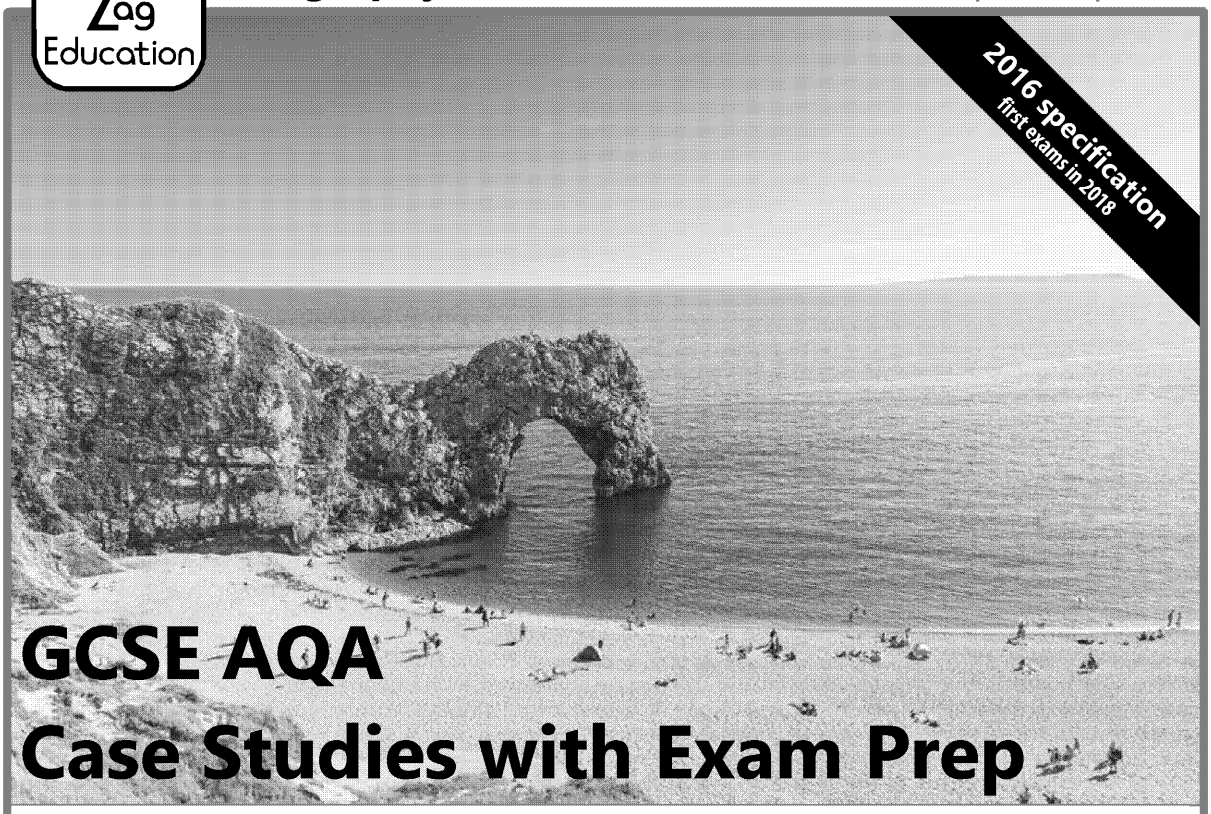
Zig Zag Education

Geography

GCSE (9–1)| AQA | 8035



GCSE AQA Case Studies with Exam Prep

Physical Landscapes in the UK: Coastal

The Jurassic Coast

zigzageducation.co.uk

POD 8797

Contents

Teacher's Introduction

This resource has been developed to provide case studies and exam preparation r
AQA specification (8035) **Section C: Physical Landscapes in the UK**.

This detailed case study is on **The Jurassic Coast** representing a **coastal landscape**

The case study includes a main content section which can be used as part of a lesson plan or distributed to students for self-guided research; a selection of ICT interactive links to further students' research around each topic and a set of Springboard images and discussion questions (also available as a file accessible by digital download) which makes a fantastic starter activity.

A webpage containing ... resource is conveniently ... Education's website at ...

You may find this helpf... rather than typing in ea...

The exam preparation section which follows the case study contains a summary ta... key facts and figures relating to the case study; rapid-fire revision questions (with... retention of the main points; and an exam-style question and mark scheme, writt... sample material, so that students can practice answering questions relating to cas... knowledge in their answers.

The resource may be used as a source of reference for the required case studies f... work leading to discussion or debate. Subheadings in the information sections are... comparisons of social, economic and environmental impacts.

Other detailed case studies are available for this topic area (1 other coastal lands... two glacial landscapes):

- The Seven Sisters (Coastal)
- The River Thames (River)
- The River Spey (River)
- Snowdonia (Glacial)
- The Lake District (Glacial)

A PowerPoint presentation containing the Springboard Images star... resource is available as a free digital download. Just register for fre... to download all available content for your school or purchasing site

Part 1: Case Study

Content

Introduction

The Jurassic Coast is a distinctive stretch of coastline situated in the south w
approxima miles across the counties of Devon and Dorset, beginning
Exmouth and finishing at Old Harry Rocks by Studland Bay.

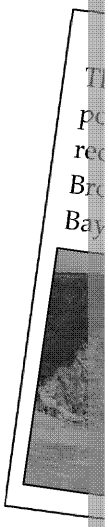
The coastline is a very important landscape due to its unique geological his
coastal landforms. It attracts millions of visitors each year who come to enj
to search the coast for fossils. It became a world heritage site in 2001 demo
site of global importance.

Figure 1: Map of the Jurassic Coast

The unique geology of the coastline gives an insight into Earth's past environ
the climate, flora and fauna of a time well before humans were around. The r
coast date back around 65 million years and as you travel west towards Exm
geological time to rocks from around 250 million years ago!

So how was this unique stretch of coastline formed?

The rocks are all from a period of time called the Mesozoic Era which began around 250 million years ago. Within this era there are three different time periods that the rocks come from, the Triassic, Jurassic and the Cretaceous. Normally, these types of rocks would build up on top of each other vertically. However, due to shifts in plate tectonics these layers of the rock tilted onto their side and exposed a unique landscape that spans a period of 185 million years. Take a look at the timeline on the following page to find out more about these time periods.



Jurassic Coast Timeline

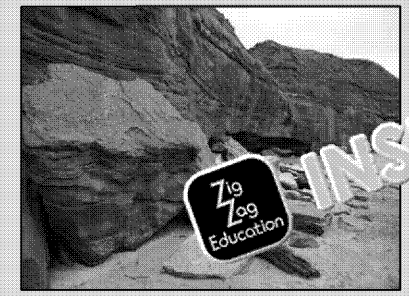


Figure 2 Exmouth Red Cliffs.

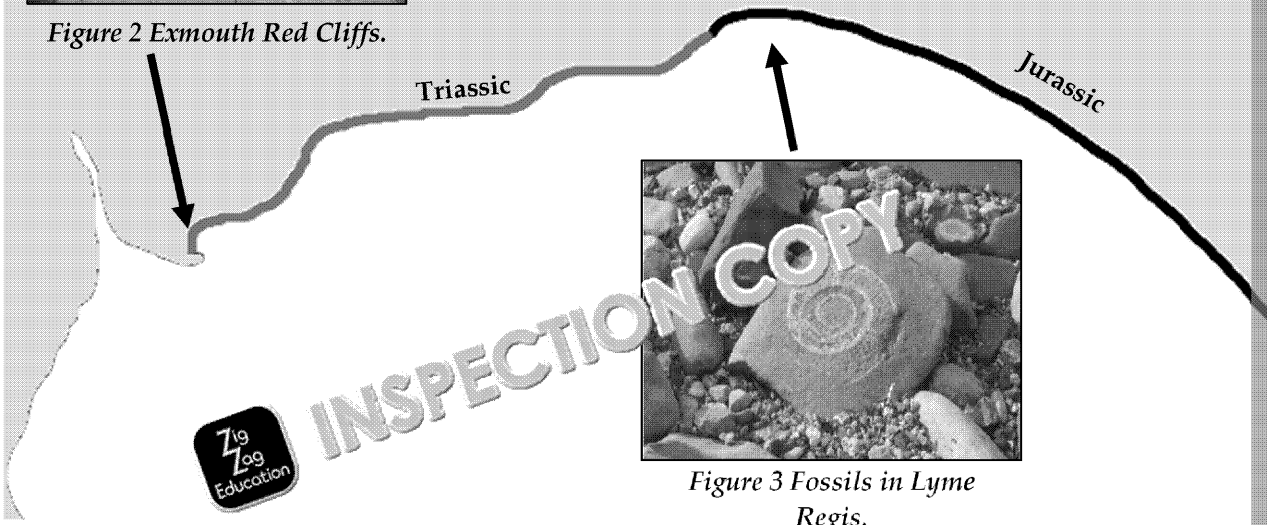


Figure 3 Fossils in Lyme Regis.

The Triassic Period	The Jurassic Period
The Triassic Period began around 250 million years ago when the continents of the world were all joined together to create a super continent called Pangea. At this time the climate was very hot and dry creating a desert environment. Over millions of years the continents shifted and evidence of the desert in Pangea has ended up on the south coast of the UK. The cliffs of East Devon show this Pangea desert through the rock formations of mudstone and sandstone.	The Jurassic Period spanned from 200 million years to 145 million years ago. During this period of time earth was in the perfect conditions for life to succeed thriving. The evidence of this abundant life is recorded in the coastline of West Dorset, an area which is now considered one of the best places to hunt for fossils. The rocks here range from clays, sandstones and limestones.

Landforms

The Jurassic Coast is home to many different coastal features and landforms making the coastline so interesting. These are mainly formed through the ge weathering, erosion and deposition. The length of the Jurassic Coast, along mean that some areas are concordant and others discordant, which also hel landforms. Below is more information on particular distinctive landforms fo

Durdle Door is a very famous coastal arch formed through erosional proces

Figure 5: Durdle Door

Rock type(s): Portland limestone, which is a hard rock.

Formation: This arch has formed over years of erosion from the sea a time ago the arch would have been a headland. Gradually limestone headland would have begun to erode as it was as hydraulic action. At first this would have formed a cav as the erosional processes continued, the cave would ever through forming the arch we see today.

Lulworth Cove is situated nearby to Durdle Door. It demonstrates a great e
concordant coastline.

Figure 6: Lu[illegible]h Cove

Rock Type(s): Variety of differe[illegible]pes. The headlands are made o
cliffs are m[illegible]ay.

Formation: The unique cove that has formed in Lulworth was caused
processes and geology. Lulworth lies on a concordant coa
to the shore. The front of the coastline is made of hard roc
of soft rock. Thousands of years ago the cove would not h
flowed through the land into the sea. This river eroded th
rock but eroded the clay area (soft rock) far more easily th
This caused the river to widen where the soft rock was. O
to erode the clay faster than the surrounding rock, creatin
this cove has now been reduced to a small stream leaving

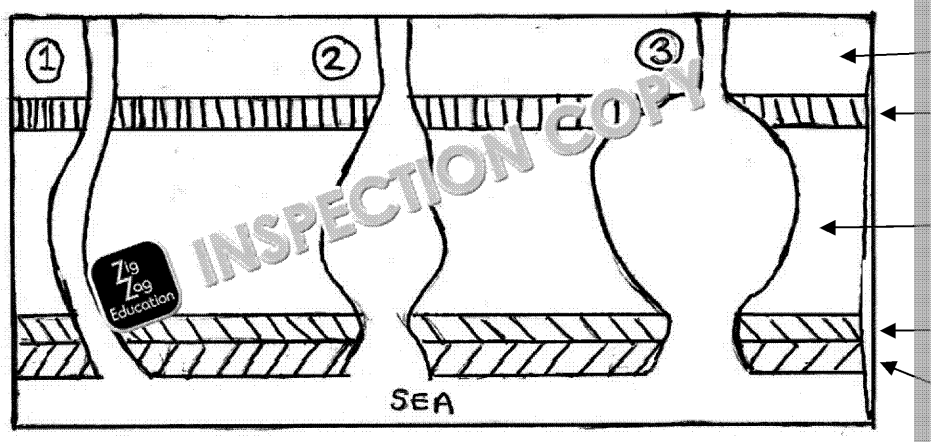


Figure 7: Lulworth Cove formation

Chesil Beach is an example of a tombolo (where a spit joins mainland to an
depositional processes.

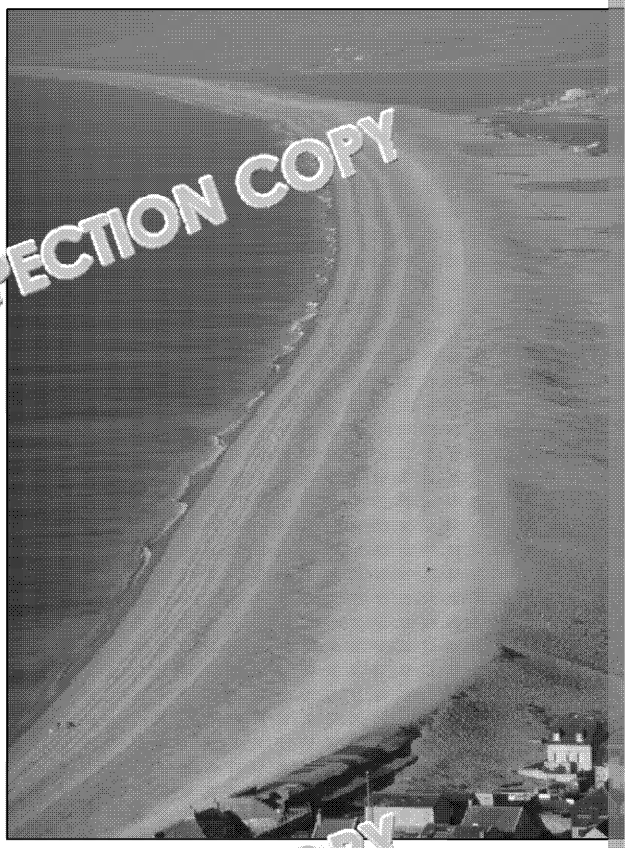


Figure 9: Chesil Beach

Sediment Type: Beach is made up of shingle and large pebbles.

Formation: No one knows exactly where the vast amount of sediment
Beach but there are theories that it came from landslides a
were retreating thousands of years ago. The prevailing so
caused the waves to then push all the sediment towards th
the process of longshore drift. This would have first form
sediment continued to be transferred in the direction of th
sediment reached the Isle of Portland, creating the tombol
itself is very steep demonstrating the power of the waves
beach is called a storm beach and acts as a natural barrier
behind.

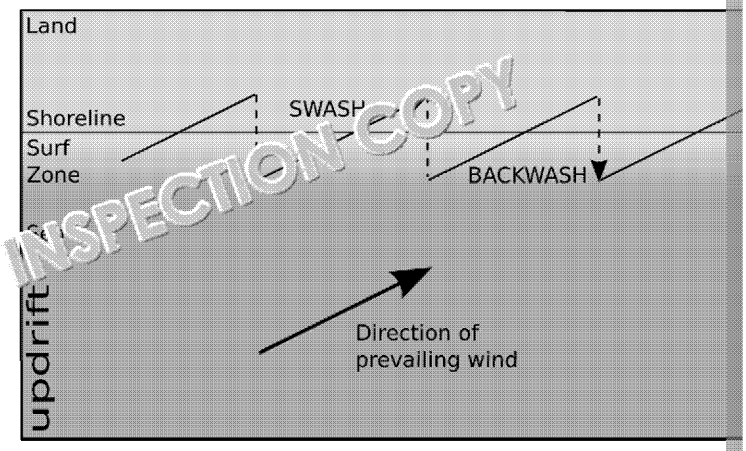


Figure 9: Diagram of longshore drift – how Chesil Beach

Physical influences on the Jurassic Coast

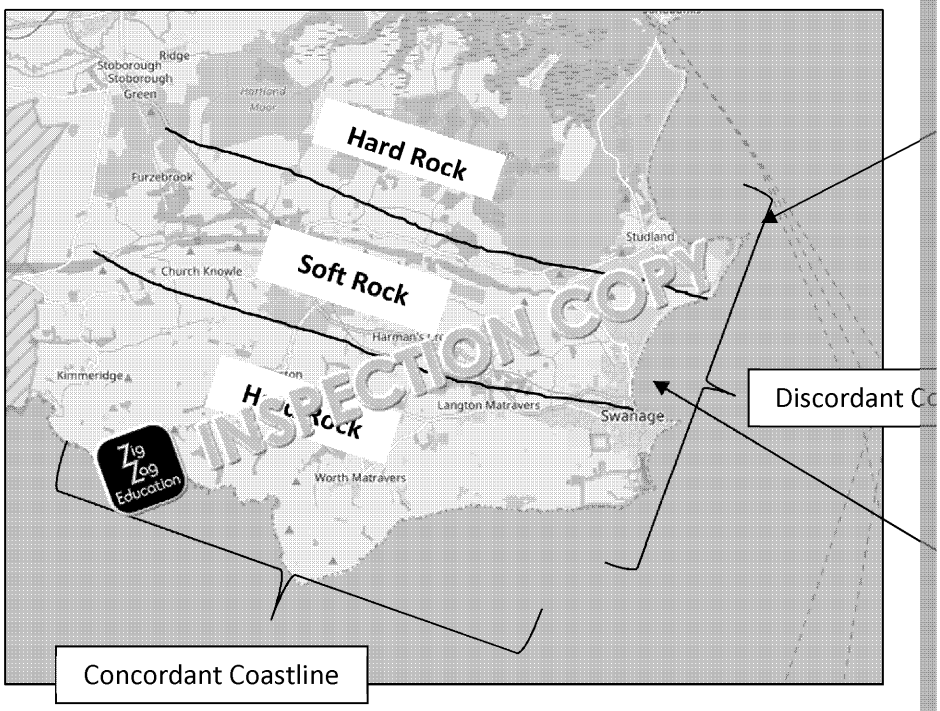
The shape and features of the Jurassic coast have been mainly formed throu
However, there are other physical factors that influence the effectiveness of
geology of the landscape and the climate can play significant roles in shapi

Geology

As we have already established, the geology of the Jurassic Coast varies co
geology has played a significant role in shaping the landscape.

- The harder rocks such as the limestones, sandstones and chalk have he
headland and island stacks as they are not as affected by geomorphic
- The soft rocks have helped to form bays and coves as they are more
- In addition, the variation in concordant and discordant coastlines has f
well as unusual landforms such as Lulworth Cove.

The diagram below shows an example of an area of the Jurassic coast that f
and discordant coastline.



Climate

Climate is also a factor that can influence the shape of the landscape as wel
geomorphic processes. The Jurassic Coast feels the full force of the UK's so
This wind helps to increase weathering processes along the coastline by cre
powerful waves. In addition, the wind brings in storms from the Atlantic C
change the shape of the coastline gradually over time, but also rapidly over
A recent example of this was during the winter storms of 2013/14.

The winter storms of 2013/14 was the stormiest period for 20 years with tw
in quick succession, over the period of December to February. Coastlines w
the Jurassic Coast was subject to extreme levels of weathering, erosion and
completely changed the shape of the coastline in the space of a few days.

How the winter storms (2013/14) changed the shape of the Jurassic Coast

Chesil Beach and the Isle of Portland were particularly affected by the winte
of the coast is already exposed to strong winds and waves so the winter sto
changing the shape of the coastline. Below are two examples of how the sha

A stack formation known as Pom Rock on Portland Bill was completely dest
effects as shown in these images:

Before:

Figure 10: Pom Pom Rock before the winter storms

After:

Figure

The force of waves during the storms changed the shape of Chesil Beach by forcing the sediment on the beach inland creating an even steeper bank. The storm waves even threw pebbles onto the pavements and road behind the beach.

Figure 12 shows the beach being [illegible] and flattened with pebbles and sedi[illegible] storms.

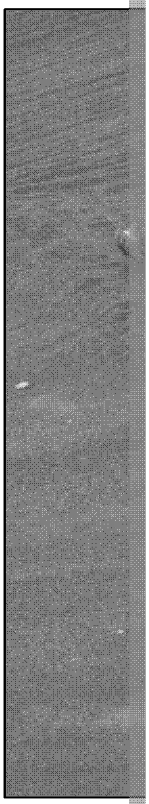


Figure 12: C

Climate ch[illegible]s another factor which may change the shape of the Jurassic Coast in the future. The two main ways it may affect the Jurassic Coast is through:

1. **Sea level rise**
   With the sea level rising, it gives the waves more power over more of the coastline. This means that there could be increased erosional processes, such as hydraulic action. In addition, some of the coastline may become submerged by the sea.

2. **More frequent storms**
   Experts are also suggesting that climate ch[illegible]ll increase the number of storms the UK experiences. As shown above, storms can rapidly change the shape of a coastline through increased geomorphic processes.

Human influences on the Jurassic Coast

Humans are influencing and changing the shape of the Jurassic Coast all th
attractiveness of the coastline has made it both a popular place to live and a
The main way that humans influence the Jurassic Coast and the geomorphi
through coastal management.

Why would humans want to manage the Jurassic Coast?

- To preserve the unique coastline
- To protect the infrastructure of towns and villages near the coast
- To protect human life from the risks that coastal erosion brings

There are many different types of management that have been used along t
engineering in the form of beach replenishment to hard engineering in the
armour. Sometimes the management strategy is simply to 'do nothing'! All
management have helped to shape the Jurassic Coast to what we see today.
example where all types of management have taken place.

Lyme Regis

Lyme Regis is a town along the Jurassic Coast that lies on the border between Devon and Dorset. It is home to around 3,700 people. It is also a popular tourist destination with thousands descending on the town each year. They come to enjoy the iconic harbour, Cobb and beach. Due to its location, it is also a top site for fossil hunters and people have been coming to Lyme in search of fossils since around the 1800s.

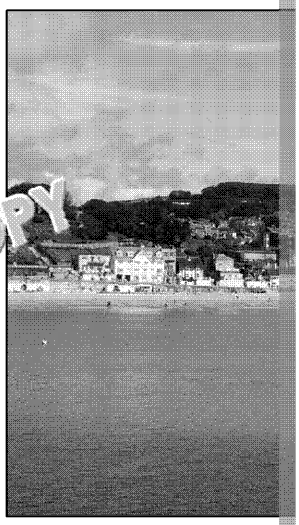


Figure 13: Ly

The town has been in a battle with the sea and its erosive power for many years. The area of land that the town sits on is highly prone to landslides which can be triggered by the sea. Over the last twenty years the town has been subject to various stages of coastal management to try and reduce the effects of these issues.

Why does Lyme Regis need coastal management schemes?

- The reason the town is prone to landslides is due to its geology. The be
made of hard limestone. However, on top of this, lie layers of softer ro
limestone which can result in landslides. The slope of the land is also d
sea, making the land even more unstable. Th management schemes ai
from happening.
- The sea itself has a powerful effect on Lyme Regis by washing sedimen
quickly and triggering landslides.
- Lyme Regis is a very popular place to live and has been for many
there is protection from the erosion and landslides that threaten the
- Tourism is one of the main incomes for the town, so preserving the tow
keep the tourism trade going.

The management strategy

The main management strategy for Lyme Regis was planned in the early 9(
to be completed over the course of 20 years. The schemes mainly consist of
although some soft engineering techniques have also been incorporated. Th
came to around £56 million.

Phase 1	
Completed:	1995
Cost:	£10 milli
What:	sea wall was built which also turned into an att people to walk along • Rock armour was put in place as extra support for th • A sewerage system was also built inside the sea wall sewerage system in the town

Phase 2	
Completed:	2007
Cost:	£26 million
What:	This phase was more extensive than the last as it focused well as protecting the land from the sea. The following w • The sea wall was extended • Rock armour was extended off the Cobb • The old wooden groynes were dc olished and repla • The beach was replenish 75,000 tonnes of sed the way from Fra ne rocks from Norway • The slop was stabilised using buttresses and trenches were made and filled with gravel

Phase 3	
Completed:	-
Cost:	-
What:	Phase 3 was designed to tackle Ware Cliffs and Monmou Lyme Regis. However, upon consideration it was decide and that spending the money to save the beach and cliffs worth it. It was, therefore, decided to 'do nothing' and le that area

Phase 4	
Completed:	2015
Cost:	£19.5 million
What:	This part of th used on the east side of the town to land The following works were completed: • pe stabilisation took place on the cliffs on the east installation of 2,500 soil nails and deep draining of th • The sea wall was extended by 390 metres along the e under the unstable cliffs

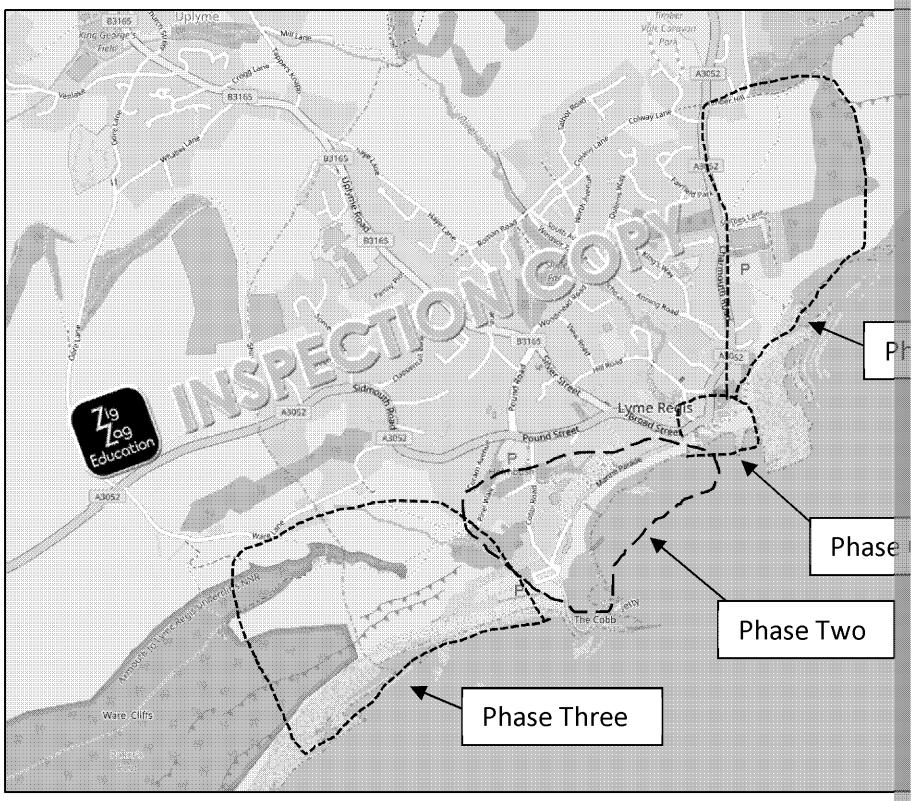


Figure 14: Map showing different phases of Lyme Regis ma

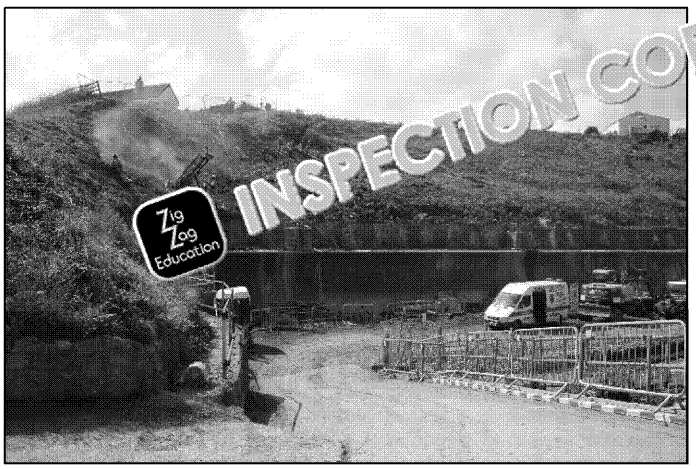


Figure 15: Soil nailing in East Cliff

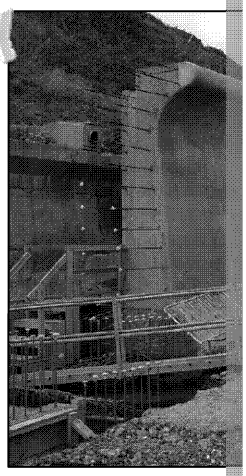


Figure 1

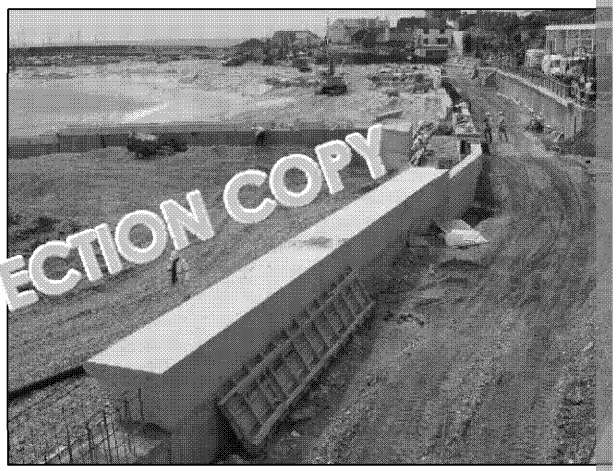


Figure 17: Beach replenishment in Lyme Reg

Effects and conflicts

The hope for all these phases of coastal management was to provide long-t
and the coast. So how effective have they been and has there been any con

Effects:

- The sea wall has been effective at protecting the seafront properties an
been useful in promoting the town as a tourist destination due to the s
scenic views across the bay.
- The slope stabilisation project has helped to prevent landslides that could be
The stabilisation drainage in the East Cliff area have helped to save ar
metres of land which would have been destroyed in 50 years' time if not
- The residents of Lyme Regis feel more secure in their own homes as th
won't be damage from landslides.
- The beach replenishment is not only providing extra protection for the
is also attracting more tourists to the area as there is a 'new' beach.
- Tourism overall has increased as the beaches and coastline are now m

Potential Conflicts:

Altogether the project cost a lot of money – could it be better spent elsewhere?

Landslides can be good – in the right place as they reveal more fossils and bring more income to the town. Preventing them could be a bad thing.

Some of t
around 5
repairing
cost even

The sea will continue to erode the shoreline anyway so shouldn't we just let the natural process of erosion happen? A managed retreat may have been more appropriate.

The sea wall has
be extended or
more of the tow
too much?

Overall it is hard to say whether the coastal management at Lyme Regis ha
time will tell!

Fact Table

Location:	South West UK
Counties:	Devon and Dorset
Length:	95 mi
Age of the oldest part:	25 million years old
Age of the youngest part:	65 million years old
Time span:	185 million years
Rock typ	Mudstone, sandstone, limest Purbeck), clays, white chalk
Erosional landforms:	Durdle Door (arch) Lulworth Cove Old Harry Rocks (stack) Headlands
Depositional landforms:	Chesil beach (tombolo) Beaches
Geomorphic processes:	Weathering Erosion: hydraulic action, at deposition
Physical influences on the landscape:	Geology • Rock type • Concordant/discordant Cli • Storms • Climate change
Human influences on landscape:	Walking, tourism, residentia
Lyme Re	3,700
Lyme Regis hard engineering :	• Sea wall • Groynes • Slope stabilisation – pili buttresses • Rock armour
Lyme Regis soft engineering:	• Beach replenishment • 'Do nothing' – west side and Monmouth Beach)
Total cost of management plans:	Approximately £56 million
Cost of Phase 1:	£10 million
Cost of Phase 2:	£26 million
Cost of Phase 4:	£19 million
Amount of sediment used for beach replenishment:	70,000 tonnes
Number of bored pile to stabilise the land i	1,150
Length o drainage trenches made in Phase 2:	2, 300 metres
Length of sea wall extension in Phase 4:	390 metres

ICT Interactive Page

Rather than type out these we

Videos

Jurassic Coast Trailer
- **https://www.youtube.com/watch?v=NXGVN[illegible]A**

What is the Jurassic Coast?
- **http://jurassiccoast.[illegible]/what-is-the-jurassic-coast/**

360° View [illegible]ssic Coast
- **https://[illegible]w.youtube.com/watch?v=ozhMCwMOy8Y**

What makes the Jurassic Coast special?
- **https://www.youtube.com/watch?v=VFKTFOu_dm8**

Chesil Beach Winter Storms 2013/14
- **https://www.youtube.com/watch?v=84EQtsgA0_8**

Crack appears in Jurassic Coast
- **http://www.bbc.co.uk/news/uk-england-dorset-36035800**

Lyme Regis Landslide
- **https://www.youtube.com/watch?v=eLvwr8[illegible]4o**

Lyme Regis Coastal Managemen[illegible]
- **https://www.youtu[illegible]atch?v=DEZKCy7lpCU**

News Stories

BBC – Cliff Collapses on Dorset's Jurassic Coast
- **http://www.bbc.co.uk/news/uk-england-dorset-37102619**

The Guardian – Winter Storms on Chesil Beach
- **https://www.theguardian.com/uk-news/2014/jan/07/uk-floods-chesil-**

Government Press Release – Flood defence repair work on Chesil Beach
- **https://www.gov.uk/government/news/flood-defence-repair-work-co**

BBC – Isle of Portland Winter Storms
- **http://www.bbc.co.uk/news/uk-engl[illegible]d-26232313**

BBC – Lyme Regis Coast[illegible]agement
- **http://w[illegible].b[illegible]/news/uk-england-dorset-33060524**

Springboard 1

Figure 18: Red Cliffs of Ladram Bay, Jurassic C

1. Name any coastal landforms you can see in this pict ure.
2. Describe how they might have been formed.
3. From which part of the Jurassic Coa t do you think this photo was tak

Springboa

Figure 19: Erosion on Old Beer Road, Jurassic C

1. Why might this part of the cliff have collapsed?
2. This section of road is now closed for good. Discuss why they might h than repair the damage and reopen the road.
3. What effects might this have had on the local people?

Springboard 3

Figure 20: Tourists enjoying the beach by Durdle D

1. Why do you think the Jurassic Coast is a popular place for tourists?
2. How might tourists affect the coastline?
3. Discuss whether tourists are good or bad for the Jurassic Coast.

Springboard 4

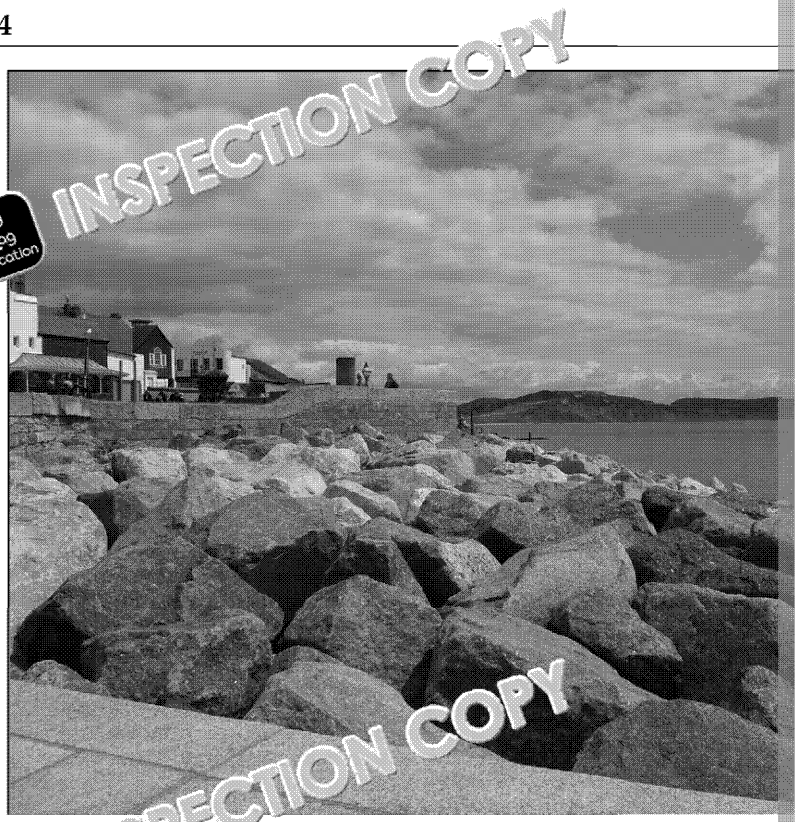


Figure 21: Hard engineering in Lyme Regis

1. What type of hard engineering can you see in the photo?
2. How does it help to protect the town?
3. Can you think of any other hard engineering strategies that could help

Figure 22: Soft engineering in West Bay, Bridport

1. What soft engineering technique is shown in the photo?
2. How does this help to protect the beach and town from erosion?
3. Discuss the advantages and disadvantages of soft engineering.

Springboard Suggested Answers

Springboard 1

1	• Stacks • Bays • Headlands • Stumps
2	• Headland and bays formed because the erosion rate of the so[ft] [rock] is faster than the erosion rate of the hard rock w[hich] [forms] headland. • Stacks and stumps have formed as the headlands have eroded leaving the hardest most resistant rock remaining in the form the stack erodes away creating a stump.
3	The Triassic section of the coastline due to its red colour which ind[icates] desert in Pangea.

Springboard 2

1	The cliff may have collapsed because of the effects of weathering a[nd] may have weakened over time and eventually crumbled. It could a[lso] influenced by rainy or stormy weather which may have increased [erosion] and weathering. It may also have been a softer rock so was more e[roded]
2	They may have chosen not to repair the damage and reopen the ro[ad] have cost too much. Also, the road will only continue to erode and happen again. It looks like a B road so it also may not have bee[n] make it viable to repair.
3	If [you] were living on the road it would be quite inconv[enient] be[cause] it may also be worrying if you live close to the cliff edge i[f] to your house. It could also be a threat to human life.

Springboard 3

1	Tourists enjoy coming to the Jurassic Coast because it is a unique g you can learn about the earth's history. It is also a good place to fi landscapes are also beautiful which attract many walkers who wa well as tourists who want to relax on beaches or swim in the sea.
2	Tourists may affect the coastline by caus[illegible]e erosion of coast pa visitors each year means coastal p[illegible]th[illegible] gradually wear down over t may leave rubbish on-sit[illegible]ic[illegible] can cause damage to the environ Jurassic Coast i[illegible] popular tourist destination it also means th fac[illegible]s i[illegible]on the coastline that may not be there if it weren't be[illegible] bins and tourist information.
3	*Good:* • Provide money to the local areas along the Jurassic Coast • Spreads the knowledge of the unique coastline • They bring money in that helps to preserve the coastline *Bad:* • Can cause overcrowding and congestion in local towns • Makes it more expensive for locals to live there • They can cause damage to the environment

Springboard 4

1	• Rock armour • Sea wall
2	• The rock armour hel[illegible] s[illegible]ead the wave's power before it h • The sea wal[illegible]s a barrier so the waves bounce off it instea [illegible]th[illegible] sea front.
3	*Ex[illegible]:* • [illegible]uilding groynes would help to stop too much sand and sedime • Stabilising the land would help the land to be less affected by • Gabions could help to dissipate the power of the waves.

Springboard 5

1	Beach replenishment
2	By replacing the sediment which gets lost through erosion it resto normal size and the sea will wash away the new sediment instead acts as a kind of barrier to the town so by restoring the sediment it from the powerful waves.
3	*Advantages*: • Cheaper • Allows the natu[illegible]l proc[illegible]s of erosion to continue • Unobtru[illegible] *Di[illegible]tages*: • Has to be replaced regularly • Is only partially effective • Often has to be used with hard engineering techniques – is ther

Summary

Jurassic Coast

Introduction

- The Jurassic Coast is a geologically unique coastline found in the south
- It spans 95 miles across East Devon to Dorset revealing 185 million yea
- The rocks are from the Mesozoic Era, specifically from the time periods Cretaceous.
- The Triassic Period began around 250 million years ago until 200 millio this time period is red-coloured mudstone and sandstone.
- The Jurassic Period began around 200 million years ago until 145 millio range from clays to sandstones and limestones, all of which are full of
- The Cretaceous Period began around 145 million years ago and spanne The rocks found in this period range from sandstone to limestone and

Landforms

- The Jurassic Coast is home to many coastal landforms formed through depositional processes.
- Durdle Door is an example of an arch formed through erosional proces
- Lulworth Cove is an example of an erosional landform on a concordan
- Chesil beach is an example of a depositional landform formed through depositional pr

Physical influences on the shape of the coastline

- The type of rock and the way it lies (the geology) can influence how eff processes, such as erosion and weathering, are.
- Softer rocks erode more easily whereas harder rocks resist erosional pr helps to form different landforms.
- Concordant coastlines and discordant coastlines allow the formation o
- Climate and weather also affect the shape of the coastline; for example, rapidly changed the shape of parts of the coast in a matter of days.
- In the future, climate change may also have an effect on the shape of th of more frequent storms and a rise in sea level.

Human influences on the shape of the coastline

- The main way human activities shape the coastline is through manage
- The Jurassic Coast is managed both through hard engineering and soft
- An example of an area that has had soft management is Lyme Regis
- There were four phases of management planned, three of which have tak
- Examples of the hard engineering that has been put in place: sea wall, and rock armour
- Examples of soft engineering that has been put in place: beach replenishmer
- The work has mainly been effective in stopping landslides and slowing
- However, it could be suggested that too much money was spent on the will continue its erosional processes and some of the engineering may

Jurassic Coast Quick fire questions

1	Where is the Jurassic Coast situated?	
2	Which two counties does the coastline cross?	
3	How long is the Jurassic Coast?	
4	What year did it become a World Heritage Site?	
5	How old is the oldest part of the coastline?	
6	How old is the youngest part of the coastline?	
7	What period of time does the Jurassic Coast span?	
8	Which era is the Jurassic Coast from?	
9	What are the three time periods within that era that the coastline is from?	
10	What type of rocks can be found in the Triassic area of the coastline?	
11	What type of rocks can be found in the Jurassic area of the coastline?	
12	What type of rocks can be found in the Cretaceous area of the coastline?	
13	What type of landform is Durdle Door?	

14	What rock is Durdle Door made of?	
15	What landform is Chesil Beach?	
16	Through what depositional process was Chesil beach formed?	
17	How does the hardness of the rock affect the shape of the Jurassic Coast?	
18	How did the winter storms of 2013/14 affect Chesil beach?	
19	Name two consequences of climate change that may affect the Jurassic Coast.	
20	Name one reason why humans would want to manage coastlines.	
21	Name two hard management strategies used in Lyme Regis.	
22	Where did the sand come from for the beach replenishment of Lyme Regis?	
23	How much did the total cost of the coastal management in Lyme Regis come to?	
24	How many homes did it help to save?	
25	Give one potential conflict to the coastal defence in Lyme Regis.	

Jurassic Coast Quick-fire Answers

1	Where is the Jurassic Coast situated?	*The south west of the UK*
2	Which two counties does the coastline cross?	*Devon and Dorset*
3	How long is the Jurassic Coast?	*95 Miles*
4	What year did it become a World Heritage Site?	*2001*
5	How old is the oldest part of the coastline?	*250 million years old*
6	How old is the youngest part of the coastline?	*65 million years old*
7	What length of time does the Jurassic Coast span?	*185 million years*
8	Which era is the Jurassic Coast from?	*The Mesozoic Era*
9	What are the three time periods within that era that the coastline is from?	*Triassic, Jurassic and Cretaceous*
10	What type of rocks can be found in the Triassic area of the coastline?	*Red-coloured mudstone and sandstone*
11	What type of rocks can be found in the Jurassic area of the coastline?	*Clays, sandstones and limestones (Por*
12	What type of rocks can be found in the Cretaceous area of the coastline?	*Sandstones, limestones and white chal*
13	What type of landform is Durdle Door?	*An arch*
14	What rock is Durdle Door made of?	*Portland limestone*
15	What landform is Chesil Beach?	*A tombolo*
16	Through what depositional process was Chesil beach formed?	*Longshore drift*
17	How does the hardness of the rock affect the shape of the Jurassic Coast?	*Soft rocks erode more easily than hard*
18	How did the winter storms of 13/14 affect Chesil beach?	*It made it steeper by pushing all the se*
19	Name two effects of climate change that may affect the Jurassic Coast.	*Sea level rise* *More frequent storms*

20	Name one reason why humans would want to manage coastlines.	*Any of the following:* • *To preserve the coastline* • *To protect human settlements* • *To protect human lives*
21	Name two hard management strategies used in Lyme Regis.	*Any of the following:* • *Sea wall* • *Slope stabilisation* • *Rock armour* • *Groynes*
22	Where did the sand come from for the beach replenishment of Lyme Regis?	*France*
23	How much did the cost of the coastal management in Lyme Regis com	*Approximately £56 million*
24	How many homes did Phase 4 help to save?	*480*
25	Give one potential conflict to the coastal defence in Lyme Regis.	*Examples:* • *Project cost too much money* • *Some defences will need repairing or replac* • *Landslides can be good as they release more* • *The sea will continue to erode – it should ju* *sh[illegible]ork around it*

Jurassic Coast Extension Questions

1. Describe the geological history of the Jurassic Coast.

2. Explain how Lulworth Cove was formed.

3. Suggest what Durdle Door will look like in the future and explain why

4. Explain how geology can influence the shape of the coastline.

5. In what ways did the winter storms of 2013/14 affect the Jurassic Coast

6. Discuss the consequences of climate change on the Jurassic Coast.

7. Explain the difference between hard engineering and soft engineering more effective.

8. Using your knowledge of the geology of Lyme Regis, explain why the management.

9. Describe and explain how hard engineering techniques used in Lyme landslides and the sea.

10. Evaluate the success of the coastal management in Lyme Regis.

Extension Answers

1. The Jurassic Coast's geology reveals 185 million years of earth's history across
The reason it shows so much geological history is because the movement of t
tilted the rocks vertically.
The oldest rock is from the Triassic period and is ... million years old and is
used to be a desert.
The Jurassic rocks range from 2... million years old to 145 million years old.
which is evidence of th... during this period.
The Creta...us ...age from 145 million years old to 65 million years old.
showi... fluctuating sea level during this time period. The youngest rock
white c...

2. Lulworth Cove was formed through erosional processes.
The erosion started with a river flowing through the rocks to the sea.
Lulworth is a concordant coastline so the hard rock (limestone) lies by the sea
lies behind.
The water eroded through the soft rock more quickly than the hard rock, formin
Over time the river has reduced to a small stream and the softer clay has conti
rate than the harder limestone by the sea, forming the cove we see today.

3. Durdle Door will likely become a stack and eventually a stump in the future.
This is because the sea will continue to erode it through processes such as hyd
causing the rock to weaken.
The process of weathering will also weaken the rock.
Eventually the arch will collapse into the sea ...ing a stack. Eventually this
a stump.

4. Geology influence... ...e of the coastline because it influences how effecti
can be ...
For exa...soft rocks are more easily eroded than harder rocks and this mak
landforms.
The areas of soft rock in the Jurassic Coast have helped to form its bays and co
The areas of hard rock in the Jurassic Coast have helped to form its headlands
The order in which the rock lies also affects the shape of the coastline. For exa
coastlines (where hard and soft rocks lie parallel to the coast) create landforms
Discordant coastlines (where hard and soft rocks lie perpendicular to the coas
and headlands.

5. The winter storms affected the Jurassic Coast by:
   - Causing more rapid erosion processes.
   - Causing flooding.
   - Changing the shape of Chesil Beach by pushing ... ediment towards th
   - The powerful waves also destroyed Pom...k from a stack to a stu

6. Climate change consequence... ...assic Coast:
   - Sea level rise ... that some areas of coastline are submerged by
   - It ... that more of the coastline will be affected by erosional
     th... creases.
   - It could also mean that there are more storms which will also increase the
     affecting the coastline.
   - The summers could be warmer which may attract more people. This cou
     the area but also increase any damage to the environment caused by hum

7. Hard engineering is the use of built structures to control the coastline whereas more natural way of manipulating the coastline.
Different stakeholders will have differing opinions on which type of manage
Soft engineering techniques are effective, unobtrusive and often better for the engineering. However, some strategies, such as beach replenishment, need re hard engineering techniques.
Soft engineering in terms of a managed retreat could also mean a loss of home

8. The town is built on unstable land
The bedrock far below the town is made of hard limestone.
On top of this lies soft cliffs which slide over the limestone making it unstal
The land also slopes towards the sea making the land even more unstable.
Heavy rainfall and the power of the sea on the cliffs can cause the land to weaken

9. The sea wall helps to prevent the sea from eroding the coastline by physically wall has a curved edge to deflect wave energy back towards the sea. The rock buffer along with the sea wall, dispersing the energy of the waves. Stone groy to stop the sea from transporting too much sediment away, and creating a buf and the land.
The ground has been stabilised using soil nails, buttresses and bored piles. Th drainage of the land more efficient as well as prevent landslides from destroyi and the infrastructure of the town.

10. Lyme Regis coastal management was effective because:
    - It helped to protect 480 homes and 900 metres of road by stabilising the l
    - The rock armour and sea wall mean that the sea is having less effect on th
    - It is also attracting more visitors, bringing in more money for the town.

    Not as effective because:
    - It cost a lot of money and the sea will continue to erode the area – was it
    - The sea wall has started cracking to be repaired or extended and could only las

Exam-style Question

Question 1

Figure 1: Hard engineering coastal management in Lyme Regis

Using Figure 1 to help you, evaluate the effectiveness of the strategies used to protect coastlines.

Level Marking

Level	Mark	Description
1	1–3	• The student evidences basic knowledge of the topic in questi • The student evidences limited understanding of the connecti environments and processes. (AO2) • A limited ability to evaluate is evidenced through basic appli understanding. (AO3)
2	4–6	• The student evidences some knowledge of the topic in questi • The student evidences good understanding of the connection environments and processes. (AO2) • A [illegible] ability to evaluate is evidenced through adequa understanding. (AO3)
3	7–9	The student evidences thorough knowledge of the topic in qu • The student evidences a firm understanding of the connecti environments and processes. (AO2) • A strong ability to evaluate is evidenced through logical appl understanding. (AO3)

Indicative Content

- Students should offer an evaluation of the effectiveness of hard engineering te
- They may use specific examples of hard engineering techniques.
- Allow the evaluation of appropriate techniques that go beyond Figure 1.
- Hard engineering techniques could include sea walls, groynes, rock armour, s
- The student should clearly demonstrate an evaluation through looking at how engineering strategies are by considering their advantages and disadvantages given for students who do not form an argument.

Suggested Content

Using the example of Lyme Regis along the Jurassic Coast:

Effective	In
• Sea walls can be very effective in protecting coastline and, in Lyme Regis, the sea wall has helped protect the town from severe flooding. • Lyme Regis has also been subject to slope stabilisation strategies, such as soil nailing. This has been effective in protecting around 480 homes and 900 metres of road that would have been destroyed in the next 50 years. • Both rock armour and stone groynes have also been built in Lyme Regis as techniques to protect the land from the sea. At the moment they are effective in providing some protection.	• However, the sea w extended along the the protection. • All the hard engine expensive to build a replacing after 50–6 money. The amoun a short time period ineffective and uns • Erosion of the coast sea will continue to engineering strategi

Spelling and Grammar (SPaG) – Total of 3 marks.

For 1 mark:

- Student shows some ability to spell and punctuate correctly.
- Student shows limited use of grammar to convey their argument.
- Student utilises a basic range of geographical phrases.

For 2 marks:

- Student demonstrates good spelling and punctuation throughout.
- Student shows some accurate use of grammar to convey their argument well.
- Student utilises an adequate range of geographical phrases.

For 3 marks:

- Student uses correct spelling and punctuation throughout.
- Student shows accurate use of grammar to clearly convey their argument.
- Student utilises a broad range of geographical phrases.