A Level

Geography

7037/1: Physical geography

Report on the exam

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Summary

Areas where students excelled

This was an accessible paper giving those students who prepared well every chance of accessing the full range of marks.

The 4-mark questions generally proved to be very straightforward where good preparation was evident. For example, the question on human factors affecting the water cycle (Qn 01.1) was particularly well answered by many. Reference was made to the impact of deforestation, climate change and land use change. These were the main routes to credit. Equally the options generally performed well provided students understood the difference between '*…processes leading to the formation…*' and '*…characteristics of…*' . The Section C, 4-mark questions had a heavy imbalance in favour of the Hazards unit and, provided students knew what an ocean ridge was, full credit was readily scored.

In terms of the skills questions, many required a degree of map interpretation. Where students were able to identify broad patterns as well as anomalies, Level 2 was readily accessed. There was also some opportunity to work with the data provided which many did successfully. Two of the skills resources where graphical based, making it easier to manipulate data. Many opportunities were taken to do this in both situations.

For the novel situations (the .3 questions on each unit), many students have now got to grips with this style of question. Q5.3 and Q6.3 were particularly effectively attempted. The key is that students need to bring their own knowledge and understanding to the question i.e. bring something new which has not already been provided in helping to answer the question.

For the 9-mark cross-specification questions this series (Q5.4 and Q6.4), it was really pleasing to see how many students readily attacked the questions with confidence and secure knowledge. Whilst the specification 'fit' was quite a natural one in both cases (links to the carbon cycle), it was really impressive to see so many students produce really strong responses with good underpinning knowledge.

The 20-mark questions are a major differentiator on this paper. In this series, it was also very evident that those who prepared well gained access to the full range of marks. For example, where students knew the basis of the Hazard Management Cycle, we saw really strong evaluation in relation to their chosen wildfire case study.

Areas where students struggled

Those who did not know what a pediment was on the deserts question, really struggled to gain credit. This makes the case for careful preparation around definitions and key terms. Also, for characteristics, we were looking for a little more on the features which made the landform distinct, though we did allow aspects of formation processes where there was clear overlap with characteristics.

On Q5.1, it was quite surprising to see so many confuse ridges with trenches. It was hard to find credit for those that did this.

For the skills questions (the .2 questions on each unit) we still had some who sought to explain patterns. This constituted AO2 and not AO3. There are still too many making this fundamental error.

For the novel situations (the .3 questions) those who reworked and regurgitated the information provided without bringing any of their prior learning, really struggled to score credit. For example, in Q1.3 we needed students to consider relief, drainage, urbanisation, weather conditions, river management etc. in accounting for the variable discharge levels. Specific knowledge of place was not required. It was more about applying broad principles around factors affecting flooding to the resource.

The 20-mark questions produced a very wide variety of marks. Those that could not link their understanding of landform development processes to a changing climate really struggled to get into the higher levels.

Similarly, on Q1.4, we were looking for measures in the forest which could help reduce / reverse the impact of climate change. This required students to consider measures such as conservation, diversified farming practice and reforestation. Wider consideration of global action such a Paris 2015 was fine as long as it linked back to the rainforest in some way. Evaluation could link to the challenges facing the rainforests, as long as there was some evidence of attempts to improve the situation. Too many focused only on the challenges associated with climate change and its impact in the forest without considering measures to improve things. For these responses, Level 2 was typically awarded as the question was not really answered despite some useful case study support and knowledge of issues.

Point marked questions

4-mark questions are point marked. A mark may be awarded where a student makes a single relevant point and subsequent marks awarded (if applicable) where the student develops those points with additional knowledge.

Levels marked questions

6-mark, 9-mark and 20-mark questions are levels marked where the response is holistically marked against the assessment objectives, given a mid-level mark initially and then a fine tune mark awarded within that level.

Assessment Objectives (AOs)

AO1: Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change, at a variety of scales (30-40%).

AO2: Apply knowledge and understanding in different contexts to interpret, analyse and evaluate geographical information and issues (30-40%).

AO3: Use a variety of relevant quantitative, qualitative and fieldwork skills to:
- investigate geographical questions and issues
- interpret, analyse and evaluate data and evidence
- construct arguments and draw conclusions (20-30%)

4-mark AO1 questions

These questions assess knowledge and understanding and require students to outline key processes, concepts, interaction and change.

Qualities seen in more successful responses

As these are point marked questions, it is very important that students think in terms of making valid points or developing more than one idea by adding something new. For example, with this question (Q1.1), students needed to identify human factors affecting the water cycle. Each time there was a valid impact on the water cycle, a mark was scored. This one scored all 4 marks:

> 0 1 . 1 Outline how human factors impact upon the water cycle. [4 marks]
>
> One human factor is a irrigation within agriculture which depletes aquifer stores of water, and increases water flowing over the surface. ✔ Another factor is deforestation – this process decreases vegetation stores, as well as reducing interception by trees, ✔ increasing surface runoff to rivers. This may lead to increased floods due to higher discharge levels. [DP]

Despite some errors, the response below outlines the process involved in the formation of ocean ridges and scores 4 marks.

> 0 5 . 1 Outline processes involved in the formation of ocean ridges. [4 marks]
>
> Mid ocean ridges arise ~~due to~~ at divergent plate boundaries. ✔ Oceanic-oceanic divergence involves 2 oceanic plates pulling apart, causing transform faults at 90° cuttings creating volcanic islands and ✔ [DP] a mid-ocean ridge. For example, the the Atlantic ocean ridge in Iceland. ✔ They are ~~are~~ created via gravitational sliding /ridge push ^ which involves plates diverging, causing magma to
>
> Extra space rise and form a new crust, ✔ which cools and forms a slope. Larger rocks then slide down the slope? and this pressure pulls plates apart. Another theory forming mid-ocean ridges is paleo magnetism. ?

Limitations of less successful responses

In weaker responses the key terms are poorly understood indicating only a vague awareness of the matter under consideration, in this case corrie formation. This one scored 1 mark:

0 4 . 1 Outline processes which lead to the development of a corrie.

[4 marks]

> A corrie is developed by a previous glaciated area which has carved and moulded the area around it which then melts and leaves behind these land forms. The glacier erodes the rock and continues to grind down (abrasion) and pluck (plucking) rocks out of the mountain side which over time creates a corrie once it has
>
> Extra space melted away.

In this one, pediments were simply not understood. No credit here.

0 2 . 1 Outline characteristics of a pediment.

[4 marks]

> Pediment is made up of desert rock and can also be referred to as a reg and all sand and dust is transported away by wind which leaves these areas rocky. The sand is also transported away by saltation and is deposited in the direction of the prevailing wind which forms an erg (sea of sand).

6-mark AO3 skills questions
These questions assess how students interpret, analyse and evaluate data, evidence and resources.

Qualities seen in more successful responses

The best responses work the data and evidence in a concise fashion drawing out patterns in the data at the headline level i.e. the big picture. They are less focused on the minutiae of the data, except to exemplify the big picture. They often look for anomalies and try to exemplify them, explaining why they do not fit with the main trend. They do not attempt to explain them as this is not relevant to the Assessment Objective (AO3) being examined. Where possible data is used in support, even better where it is manipulated. In this one the student achieves all of the above and comfortably scores 6 marks.

Figure 3b shows the average rainfall and vegetation types in central and north Africa around 6000–10 000 years ago.

0 2 . 2   Using **Figure 3a** and **Figure 3b**, interpret the change in rainfall and vegetation patterns in central and north Africa.

[6 marks]

Limitations of less successful responses

Least successful responses fail to identify the major patterns, anomalies and often drift into explanations for the pattern, which is clearly AO2. Where there were opportunities to manipulate data, these were rarely taken or at best are only dealt with in a simplistic fashion. This one scored 2 marks.

1970 and 2010.

0 1 . 2 Analyse the data shown in **Figure 1a** and **Figure 1b**.

[6 marks]

Both figures show that there is more change in river surface water temperature north of the equator rather than south. This is shown by most data points are in the temperature region between 20°N and 60°N. Polar region 80°S of the equator is the only region where with no temperature change in rivers. Figure 1b shows that 75.1 of temperate change in rivers are located north of the equator.? Both pieces of data shows that river and lake surface water temperatures has increased over the years. Figure 1A has data points which are less cluttered? the figure 1B where all data points are cluttered.

[AO3 annotation]

[annotation: means no data presumably]

[AO3 annotation]

L1

Extra space

This one showed a lack of understanding of the data and drifted into AO1 towards the end (2 marks):

| 0 5 . 2 | Interpret the data shown in **Figure 9**.

[6 marks]

More frequent tropical storms are evident in the atlantic ocean whereas ~~few there are still~~ less frequent tropical storms are located in the Indian ocean. [AO3] ~~About~~ All tropical storms occur between 40°N and 40°S except a few which go above 40°N. [AO3] About ½ of all worlds tropical storms are frequent? An outlier is south of the pacific ocean as no tropical storm occur here. More frequent tropical storms appear across warmer oceans as set temperatures require for tropical storms to form. This may be why there are no tropical storms in the pacific as temperature may be to low.

6- & 9-mark AO1/AO2 questions with stimulus
These questions assess knowledge and understanding when applied to novel situations (resource prompts).

Qualities seen in more successful responses

In these questions we test students' subject knowledge in a novel situation. Here the students need to demonstrate secure underpinning knowledge and then apply this to the context of the novel situation. We tend to talk in terms of 'knowledge' (AO1) and 'argument' (AO2). The simple rule of thumb is to answer the question as set. By doing this effectively, both AOs will be addressed because this is how the question has been designed.

In the response below, the student clearly takes the information from the novel situation (the volcanic eruption) and applies their understanding of hazard responses to the information provided. In this case the student quite sensibly identifies a number of challenges associated with the scale and remoteness of the event. It could still have been improved a little further but did score Level 3 and 8 marks.

0 5 . 3 Using **Figure 10** and your own knowledge, assess challenges in responding to this event.

[9 marks]

[AO1] Volcanic eruptions are when lava, gas and tephra are ejected out of a vent in the Earth's crust. Tsunamis are **[AO1]** huge sea waves generated by underwater volcanic eruption / underwater shallow focus earthquakes. Both are highly destructive in nature, and can cause a lot of damage. This is shown in figure 10 in which only 280 houses were destroyed, and 1 health care centre and 1 underwater communication cable. Of these losses, the destruction of the underwater cable is arguably **[AO2]** the most challenging as it can affects the coordination of the response and the ability of the country to communicate not only with the local population, but can also hinder aid efforts as **[AO2]** cannot communicate to other countries /organisations for help, which the area was in dire need of with 50 525 people in need of drinking water – water tanks need to be installed e.g. by NGOs like oxfam. **[AO1]** Furthermore the destruction of the health centre would not been detrimental on the response as there are less services available to **[AO2]** Extra space the 14 injured and it could also lead to the 5 cases of transmittable disease that were caused by the hazard event. Figure 10 also shows **[AO2]** that the island of Tongatapu is very isolated, which could slow the efforts to provide aid as it has to be transported great distances meaning it harder to respond to. **L3**

Turn over ►

In this response, the student clearly considers a range of factors which could plausibly affect flooding in relation to the evidence presented in the resource. This one scored 6 marks.

0 1 . 3 Using **Figure 2** and your own knowledge, assess factors affecting the likelihood of flooding across the UK.

[6 marks]

Figure 2 shows Central UK having river flow data which ranges from above normal to exceptionally high. For example, Sheffield is entirely exceptionally high for river flow data, indicating the discharge levels now surpassed bank flow, causing the river to flood. A cause of this may be physical - seasonal change. This data was collected in November, part of Autumn wet where precipitation levels tend to be higher. This causes increased input into the drainage basin, causing more flow including surface runoff to rivers. Manchester also has levels exceptionally high - this may be caused by urbanisation, which involves deforestation and an increase in impermeable surfaces (e.g. tarmac roads). Both these changes, decrease tree interception by vegetation and infiltration by porous soils, increasing surface-runoff to rivers which may cause a flood. However, London has majority of levels normal to below normal indicating they may be in a slight water deficit and soil moisture saturation is low, enabling it to absorb more water, unlike Stoke-on-Trent.

L2

Limitations of less successful responses

The typical issue with questions of this nature is related to students either: interfacing solely with the resource and analysing it (i.e. demonstrating AO3); or simply drawing on knowledge linked to the thrust of the question without linking to the resource i.e. demonstrating AO1 only.

In this question, the student should have used the resource to identify the coastal challenges and they should have offered sensible coastal management ideas in terms of how to manage these issues. Many only covered the basics of hard and soft engineering, despite opportunities to consider a much wider set of possible management ideas. As with all of these questions, no specific knowledge of place is required. This one scored Level 1 - 3 marks:

0 3 . 3 Using **Figure 6** and your own knowledge, assess potential approaches to managing this coastal region.

[6 marks]

Figure 6 shows that the surface area of mangroves has decreased by 25% between 1980 and 2006. One approach to managing this coastal region would be to plant more mangroves as this is cheaper than other techinques *and will provide protection against coastal erosion and storm surges. (AO2) (AO2)

☆ which is good as many African Countries are LICs (AO1)

Another approach would involve an ICZM (AO1) were some of the areas could undergo the do nothing strategy as only 51% of people in Africa live by the coast. However, some

Extra space areas would need to be more protected (AO2) as 56% of West Africa's GDP is made from the coast. The best way would be to use hard engineering strategies like sea walls (AO1) and rock armour to protect at risk areas.

In the following response the student showed only a limited awareness of the impacts of desertification and offered no obvious assessment. It scored Level 1 - 2 marks.

0 2 . 3 Using **Figure 4** and your own knowledge, assess the potential impact of desertification.

[6 marks]

(AO2) Figure 4 suggest at Ayria Sahals region that there population has grown resulting in deforestation to and land clearing for housing. Less trees due to deforestation results in the ground more exposed the sunlight leading to oxidise making the soil unsuitable for vegatation to grow. This means farming for crops becomes a struggle as the land is desertification.

(AO1) Figure 4 also shows that droughts are occurring in Australia due to lack of rainfall. Deserts which are arid only recieve >250mm of rainfall a year which means

(AO2) vegation can't grow and people suffer droughts so they migrate elsewhere. This causes more degrading in the land

Extra space leading the area experience desertification.

L1

20-mark questions

These questions assess knowledge, understanding and application: constructing arguments and drawing conclusions.

Qualities seen in more successful responses

The best responses evidence a deep and secure knowledge and understanding of the specification area/s being tested. Attention to detail is always strong and case study support is almost always very accurate. Knowledge of content, concept, processes and change at a variety of scales always comes through strongly. These elements constitute strong AO1 content. When this is used to construct and support arguments/ positions with a clear and sustained line of reasoning throughout (and a logical conclusion based on preceding content), such responses always score well for AO2.

This response shows a strong understanding of the Hazard Management Cycle as a simple model which authorities could potentially use to help mitigate the impact of wildfires. It shows clear evidence of how authorities (in this case the Canadian and Albertan governments) used a variety of management techniques to minimise the impact of the Alberta / Fort McMurray events. There is also a clear understanding of the cyclical nature of management using the model. This one scored L4 - 18 marks.

a wildfire to occur. ↑ The wildfire spread across

the ~~the~~ river to highway 63, making evacuation

[AO1] difficult. However, Fort McMurray's government

showed effective ~~mitigation~~ preparation [AO2] as 90,000 residents

[AO1] were evacuated by bus, car and aircraft

a day prior to the wildfire arriving. Moreover,

the oil-work refineries were ~~causes~~ created

more fuel for the wildfire which caused 251.9

km to permanently close? Aircrafts evacuated

workers ~~to~~ from ~~them~~ them, predominantly at

the syncrude oil works. These evacuation

protocols showed great preparation by ~~the~~ the

[AO2] Fort McMurray government, protecting residents

from harm.

The next stage in the hazard management cycle is

[AO1] response and recovery. As insurance costs grew to

a total of CAN $9 billion, [AO1] the Canadian government

took a role in ~~ensuring~~ ensuring evacuated

[AO1] residents were economically stable for ~~the~~ this

time period. Each evacuated adult ~~receive~~

received CAN $1250 each, with CAN $500

[AO1] provided for children, ~~and~~ enabling them to

access temporary accommodation. Moreover, taxi

drivers gave free rides for ~~those~~ affected to

[AO1] escape danger. These ~~re~~ short-~~term~~ term responses

[AO2] from the ~~Can~~ Canadian government were

Extra space [AO2] significantly effective, as no victims died during the 5 wildfires within Fort McMurray. A recovery period with Fort Mc~~~~ The Canadian government also effectively ~~provided~~ installed long-term [AO2] responses, covering the recovery process of the hazard management cycle. For example, $28mil donations were received in just 5 days after the fires ignited by the Canadian Red Cross [AO1] charity. The Canadian ~~prime minister~~ president ensured that any donations ~~or~~ given to reconstructing Fort McMurray would be matched [AO1] by the government, doubling the level of income provided to the affected area.

Clearly [AO2] the Hazard Management cycle is useful in minimising the impacts of wildfires as mitigation of building fire resistant homes will prove to decrease the ~~or~~ impacts of wildfires within Fort McMurray in the future. This area was clearly well prepared for the previous event and will only become more mitigated and strategised in protecting residents, employment and land from future wildfire hazards.

End of Question 5

L4

The response below was very strong indeed. It was consistently focused on the impact of climate change on the formation of desert landscapes. Support was strong as was the awareness of how changes to the climate will potentially accelerate (or decelerate) the development of certain landforms, mainly through changes in the amount of aeolian, fluvial or solar energy. Really strong subject knowledge underpinned this throughout. This response scored full marks (L4 – 20 marks)

0 2 . 4 With reference to **one or more** hot deserts that you have studied, assess potential impacts of climate change on the development of landforms.

[20 marks]

The Mojave desert is 140,000 cm² wide and spans across 4 countries within America, but mainly California. Majority of the landforms developed over the last ice glacial maximum around 8000 years ago when cryophere stores melted and fluvial processes eroded and deposited material. The current landforms in the desert may develop into different and more mature structures as climate change progresses.

Climate change is creating warmer temperatures, which increases evapotranspiration, depleting vegetation & water needed for growth via photosynthesis. As plants die, soil binding decreases and erosion occurs. The combination of prevailing winds and rate of erosion allows increasing unconsolidated material to travel great distances by suspension, saltation and traction which may increase aeolian erosional landforms within the Mojave and other hot deserts. Moreover, aeolian processes also create depositional landforms such as self dunes, which are long, ripples of sand, and barchan dunes. These dunes are crescent-shaped and form when prevailing winds push sand until it collapses over. A change in landforms is present in the Mojave as seen within

the Kelso dunes, which is the biggest aeolian landform within the Mojave, spanning an area of 120km² with 5 dune sets. These landforms have arisen fairly recently when compared to the fluvial landforms such as the Clima domes, and Lucy Gray (alluvial) fan. ~~Such~~ Also, the area of these dunes is projected to increase as climate change enables more aeolian processes.

~~However, it may be argued that~~ Another impact of climate change is ~~extreme~~ an increase in the frequency of extreme weather events such as floods. Several landforms within the Mojave have formed as a result of sheet floods such as the Grand Canyon. As flooding events become more severe, we may see greater erosional landforms occurring via fluvial processes. For example, mesa landforms may experience a breakdown to form buttes which are much narrower structures. As evapotranspiration in non desert environments is high, volumes of water remaining from flood may be low, indicating deposition will occur. Landforms from deposition included alluvial fans, and inselbergs. The Mojave has both of these landforms - a Lucy Gray fan and Clima ~~Domed~~ Dome, which is an inselberg (erosional) landform with a pediment base. Due to

Extra space

Climate change, it is likely that the pediment
bank will grow as water deposits new material.
Moreover, the Lucy Gray fan may join with other
alluvial fans as it rises in area, forming a bajada [AO2]
Climate change may increase the occurrence of
As climate change increases global temperatures
by the enhanced greenhouse gas effect, water
sources may dry up, and the occurrence of
ephemeral rivers may increase. Some or many salt
lakes formed by human processes contain an

Pediment is an erosional feature

ephemeral river which flows seasonally, or
[AO1] following a flood or rainfall.
A Soda lake is a playa in the Mojave with an
ephemeral river, and when it dries, sodium / salt
[AO1] remains which reacts to form sodium carbonates,
making the area up wind playa appear white and
crystallised. It is likely that climate

[AO2] change will increase the occurrence of salt
lakes in the Mojave as well as other deserts including
the Sahara, the Namib and the Atacama desert.
Clearly climate change plays a key role in
desert landforms, and may potentially amplify the
rate in which they form.

Limitations of less successful responses

Less successful responses tend to fall down for a number of reasons. Students sometimes misread the question or, in the heat of examination, may not fully grasp what is required. In such circumstances they may tend towards knowledge recital and only touch on what is required to actually answer the question. The other type of response involves students who have not engaged in enough revision. These evidence ability to craft a response but without enough subject knowledge or case study support to underpin the answer. The very weakest offer very limited subject knowledge and fail to engage with the question.

This response has not engaged with the actual question, though has shown some understanding of the context (tropical rainforest) with an awareness of mitigation strategies. Level 2 – 7 marks.

0 4 With reference to a tropical rainforest that you have studied, evaluate attempts to mitigate the impacts of climate change.

[20 marks]

Climate Change is a serious issue faced we face on this planet as temperature rises causing more extreme weather patterns. Rainforest such as the Amazon captures 35% of all worlds CO₂ but is slowly being destroyed due to in-distrialisation and farming practices. Many schemes are in place to prevent the impact of climate change such as Africa's great green wall. ?

Climate Change is caused by an increase in greenhouse gasses in the atmosphere such as CO₂ and water vapour. This also results in global warming as the atmosphere warms up which leads to more evaporation. This causes water from all oceans to rise to change into water vapour which goes into the atmosphere warming up the planet more which creates a positive feedback loop. Oceans are a massive carbon sink and holds more carbon than any other source on the planet by pyroplankton at the bottom of the ocean which is released from coral. However, coral itself can become stressed due to waves and temperature change in oceans causing coral to bleach. this This forms limestone (CaCO₃) which can be broken down by weathering and this can release more carbon into the atmosphere.

Turn over ▶

AO1 Despite all this seeming bad, there are ways to ~~prevent~~ capture carbon through sequestration.

AO1 One major store of CO_2 are rainforest with their large amount of trees can capture carbon effectively. **AO1** This is done through photosynthesis ($H_2O + CO_2 \rightarrow O_2$ + glucose) which captures carbon and releases **AO1** CO_2 into our atmosphere. Unfortunately, cattle ranch **AO1** farming cause deforestation as farmers chop down trees for land to farm on. Trees are essential to creating a dynamic equilibrium in the carbon cycle but so **AO2** laws have been taken in place to mitigate the impact of climate change. These laws include that deforestation in the amazon is prohibited and alongside this afforestation **AO2** schemes are been implemented to save the amazon.

Extra space

Furthermore, over in Africa, 20 countries along the Sahel have have forced an agreement with the African UN to ~~withthe~~ create a project called African great green wall. Formed in 2007, their goal was to plant a 8,008km wall of trees along the Sahel from Senegal to Djibouti. This would drastically increase levels of photosynthesis capturing more carbon ~~th~~ and releasing oxygen into the atmosphere. This would have a massive impact in the mitigation **01** schemes taking in place to combat climate change.

Overall, ~~carbon~~ the positive feedlop of the carbon cycle has made struggles to mitigate the impact of climate change. Despite laws being upheld to prevent deforestation, illegal logging is still a common occurrence in the Amazon. In addition, Africas great green wall isn't going as expected due to contries like N ger not planting enough trees. ~~Its~~ Climate change is attempted by nations across the globe to mitigate but some believe that climate change can't be stopped,

End of Section A

In the response below, the student does show an awareness of the impact of climate change on coastlines but never really gets to the associated landform development apart from touching on landforms of submergence. There were so many more landforms of erosion and deposition that could have been considered. This one scored Level 2 and 9 marks.

0 3 . 4   With reference to **one or more** coastal environments that you have studied, assess the potential impact of climate change on the development of landforms.

[20 marks]

• Holderness
• Col Isha

[AO2] Climate change has a Significant Impact on the development of Coastal landforms, eustatic Sea level rise Increases rates of coastal erosion. However human management also plays a role.

[AO1] The Holderness Coast Stretches 61km on Englands east Coast. It experiences the highest rates of Coastal erosion in Europe and has retreated 4km in the past 2000 years. [AO1] Eustatic Sea level rise,

global rate of 3.2mm per year   Induced by anthropogenic Climate change threatens the coastline by Increasing the rate of erosion [AO1] and presenting a flood risk [AO1] at the Humber estuary. Whilst an Increase in Coastal erosion would

[AO1] coincide with rising Sea levels, human management of the Coast plays a more Significant role. Coastal defences at Bridlington (4.7 Km Sea wall) and

[AO1] Hornsea ($ 5.7 million investment in gyone Construction) have Increased erosion down drift

[AO2] along the Coast to a greater extent than Climate change. Sea Walls reflect wave energy, exacer-

[AO1] -bating erosion elsewhere, and gyones Capture

[AO2] Sediment, Starving down drift beaches of a

[AO1] Sediment Input. The defences at Bridlington + Hornsea have Increased the rate of erosion at mappleton to 2 meters / year, and at Great Cowden it has reached 10 m / year.

Eustatic Sea rise Induced by climate Change plays a Significant role in developing Coastal landforms of Submergence, Such as Fjords, rias and dalmation Coasts. Fairbourne is a Small Village on Wales west Coast, bordering Snowdonia national park and the Irish Sea. The Village is at risk

of Submergence due to climate change predicting to rise sea levels by 1.5 meters by 2050. The Village, which is low lying and already below Sea level 24 times per year (due to high Spring tides) is at risk of flooding in excess of 2 meters if Coastal defences, Such as an Embankment, are overun by eustatic Sea rise. This places

Fairbournes population of 681 people at risk of becoming Climate refugees.

Extra space

Climate change is directly Influencing the Shoreline
(SMP) < management plan, of fairbourne, which Since 2000 has adopted a policy of temporary managed realignment However by 2050 all flood defences this policy will change to a do nothing Strategy and from 2054 all flood defences will be decomissioned and fairbourne will be abandoned to Submergence by rising Eustatic Sea levels. The reasons for this Include Cost benefit analysis employed by SMP's, national resources waves

has spent an annual £19,000 on Fairbournes Coastal defence, across 1.8 miles of its coastline. However this is economically unsustainable as the cost of Coastal defence against climate change is more expensive than the villages economic value.

In Conclusion, Climate change is causing Eustatic Sea [AO2] rise which threatens low lying settlements like Fairbourne of Submergence. However human Intervention as seen at Holderness can also play a role in driving the development of Coasts.

L2

End of Question 3

Synoptic question – 9 mark AO1/AO2
These questions assess knowledge and understanding applied to links across specification content.

The synoptic question appears once each series in either Paper 1 or Paper 2 and makes links across specification content. The questions tend to appear in either the 9-mark or 20-mark questions.

In this series the synoptic question appeared in Paper 1, the 9-mark questions 05.4 and 06.4

Qualities seen in more successful responses

This series the cross-spec question was a very natural link between tropical storms and changes in the carbon cycle (Q5.4) or coral vulnerability and changes in the carbon cycle (Q6.4). We saw plenty of strong responses which clearly argued well with good support and a sustained line of reasoning. There was often strong subject knowledge and case study support as well as effective factual knowledge, used well in the context of the question.

For example, in the response below, there is a strong, clear argument which remains focused on the question throughout and has very secure subject knowledge underpinning it. Given that students can never prepare rehearsed / model answers for these sorts of questions, this was particularly impressive and scored L3 – 9 marks.

0 5 . 4 — To what extent do you agree that changes to the carbon cycle are responsible for increasingly frequent and severe tropical storms?

[9 marks]

[AO2] Initially, I agree to a large extent as the intensity an frequency of tropical storms has increased by 66% over the last decade and the concentration of CO_2 in the atmosphere has increased from [AO1] 280 ppm to 417 ppm since the industrial revolution.

[AO1] // Increasing the amount of CO_2 in the atmospher de to the removal of sinks in the carbon cycle such as trees can lead to higher atmospheri global temperatures that scientists predict will almost definitely increase the severity of tropical storms [AO2] as ocean temperatures will remain at/ [AO1] above 27°C (critical temp. for formation of tropical storms) for longer allowing more evaporation, providing more energy for more [AO2] intense tropical storms to form. // However, it could be argued that changes to the water cycle are more responsible [AO2] for increasing frequency and severity of tropical storms as due to climate change, more the glacial ice is melting, increasing sea levels so that sea can absorb more CO_2 from the atmosphere and form more carbonic acids, making ? Sea temps. warmer and more likely to reach the critical 27°C point to allow tropical storm formation. Although, this is closely linked with the carbon cycle as

Extra space amount of CO_2 absorbed by oceans is dependent [AO1] on concentration of CO_2 in the atmosphere which forms part of the carbon cycle // PBA Scientists have declared concluded that it is unclear wether the frequency of tropical storms will in increase due to climate change resulting from the increasing amount of CO_2 in the atmosphere as other processes are involved in formation of tropical [AO2] storms e.g. coriolis force. Plus, no storms has occured yet outside the usual ori- [AO1] gin (the tropics). // In conclusion, I believe that changes to the carbon cycle are responsible for increasingly frequent and severe tropical storms to a ... extent as levels of CO_2 impact upon temperature ... in the atmosphere

The response below considers the impact of climate change on the Great Barrier Reef. Support is strong and other factors are also considered in a well-balanced response. Overall this scored Level 3 and 7 marks.

0 6 . 4 How far do you agree that changes to the carbon cycle are leading to an increasingly uncertain future for coral reefs?

[9 marks]

[AO2] Changes to the Carbon cycle, particularly an increased size of atmospheric Carbon Store due to anthropogenic combustion of fossil fuels, is having significant impacts on Coral reef ecosystems such as the Great

[AO1] Barrier Reef.

[AO1] The Great Barrier Reef is the largest reef on earth, covering 2000 km across Australia's Northeast Coast. Increasing global temperatures as a result of the enhanced greenhouse effect from anthropogenic carbon emissions are causing an increase in global ocean

[AO1] temperatures. Coral reefs require between 22°C - 24°C (ideal) to survive, temperatures above 29°C

[AO1] result in Coral bleaching, in which Coral polyps expel photosynthetic Zooxanthellae which provide them nutrients (Symbiotic relationship). Coral bleaching results

[AO1] in Coral death, and in 2016 the Great Barrier Reef experienced its worst bleaching event in history, with

Extra space 67% of Coral in the reefs Northern Section

[AO1] dying.

[AO2] However, there are other Challenges which pose a threat to Coral reefs, in the form of Overfishing. Coral reefs are highly biodiverse, accounting for 25% of all marine species whilst comprising 18% of the marine environment. Overfishing affects 55% of all Coral reefs

[AO1] globally and threatens this biodiversity and wider marine food webs.
→

6.4

Overfishing of predatory Red Snapper in the Great Barrier reef has resulted in the uncontrolled population growth of

[AO1] low level consumers, such as damselfish. This has caused overgrazing of coral and ~~these~~ Zooxanthellae, posing a significant risk to the reef ecosystem. However there are restrictions

[AO2] on fishing in Vulnerable areas through a Zonal System established by the Great Barrier Reef Marine Park ~~Authority~~

Authority in 2003, providing protection.

[AO2] Overall, the view is valid to a great extent, there are protective measures in place for threats such as overfishing but climate change continues to threaten reefs by coral bleaching.

L3

Limitations of less successful responses

Weaker responses tend to rely too heavily on AO1 knowledge of content, concepts and processes. They are usually not well focused on the question and may fail to offer any assessment or evaluation where it is invariably required.

The response below focused more upon contrasting two storm events having clearly put in a lot of time and effort into revising this material. Whilst it was valid to do this, it needed to be much more focused on the carbon cycle element of the question knowledge recital. However, it did gain L2 - 4 marks (just).

0 5 . 4 To what extent do you agree that changes to the carbon cycle are responsible for increasingly frequent and severe tropical storms?

[9 marks]

> [AO2] The carbon cycle is worsened by global warming which can cause the impacted on tropical storms to worsen. This is due to more evaporation leading to water vapour going into the atmosphere which [AO1] forms a positive feedback loop as this enhances global warming. Furthermore, warmer seas makes more suitable temperatures for tropical storms of [AO1] 27°C meaning tropical storms can occur more frequently [AO2].
>
> However, some would say a more severe tropical storm would depend on where the storm hits. Cyclone Nargis was a tropical storm which hit Haiti causing the death of 190,000 people. This is due to Haiti being LIC where they had no money or no idea that they where about to be hit by a category 3 cyclone. This caused for more severe effect of the cyclone which was worsed by Haiti's flat land meaning flooding and would high winds cause for a devestating impact.

Extra space

A01

In contrast, Super Storm Sandy which hit New York only killed just over 200 people as these are a more developed place with higher income. However, Breezy point was hit where most people died due to a poor region. Overall, the carbon cycle is responsible for more frequent tropical storm but how severe a tropical storm is depends on where the storm hits.

12

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