 = 15 marks)  Some suggested ideas are given below but you may wish to expand on these or include other relevant points.  **AO1 Demonstrating your knowledge and understanding** Shoreline Management Plans (SMPs) are used as the framework for decision-making for coastal management in the UK.  SMPs recognise the interconnectedness of coastal systems and that actions in one part of the system have consequences elsewhere. The SMPs identify 11 sediment cells around the shores of England and Wales. These are natural sections of coastline which are self-contained in terms of the movement of sand and shingle.  SMPs seek to:  • identify the social, economic and environmental risks of flooding and coastal erosion in a sediment cell;  • set out the preferred policy approach to address these risks;  • outline the consequences of the approach recommended. In doing so, SMPs consider three key factors:  • *Cost–benefit analysis:* If the costs outweigh the benefits, coastal protection is less likely to be recommended.  • *Environmental Impact Assessment (EIA).*  • *Technical viability:* If it is decided that a section of coastline merits active management intervention, to what extent can the proposed management strategies actually produce the desired management outcome? **AO2 Applying your knowledge and understanding** There are four broad policy approaches SMPs may choose from:  • Hold the line.  • Advance the line.  • Managed retreat.  • No active intervention. The SMP requires impacts on the following to be considered when making policy decisions:  • The physical environment.  • The human environment: land use; tourism/recreation; heritage; communities. When the above factors are applied in the context of a specific policy decision, the decision-making process, although it seeks to be ultimately sustainable, can still be controversial. There can be losses and losers, and these are to be sacrificed for the greater overall benefits.   **Answers to this question will be given a mark within a level band  Level 1 (1–5 marks):** You include isolated points of geographical knowledge and understanding of the decision-making factors, with some errors and inaccuracies. You have not made connections from the question to points made. Your answer is incoherent and lacks relevant evidence to support ideas. Your argument is limited, with unbalanced points. Points that you make are concluded in a general manner, if at all.  **Level 2 (6–10 marks):** You make some points showing geographical knowledge and understanding of the decision-making factors, some of which may be relevant. You make some inaccurate points. You apply some of your knowledge about differences in economic and social inequalities and their connection with regeneration priorities but your ideas are not developed or may not be linked directly to the question. You use some evidence to support statements, which may answer only part of the question. You make a conclusion but this is drawn from often unbalanced ideas.  **Level 3 (11–15 marks):** You make generally relevant points showing geographical knowledge and understanding of the decision-making factors. Your ideas are mostly accurate and some connections are made between ideas. You interpret the question well in general but there may be some gaps in the use of evidence to support points. You draw a conclusion that links to the arguments made but is not fully supported by evidence.  **Level 4 (16–20 marks):** You show good use of geographical knowledge and understanding of the decision-making factors. You make a range of relevant points to create a coherent argument supported by appropriate evidence. You apply your knowledge well throughout. All points you make are linked to the question. You draw a good, well-balanced conclusion that links clearly to the evidence presented.   **Hints and tips** Give balanced attention to various considerations that go into an SMP and reach an overall assessment of their relative impact. | |

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| Student Response A | |
| (a) (i) | At headlands, waves are refracted as they approach the headland, bending around it and concentrating their energy here. This means that headlands are places that experience significant erosion. This can occur by three main methods: hydraulic action (when the waves break on the shore, it may trap air in crevices in the rock, increasing air pressure, putting stress on the rock); abrasion/corrasion (sediment being carried by the waves being thrown against the shore by the breaking waves); and corrosion (carbonic acids in the water dissolving limestone and chalk).    |  | | --- | | **Examiner comment** The student shows a strong understanding of these processes and has communicated that clearly. |   The way these erosional processes operate at a coastline is influenced by various factors, especially the geology. The landforms shown in the diagram are typical in places with sedimentary rocks such as limestone and chalk, with bedding planes and joints. Clay coasts tend not to have many of these features as they are not resistant enough for them to form.   |  | | --- | | **Examiner comment** The student outlines clearly the factors that are relevant to the formation of the features in the figure. |   In places where rocks have clear joints, the erosion is concentrated along these places of weakness. Where the joins run parallel to the main shoreline, running through the headland, a sequence of processes occurs. First, a notch is carved out by erosion, widening out into a cave which can cut through the entire headland, forming an arch. The unsupported roof of this cave collapses to form a stack (the stack eventually is eroded away leaving only a stump). Where the joins run perpendicular to the main shoreline, the cave erodes back into the land. First, the water may be funnelled back into the cave to erode a blow hole in the ceiling. Eventually, the entire cave roof collapses to form a narrow inlet called a geo.   |  | | --- | | **Examiner comment** The student applies their understanding of the erosional processes and factors to the particular scenario outlined in the figure. Level 3, 6 marks. | |
| (a) (ii) | Longshore drift is a very important process of transportation along coastal areas. As the wave breaks at an angle, the swash moves up the beach at the same angle. Any sand or shingle carried by the breaking wave thus moves up the beach at the same angle. However, the backwash follows the most efficient way back down the beach, and so moves back down straight. Again, this carries the sediment back with it. The end result is that the sediment moves along the beach with each breaking wave, following a zig-zag route.    |  | | --- | | **Examiner comment** A clear understanding of the operation of longshore drift. |   How this process actually interacts with a coastline is determined mostly by the prevailing wind (the most commonly occurring wind direction) and the orientation of the coast. For example, when a coastline changes orientation suddenly (such as at an estuary mouth), the prevailing wind carries the longshore drift out across the estuary mouth. This forms a feature known as a spit. The end of the spit can form a hook as a secondary prevailing wind causes currents to curve the end round. If the spit builds across the entire estuary mouth, it forms a bar.  When you have a place where two prevailing winds cause longshore drift to operate in opposite directions, where the currents meet they can cancel each other out and cause deposition to occur. This can form a triangular shaped feature called a cuspate foreland. This cancelling out of longshore drift is also relevant in the formation of tombolos. Where you have an offshore island, the waves refract around it and meet behind it. As these waves break on the beach from opposing directions, they cause longshore drift to move from these two directions and hence towards each other. Where these drifts meet behind the island, the sediment starts to build out seawards.   |  | | --- | | **Examiner comment** The student clearly applies their understanding to the various depositional features shown in the figure, explaining the role longshore drift plays in their formation. Level 3, 6 marks. | |
| (b) | Sand dunes may form where there is a large supply of sand and sediment (e.g. from a beach), where there are onshore winds for periods of time and where there is a large area of flatter land behind the shore. However, the role of vegetation in stabilising the sand during sand dune plant succession is vital in the formation of a stable dune system.  Sand found above the high-tide level is transported by onshore winds towards the back of the beach. Where there are obstacles such as pieces of driftwood or seaweed, the sand can build up in height, forming the embryo dunes. This increased height raises the beach up slightly away from the influence of the tides and allows plant succession to begin. Salt-tolerant plants such as sea couch colonise the embryo dunes. Their roots help stabilise the sand, and further deposition occurs around the long, thin leaves of the grass, further raising the height of the dunes, and forming the foredunes. Foredunes can build quickly as plants like marram grass begin to grow, forming a height of several metres in 5–10 years. As they grow, they improve the soil quality further as they add organic matter to the soil. This improves its structure and further stabilises the soil, making it much less susceptible to wind erosion. Furthermore, the better soil quality allows a wider variety of plants to grow, including rosette plants (e.g. dandelions) and the percentage vegetation cover in the dunes rises to 100\_This protects the soil from further wind erosion, and increases its stability.  The importance of vegetation in stabilising the sand dunes can be seen when the vegetation is removed by erosion. This can occur naturally, forming large hollowed-out bowls of sand called blow outs. But it can also happen because of human activities. Sandy beaches and dunes are popular recreational destinations. As people trample through the dunes, the vegetation can die and wind erosion can degrade the dunes considerably. Many dune systems in the UK are now managed to try to mitigate the impacts of trampling on dune stability.     |  | | --- | | **Examiner comment** The answer shows a very good understanding of the various ways in which vegetation in sand dunes can act to stabilise the dunes. The reference to human trampling to show what happens when vegetation is removed is an effective illustration of the importance of vegetation. Level 3, 8 marks. | |
| (c) | To provide a framework to guide the complex decision-making involved in coastal management, Shoreline Management Plans (SMPs) are used in the UK. They guide sustainable coastal management into the twenty-second century. They have the following characteristics. First, SMPs recognise the interconnectedness of coastal systems and that actions in one part of the system have consequences elsewhere. The SMPs identify 11 sediment cells around the shores of England and Wales. These are natural sections of coastline which are self-contained in terms of the movement of sand and shingle. Their boundaries coincide with major physical features such as estuaries or headlands. Sediment cells can be sub-divided into smaller sub-cells, within and between which sediment can move freely.  Second, SMPs seek to identify the social, economic and environmental risks of flooding and coastal erosion in a sediment cell; to set out the preferred policy approach to address these risks; and to outline the consequences of the approach recommended.  In doing so, SMPs consider three key factors. First, cost-benefit analysis: weighs up the benefits, including what is the value of the land being protected in terms of human infrastructure (including settlements, industry, power stations) and economic activities (such as tourism) against the costs, especially what the cost of building and maintaining coastal defences is. If the costs outweigh the benefits, coastal protection is less likely to be recommended. The second factor is Environmental Impact Assessment (EIA): what are the impacts of action (or inaction) on the local ecology and habitat diversity? To what extent does the local geology and wave energy environment make the area susceptible to erosion? What is the likely impact of climate change on sea levels in this location? Finally, the SMPs consider technical viability. If it is decided that a section of coastline merits active management intervention, to what extent can the proposed management strategies actually produce the desired management outcome? And what about its potential impacts on other sub-cells of the sediment cell? In short — will it work?  There are four broad policy approaches SMPs may choose from. The first of these is hold the line (maintaining the current coastal position by repairing or upgrading existing defences). Second, advance the line (placing new defences seaward of the original defences). Third, managed retreat (allowing coastal erosion processes to occur at a location while implementing management strategies to manage the retreat of human and economic assets). Finally, no active intervention in coastal defences.  In addition to the three factors and four policy approaches, SMPs must consider the impacts of making a decision. First, the impacts on the physical environment are evaluated. There is a legal requirement to consider the environmental impacts of interventions in Special Protection Areas (SPA) or Special Areas of Conservation (SAC) and government policy requires local councils to avoid environmental damage and to look for opportunities for environmental enhancement. Second, the impacts on the human environment are evaluated. The SMP assesses various aspects of the human environment. These include land use — in the past, there has been unhindered development of settlements and other human activities along the coastline. However, this has resulted in the need for hard engineering protection, which is not economically sustainable in the longer term. Also, tourism/recreation are considered. Although tourism to coastal areas has declined in recent decades in the UK, it is still an important part of the economy of many coastal locations. So, the SMP needs to consider the impacts on the tourism industry when reaching policy decisions. In addition, the SMP looks at heritage value. There are many places of heritage value along the coast. The SMP should, where possible, seek to protect these. But it is recognised that this is not always possible or sustainable. And so each location should be considered on a place-by-place basis — which may mean decisions are made that result in the loss of heritage sites. Finally, it considers the impacts on communities. Indices of deprivation show that many of the UK’s coastal areas have issues such as unemployment, health problems and the impacts of seasonal visitor business. These problems can be worsened when the communities face threats from coastal erosion or flooding.  How these work together in a real world context can be seen in the SMP from North Norfolk. Part of the SMP covers the shoreline from east of Cromer to Happisburgh. Previously, this part of the coast was protected by revetments, constructed in the 1950s. However, by the 1980s, these had fallen into a bad state of repair and the coast here was suffering badly from erosion, resulting in the loss of land — and of buildings.  However, the SMP recommends managed retreat as the policy for this section of coastline. The SMP assessment of the impact on the physical environment of this policy states that erosion will allow continued exposure of the 6 hectares of cliffs with Site of Special Scientific Interest status at Happisburgh. However, Natural England sees this as positive as far as the environment is concerned as it allows the study of the geology found there. Any processes that interrupt erosion can stop the exposure of fresh geological outcrops, as the previous ones get covered by vegetation and rock debris. Elsewhere in the sediment cell, the sediment eroded from these cliffs will contribute to beaches and dunes further to the south, maintaining and enhancing the dunes at places like Eccles and Winterton-on-Sea. Furthermore, there will be loss of Grade 1 agricultural land to erosion from the sea, totalling up to 45 hectares by 2105.  In its assessment of the impacts on the human environment, the SMP states there will be a significant loss of commercial and residential properties as a result of the managed retreat option. By 2025, around 15 properties in Happisburgh will have been lost, primarily along Beach Road. In addition there will be a loss of land from the clifftop caravan park and the HM Coastguard rescue facility. However, at this stage, no loss of clifftop heritage sites is expected. By 2050, it is expected that cumulative losses of properties will be between 15 and 20. There will be further loss of land from the clifftop caravan park at Happisburgh. By this stage, the Grade I St Mary’s church and the Grade II Manor House will be at risk of erosion. By 2105, total residential losses are expected to be between 20 and 35 properties and the SMP foresees the probable loss of St Mary’s church and Manor House.  Despite these impacts, the policy of managed retreat is sustainable into the longer term. The loss of land will be a major input of sediment into the sediment cell, and it will be transported south along the coast to enhance the beaches and dunes found there. This will not only protect settlements such as Eccles-on-Sea, but it will also help to maintain and develop natural habitats. It will also allow the coastline to operate in a natural manner. So, despite the loss of residential properties, cultural heritage and economic assets, these losses are not sufficient to justify the costs of protecting the coastline here, never mind the negative impact such interventions here would have in other areas to the south.  In conclusion, we can clearly see how complex the range of interacting factors are that must be considered when making policy decisions for coastal management. And we can see how the final decisions made can have losers, despite being judged as sustainable overall.    |  | | --- | | **Examiner comment** This is a very detailed and comprehensive answer. The student shows wide-ranging knowledge of SMPs and the decision-making process, and understanding of how the various elements are linked together and inform each other in the decision-making process. Use of examples from North Norfolk give the answer useful evidence to support the argument. Level 4, 19 marks. | |

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| Student Response B | |
| (a) (i) | The features shown here are erosional. There are various erosional processes at coasts: hydraulic action (when the waves break on the shore, it may trap air in crevices in the rock, increasing air pressure, putting stress on the rock); abrasion/corrasion (sediment being carried by the waves being thrown against the shore by the breaking waves); and corrosion (carbonic acids in the water dissolving limestone and chalk).   |  | | --- | | **Examiner comment** The student demonstrates a good grasp of the erosional processes. |   At a headland, a notch is carved out by erosion. This can widen out into a cave and this can cut through the entire headland to form an arch. As the arch is unsupported by material below, it will eventually collapse to leave an isolated stump offshore. Elsewhere, the caves can erode inland by wave action. As the water travels down the cave, it can break upwards towards the end and erode a hole in the roof (the blow hole). In fact, the entire roof may collapse leaving an inlet called a geo.   |  | | --- | | **Examiner comment** The student shows a good understanding of how the processes create the landforms. To gain more marks, however, the student could set this in the context of the factors that affect how these processes operate, especially geology. Level 2, 4 marks. | |
| (a) (ii) | As the wave breaks at an angle, the swash moves up the beach at an angle, carrying sand or pebbles with it. However, the backwash moves back down straight, again this carries the sediment back with it. So the sediment moves along the beach with each breaking wave, in a zig-zag route. This process is known as longshore drift.    |  | | --- | | **Examiner comment** The student demonstrates a solid understanding of the operation of longshore drift. |   At an estuary mouth, longshore drift occurs out across the estuary mouth. This forms a feature known as a spit. If the spit builds across the entire estuary mouth, it forms a bar. When two longshore drift currents move in opposite directions, where they meet they can cancel each other out and cause deposition to occur. This can form a triangle-shaped feature called a cuspate foreland. A tombolo is formed as the waves that refract around an offshore island cancel each other out, forming an area of calm, where deposition occurs.    |  | | --- | | **Examiner comment** The student outlines the processes that operate to form these features. The answer would be improved by exploring the factors that affect how longshore drift operates (such as prevailing wind and coastal orientation) and by explaining the specific role of longshore drift in the formation of a tombolo. Level 2, 3 marks. | |
| (b) | Sand at the back of the beach starts to build up around obstacles such as pieces of driftwood. As it builds up, plants can begin to colonise, e.g. sea couch. These plants have rhizome roots that spread out laterally and help to bind the sand together. And the leaves of the plants encourage more sand to build up, improving stability.  As the dunes get higher, other plants start to grow too. For example, marram grass. This adds more organic matter to the soil and this means that it binds together better and is more stable. When the winds blow over the dunes, they are less likely to erode the sand because of this, so the dunes are more stable.  We can see just how important the vegetation is in dune stability when we think about how people can destroy the vegetation by walking over it. When this happens, the dunes can be badly eroded. Many sand dune systems in the UK need to be managed to help fight against this.   |  | | --- | | **Examiner comment** The student shows a good overall grasp of most of the relevant material here, but the answer needs to show greater depth of understanding to gain top-level marks. Level 2, 4 marks. | |
| (c) | Shoreline Management Plans (SMPs) are used in the UK to give a framework for coastal management decision-making. SMPs identify 11 sediment cells around the shores of England and Wales. These are sections of the coast that are interconnected — actions in one part of the sediment cell will have consequences elsewhere. Decisions made under SMPs are based on some decision-making factors. Cost-benefit analysis weighs up the benefits, including what is the value of the land being protected against the costs. Environmental Impact Assessment looks at the impacts of a policy on the natural environment, including the impact that climate change might have on any coastline and management decisions.   |  | | --- | | **Examiner comment** One of the key factors is missing here: technical viability. |   In terms of decisions that can be taken, SMP outlines ones that can be made. Hold the line — maintaining the current coastal position by repairing or upgrading existing defences. Advance the line — placing new defences seaward of the original defences. Managed retreat — allowing coastal erosion processes to occur at a location while implementing management strategies to manage the retreat of human and economic assets. Finally, no active intervention in coastal defences.   |  | | --- | | **Examiner comment** To set the full context of the decision-making processes the student could also examine how the SMP considers the impacts on human and physical environments. |   How these work together in a real world context can be seen in the SMP from North Norfolk. Part of the SMP covers the shoreline from east of Cromer to Happisburgh. Previously, this part of the coast was protected by revetments, constructed in the 1950s. However, by the 1980s, these had fallen into a bad state of repair and the coast here was suffering badly from erosion, resulting in the loss of land and of buildings.  However, the SMP recommends managed retreat as the policy for this section of coastline. This policy is sustainable in the long term. The loss of land will be a major input of sediment into the sediment cell, and it will be transported south along the coast to enhance the beaches and dunes found there. This will also allow the coastline to operate in a natural manner. So, the losses of residential properties are not sufficient to justify the costs of protecting the coastline here.  Elsewhere in North Norfolk, from Kelling to Cromer, the decision was to hold the line via sea walls and groynes. Overall, the use of sea walls and groynes could be considered largely sustainable in this particular case. This is mainly because this section of coast has relatively low sediment transport rates and so stopping erosion at Cromer will have limited negative impacts elsewhere in the sediment cell. Additionally, the town is a main urban centre for the region, providing services that support a number of surrounding communities. It is thought that the groynes will help maintain the beach for around 20–50 years, and this will help protect the sea wall from further damage.  However, there are ongoing economic costs in the longer term in terms of maintenance costs for the sea walls and groynes. In fact, after around 50 years, the SMP predicts that the beach will no longer be in existence at Cromer, because of factors such as a rise in sea level, more severe storms, and the fact that the sections of coast to the west and east of Cromer will continue to erode, leaving it as a promontory exposed to further erosion. Beyond 100 years, the SMP considers that the erosion pressures on the town will be such that it may be hard to justify the costs of maintaining the hard defences.   |  | | --- | | **Examiner comment** The student makes good use of examples from North Norfolk to illustrate the decision-making process and makes evaluative statements. The argument would have greater substance if the social and environmental impacts outlined in the SMP were also considered. |   Overall, then, you can see how challenging it can be to make decisions about coastal management.    |  | | --- | | **Examiner comment** The conclusion should be better developed to provide a fuller and more detailed summary of the argument. Level 3, 12 marks. | |