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Examiners' Report
June 2023

GCE Geography 9GE0 01

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Introduction

The 2023 series was the first 'usual' series taken since 2019. It was also the first high stakes examination that the 2023 cohort had taken (as the 2021 GCSE series were teacher assessed grades) and there was no Advanced Information which had been given to the 2022 cohort.

There was however a decrease in the number of candidates using extra paper in completing their responses. Centres are to be congratulated in impressing upon their candidates that it is the quality rather than the quantity of the response that they should be focused on. The fall in numbers of candidates using extra paper was particularly noticeable in 1b, possibly as a result of a question having a focus on managing volcanic as opposed to other tectonic hazards.

In general, the June 2023 paper was accessible to candidates across the ability range. There was evidence of high-quality work in all of the high mark tariff questions. In terms of the two option questions, Question 3 ('Coasts') was again far more popular than Question 2 ('Glaciation'). It was pleasing to note, however, that the numbers attempting the glaciation questions rose slightly to around 8% of the cohort – possibly as a result of the ability of centres to carry out field studies in relict and active glaciated areas.

Question 1 (a)(i-iii)

This was a stepped question that was similar to that set in 2020. The majority of candidates were able to correctly calculate the sum of the squared differences as 121 but a surprisingly large amount were unable to calculate the rs correctly. Common errors included forgetting to take the calculated value of the right-hand part of the equation from 1 or being able to substitute the correct value of 10 for n.

There were also a significant number who were unable to express the rs value to two decimal places. Centres are encouraged to ensure that their candidates are confident in handling the named statistical tests in the specification as well as being accurate in their understanding of rounding.

There is a comprehensive list of the skills at the end of each of the sections of 9GE01 and centres are reminded that the AO3 marks can come from any of these skills, not just the ones listed after the section on Tectonic Processes and Hazards.

Question 1 (b)

It was pleasing to see that many centres had taken on board the comments made in the 2022 Examiners Report over the need to ensure that candidates could answer questions on a range of tectonic hazards and not rely solely on their Haiti and Tohoku case studies. Candidates who had either studied a range of volcanic case studies or had followed the specification 1.8/9 and used a hazard management cycle approach or assessed the value of using mitigation and adaptation strategies found the essay relatively straightforward and obtained pleasing marks. The range of case studies used by some candidates proved problematic as some were insecure in the details of the management of the Eyjafjallajokull eruption of 2010 in Iceland, whilst others tended to describe the impacts of the eruption of Nyiragongo 2002 and the subsequent lava flows into Goma as opposed to assessing the effectiveness of strategies used to manage the impacts of these volcanic events. Sadly, some even tried to use the 2010 Haiti earthquake as an example which was unfortunately self-penalising.

The very best answers outlined at the start of the essay what they understood by the term effective and then used this definition in their assessment of the effectiveness of varying strategies either in terms of managing the type of impacts (social or economic) or in considering whether there had been more effective short term rather than long term management.

This demonstrates accurate and relevant knowledge and understanding of the effectiveness of strategies used to manage the impacts of volcanic hazards. The candidate also produces a full and coherent interpretation that is relevant and supported by evidence drawn from Iceland and the USA. The candidate also makes supported judgements about the significance of lava diversion, evacuation, building design and radon gas measurement throughout the response. Level 3 10 marks.

(b) Assess the effectiveness of strategies used to manage the impacts of volcanic hazards. Heimaey 1973 5,000 57 Radon

(12)

Volcanic hazards pose threats to human life, wellbeing and property and so efficient management strategies would be judged as mitigating damages to these factors.

One strategy used in modifying the event is lava diversion, shown by the event of the volcanic eruption of heimaey in 1973. Management strategies used were the channeling of lava around the urban area as well as the pumping of seawater onto the lava to form a rock wall which diverted the lava. In addition to this Heimaey's population of around 5000 was evacuated. This proved to be an exceptionally efficient strategy as Nobody died as a direct result of the volcanic hazard and very few harmed.

Evacuation was less efficient however in the case study of the 1980 eruption of mt. St Helens. For context, 400m was blown off the North face of the mountain, killing all animals up to 25km away north, 4 million tonnes of ash fell on roads, buildings and airports, 12 million salmon were killed by mudflows in mini lake and millions of trees destroyed. 57 people died as a result of the explosion, with the majority of those being outside of the evacuation zones of the eruption was

not predicted to be of that magnitude (VEI 5)

A simple strategy of managing volcanic hazards is creating sloped roofs on buildings as the biggest killer in eruptions is the collapsing of building under the weight of tephra. This is effective however difficult as in Low income countries as many houses are built by the owners and do not follow building codes. This is due to rapid urbanisation under poor governance leading to slum conditions.

A further strategy is to implement prediction and forecast science as well as experts, such as radon gas detectors which may show signs of an upcoming eruption. This is more difficult however in LIC due to a lack of resources and migration of skilled people in the country (brain drain).

ResultsPlus
Examiner Comments

The candidate ensures that their understanding of success is outlined at the start of the essay and uses the language of assessment throughout.

ResultsPlus
Examiner Tip

The response could have been improved if the candidate had more accurate AO1 knowledge particularly concerning the portability of predictive equipment such as radon gas monitors.

Question 2 (a)

This question was generally answered well by the candidates. Most showed a good understanding of the process of glacier movement and were able to correctly explain the contribution of meltwater to these processes. Centres are reminded that questions containing key words such as 'contribute' allow candidates to examine other factors and processes beyond those written in the question. In this case better answers used the information in the diagram to highlight that some glacial processes such as internal deformation did not rely on meltwater and indeed in some cases contributed more to glacier movement. Others highlighted factors such as gradient as also contributing to the movement of temperate glaciers.

This demonstrates accurate and relevant geographical knowledge and understanding of how meltwater contributes to the movement of temperate glaciers. The candidate applies this knowledge and understanding to find fully relevant connections/relationships between the resource and the question. Level 3 5 marks.

2 Study Figure 2a in the Resource Booklet.

(a) Explain the contribution of meltwater to the movement of temperate glaciers.

The meltwater at the base of temperate glaciers (caused by pressure melting) will contribute to the movement of glaciers. This is because it enables basal slip, which is where the water lubricates the base of the glacier allowing it to slide down the mountain. This could move the glacier by up to 2-3m a day.

The presense of meltwater also enables movement through regelation creep. This is when the glaciers path is blocked by an obstacle and pressure melting occurs and the water flows over/through the obstacle and refreezes on the other side, leading to increased rates of movement within the glacier.

Meltwater isn't the only factor impacting the movement of temperate glaciers local factors such as gradient also play a key role. If the gradient is steep the glacier will move under the force of its own gravity. However meltwater is the key component in enabling glacier movement as it enables basal slip and regelation creep.

ResultsPlus
Examiner Comments

This response was awarded level 3 as it recognises the contribution that meltwater, developed through pressure melting plays in basal slip. It also examines the impact of local factors such as gradient.

ResultsPlus
Examiner Tip

It could have been improved if the candidate had also examined in greater detail the contribution of internal deformation regelation slip.

Question 2 (b)

This question was also found accessible by the majority of candidates who could correctly explain the positive feedback loop depicted in the resource. Candidates also identified that there were other feedback loops (both positive and negative) that impact on the size of ice sheets and sea ice. These included feedback loops such as the melting of permafrost.

This demonstrates accurate and relevant geographical knowledge and understanding of the role of feedback in changing the size of ice sheets and sea ice and has relevant connections/relationships between the resource and the question. Level 3-5 marks.

Study Figure 2b in the Resource Booklet. 9:44

(b) Explain the role of feedback in changing the size of ice sheets and sea ice. (6)

Figure 2b shows a positive feedback loop where increased melting due to increased atmospheric temperature leads to a reduction in surface solar radiation reflection (albedo), which leads to an increase in atmospheric temperature which leads to more ice melting which will then continue the cycle. Positive feedback is very important as it makes the change on the size of ice sheets and sea ice faster and greater. There are also negative feedback loops such as ~~increased~~ increased accumulation (input) leading to increase ice in the ablation zone, leading to increased ice melt or calving or sublimation in the ablation zone, leading to less ice ~~thickness~~. This can ensure a glacier remains in dynamic equilibrium.

ResultsPlus Examiner Comments

A variety of feedback loops could have been explained.

ResultsPlus Examiner Tip

The candidate could have improved their answer by developing their explanation of the other feedback loops such as the interaction of sea water with ice.

Question 2 (c)

Periglacial questions have always proved to be challenging for some candidates and the 2023 Q2c highlighted the need for centres to ensure that their candidates are secure in their understanding of both the processes and the resulting landforms of periglacial areas. Whilst it is recognised that landscapes with periglacial features are harder to access for fieldwork than active or relict glacial landscape, they are still an important part of the specification and will continue to be examined. Despite these comments the Principal examiner is pleased to report that there was some very pleasing work as the following example highlights.

This demonstrates accurate and relevant geographical knowledge and understanding of the role of melting and refreezing cycles in forming distinctive periglacial landscapes. It has a broad range of geographical ideas, which are detailed and fully developed. Level 3 8 marks.

(c) Explain the role of melting and refreezing cycles in forming distinctive periglacial landforms.

(8)

Melting and refreezing cycles are instrumental in the formation of distinctive periglacial landforms as they are heavily reliant on freeze thaw weathering. For example in relation to ice wedge polygons water enters cracks in the ground and from there as it freezes and thaws over time the crack will increase in size (as water expands by ~9% when it becomes ice) which will eventually lead to the joining up of cracks to create the distinctive pattern of ice wedge polygons which makes periglacial landscapes distinctive. Furthermore in relation to solifluction lobes melting is required to occur so that the excessive amount of meltwater (which cannot percolate due to permafrost) saturates the active layer and causes it to slide down a slope which when refreezing occurs will create a tongue-shaped lobe on the slope which is distinctive to periglacial landscapes. Furthermore freeze thaw weathering is instrumental in the production of patterned ground through frost heave. As the specific heat capacity of rocks is lower than that of soil the ice crystals form beneath the rock which shunts the rocks upwards when the ice melts during the summer sediment fills the gap to prevent the rocks from falling. After many freeze thaw cycles the rocks emerge from the ground and role to the base of the mound created leaving a distinctive pattern of rings of rocks (or lines of rock if occurring on a slope) which is distinctive to periglacial environments. Furthermore pingos rely on freeze thaw weathering to grow their ice cores to create their pronounced mounds as they need to take in

water by capillary action and then freezes it to grow the ice core.

ResultsPlus
Examiner Comments

The response explained the role of melting and freezing in the formation of a variety of periglacial landforms such as ice wedge polygons, patterned ground, solifluction lobes and open pingoes. In particular the response focuses well on the key word in the question which was 'distinctive'.

ResultsPlus
Examiner Tip

It could have been improved by naming at least one periglacial landscape where these landforms may be found.

Question 2 (d)

This question was answered well by the majority of the candidates and it was pleasing to see that as many opposed the view as supported it. As with many of the 20-mark questions that use the word (un)successful, the best answers outlined at the start (or in a conclusion) what they understood by the word '(un)successful' and then evaluated their case study material to support (or to oppose) their view. Centres are reminded to ensure that their candidates are fully aware of the need to examine both types of glaciated landscapes (active and relict).

This demonstrates accurate and relevant geographical knowledge and understanding of the extent to which the management of active and relict glaciated landscapes is likely to be unsuccessful. The candidate applies this knowledge and understanding to produce a full and coherent interpretation that is supported by evidence and comes to a rational, substantiated conclusion. Level 4 17 marks.

(d) Evaluate the view that the management of active and relict glaciated landscapes is likely to be unsuccessful.

(20)

PLAN - Active - climate change, feedback mechanisms

Relict - conservation

Global scale, local, national

Successful - Paris agreement to reduce temp globally
eval- must be global

different people have different views + objectives

Active ~~ten~~ glaciated landscapes are those that still have ice cover on them today. Relict glaciated landscapes are characterised by landforms that prove there was ~~one~~ once ice cover in the landscape, but there no longer is. ~~one of the~~ management can be implemented through local, national or global scales but some oppose the idea that management will be successful because of the scale of threats that face both relict and active landscapes

One of the largest threats facing both active and relict landscapes is climate change, although arguably active glaciated landscapes are more at risk. Climate change poses a threat to active glaciated landscapes because of increased global temperatures and therefore more ablation and negative mass balance.

For management of this threat to be successful, there needs to be global change. Atmospheric gases are not specified to one country and although some countries are more at risk of the effects of climate change, it cannot be tackled at a small scale. Global agreements such as the Paris agreement need to be put in place to allow for global consensus. The Paris Agreement poses the idea that all members must aim to keep global temperature increase at a ~~minimum of~~ maximum of 2°. This would be successful at managing the threat to active glaciated landscapes as global temperature increase in the future will be limited. However, many would argue that it is unsuccessful because not all countries signed the Paris Agreement. Namedly, the USA ~~did~~ is not part of it at current, one of the biggest global polluters and enablers of climate change. It can be said that without global agreement, it would be unsuccessful and tackling climate change, although imperative, has been seen as challenging and potentially impossible because of the complexity and grand scale of the management needed.

Relict landscapes may be easier to manage, as the

Threats are more closely linked to national or local levels. For example, tourism is a threat to ~~the~~ relict Glaciated landscapes like the Lake District. The lake District has imposed management schemes such as buses to and from nearby ~~stat~~ train Stations in order to reduce congestion and traffic in the nearby area. ~~Similarly, many relict glaciated landscapes are protected which~~ This is a local scale project that will be successful in ~~that~~ managing the problem of high levels of tourism congestion, however it may only be seen as successful because they are tackling a smaller threat.

Stakeholders such as the UN have taken control of protecting active and relict glaciated landscapes through appointing them UNESCO heritage sites. Some examples include Sagarmatha national park, ~~&~~ Yosemite national park and the Lake District which are managed by the protection of relict landforms in these locations. This title means they cannot endure major land use changes or be destroyed. This type of management is rarely seen as unsuccessful because of the status ~~&~~ that the title holds and the past ability for it to protect ~~these~~ such landscapes. However, ~~&~~ there are many Stakeholders in the management of glaciated landscape who all have contrasting views of what is

Successful or not. This creates conflict as to how threats should be managed, as well as who should manage them.

Overall, it can be said that management of both active and relict glaciated landscapes will be challenging because of the wide range of threats that face them, as well as uncertain futures and conflicting views on how management schemes ~~sout~~ should be implemented. However, ultimately management schemes have been successful thus far and glaciated landscapes hold social, environmental and economic value, making the strife for management and protection greater. Therefore, management of active and relict glaciated landscapes is/is and won't always be unsuccessful.

(Total for Question 2 = 40 marks)

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Examiner Comments

This was a cogent answer that sought to explore the reasons why the management of active and relict landscapes was likely to be successful (and therefore opposing the view) as a result of both the existing successful schemes in place as well as the value of such landscapes ensuring that they would continue to be managed. Unlike many other responses it did not take an overt case study route and highlights that the majority of marks in the 20-mark questions are for AO2 as opposed to AO1 marks.

ResultsPlus
Examiner Tip

The response could have been improved by identifying where in the case study material that was used (such as the Lake District or Yosemite) there had been successful management and where there had not.

Question 3 (a)

This question was generally answered well. Most candidates were able to explain the contribution of erosion in creating sediment within a sediment cell. It was also pleasing to see that many also recognised that the word contribution allowed them to explain other processes such as sub-aerial process on the cliff face as well as aeolian processes and the role of destructive waves creating sediment from the beach. Centres are reminded, however, to ensure that their candidates understand that the word explain requires more than just the listing of erosional processes. There were a substantial minority who simply listed the erosional processes and did not explain how these processes could create sediment. These responses rarely achieved more than level 1 marks.

This demonstrates accurate and relevant geographical knowledge and understanding of the contribution of erosional processes in producing sediment. The response applies knowledge and understanding to geographical information logically to find fully relevant connections/relationships between the resource and the question. Level 3 5 marks.

3 Study Figure 3a in the Resource Booklet.

(a) Explain the contribution of erosional processes in producing sediment.

(6)

Erosional processes like hydraulic action and abrasion are most evident at the coastline, pushing air into cracks to apply pressure and other rocks eroded sediment. This is shown in figure 3a, where the sources of sediment labelled (S) are at the cliff, eroded by these processes. These are the largest sediment cell producers but cells are known as "closed systems". Sediment from the sea bed from erosion also causes addition to cells, with traction, saltation and suspension processes degrading the sea bed. This is evident in figure 3a, where it is labelled as (S) coming from the ocean. Erosion from the beach also occurs through longshore drift, moving sediment through backwash, mainly prominent in higher energy environments, contrasting destructive waves. Subaerial weathering may also occurs through mechanical, biological or chemical weathering, which further erodes soils via roots, freeze-thaw, wetting and drying, burrows and acid rain.

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Examiner Comments

This response correctly identified the processes of hydraulic action and abrasion in creating sediment and linked it well to the resource. The response also notes the possibility that weathering may contribute to the creation of sediment.

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Examiner Tip

The response could have been improved if these weathering processes had been explained rather than just listed.

Question 3 (b)

This question was found accessible by the majority of candidates who were successfully able to explain how rising sea temperatures had led to thermal expansion and so to the increase in sea level. Many also linked the role of global warming on the melting of land-based ice sheets as well as glaciers in also causing the observed rise in sea level. Many candidates were, however, unable to distinguish between the role of the melting of the Arctic ice cap and the Antarctic ice cap and some unfortunately ignored the resource and explained processes that occurred several thousand years ago.

This demonstrates accurate and relevant geographical knowledge and understanding of the role of global warming in changing mean sea level since 1920. It applies knowledge and understanding to geographical information logically to find fully relevant connections/relationships between the resource and the question. Level 3 5 marks.

Study Figure 3b in the Resource Booklet.

(b) Explain the role of global warming in changing mean sea level since 1920.

(6)

Global warming is the rising of the surface temperature of earth due to the enhanced greenhouse effect, where carbon emissions trap IR radiation in the atmosphere. In figure 3b we can see that since 1920, the mean sea level has risen from -130mm of the 1993 - 2008 mean, to over 50mm above it by 2020, a rise of 180mm. As the temperature rises, the oceans undergo thermal expansion, as the water molecules have more energy and spread out further, causing sea level rise. The polar ice caps have also reduced in extent in the last 100 years, as less ice can form at higher temps, which increases the albedo of the ocean, whilst also leading into a feedback loop where the albedo effect is reduced, as white ice reflects IR radiation, but less ice reflects less, so more warming happens, so less ice forms, and so on. However, this sea level change could also be occurring due to isostatic change, as the land shifts relative to the sea, but this is unlikely

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This answer starts with a brief explanation of global warming before accurately using the resource. It then explains how increasing temperatures cause thermal expansion as well as how increasing temperatures cause polar ice caps to melt and so contribute to a positive feedback loop.

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Examiner Tip

The answer could have been improved if there had been greater accuracy on how melting of specific polar ice caps would lead to sea level rise.

Question 3 (c)

Candidates generally found this question challenging. Cliff profiles are detailed in three parts of the specification:

2B.2c Geological structure (jointing, dip, faulting, folding) is an important influence on coastal morphology and erosion rates, and also on the formation of cliff profiles.

2B.3b Differential erosion of alternating strata in cliffs (permeable/impermeable, resistant/less resistant) produces complex cliff profiles.

2B.6c Mass movement creates distinctive landforms (rotational scars, talus scree slopes, terraced cliff profiles).

It was therefore rather disappointing that a substantial number of responses showed little understanding of what a cliff profile might be. Many simply wrote about concordant and discordant coasts and ignored the word cliff profile completely.

The best responses went beyond a rather simplistic steep and gentle cliff profile and examined the role of dip and differential strata in forming contrasting cliff profiles.

Whilst centres are to be congratulated on ensuring that their candidates are secure in their understanding of coastal processes, the responses to this question highlighted the need to ensure that in future candidates are secure in their understanding of how geology (lithology) as well as geological structure play a vital role in shaping the coast.

This demonstrates mostly accurate and relevant geographical knowledge and understanding of the role of geology in the formation of contrasting cliff profiles. Understanding addresses a broad range of geographical ideas, which are detailed and fully developed. Level 3 7 marks.

(c) Explain the role of geology in the formation of contrasting cliff profiles.

(8)

Resistant rock type such as igneous or metamorphic - due to their ~~[illegible]~~ interlocking crystalline texture - lead to cliff profiles with steep relief such as cliffs found on the Jurassic Coast. This is because ~~[illegible]~~ the rock type / geology creates cliffs with high stable slope angles. In contrast, sedimentary rocks create less relief cliffs with shallower stable slope angles. Such as unconsolidated glacial till / boulder clay found on the Holderness Coast. This leads to contrasting cliff profiles found around the UK due to geology.

Geological structures also contribute to contrasting cliff profiles. ~~[illegible]~~ Cliffs with landward dip are more resistant to sub-aerial processes such as mass movement due to the fact that there is no slip plane facing the sea. This leads to steeper cliffs as mass movement has not occurred to low scree slopes and reduced the angle of the cliff-face. Contrastingly, cliffs with seaward dip often have a shallower relief as the ~~[illegible]~~ mass movement such as landslides along the slip plane create a shallower face on the slip plane. Leading to contrasting cliff profiles.

Finally, these cliffs on discordant coasts are more likely to form erosional landforms such as headlands, bays. The formation

of headlands and bays leads to further erosional landforms forming such as caves, caves, arches, stacks and stumps. This means that the diff profile will become more complex in contrast to that of a cliff on a concordant coast, where erosion may only form caves and caves.

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Examiner Comments

The response correctly explains the role of lithology (igneous and metamorphic rocks compared to sedimentary rocks) in creating steep and more gently sloped cliff profiles (though it would have been better if the example of igneous/metamorphic cliffs had been the Isle of Arran rather than the Jurassic coast!). The response then explains how the dip of the rock strata can also cause contrasting cliff profiles with landward dip creating steeper cliff profiles than those with a seaward dip. Finally, the response tackles concordant and discordant coasts. This is the least convincing part of the response, but the candidate does try to link this with a cliff profile being more 'complex'.

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Examiner Tip

The answer could have been improved if the candidate had been accurate in their choice of case studies support as well as using more named examples in their response.

Question 3 (d)

In contrast to the previous question the majority of candidates were able to produce sound coherent answers to this question. There were a variety of approaches taken with some candidates focusing solely on hard engineering and evaluating whether they were actually successful in protecting coastal communities threatened by coastal recession and flooding. Others took the view that some hard engineering approaches were successful but other sustainable approaches could also protect coastal communities threatened by coastal recession and flooding. Both approaches allowed the candidates to come to a convincing conclusion.

This demonstrates accurate and relevant geographical knowledge and understanding of the extent to which without hard engineering there is little future for coastal communities threatened by coastal recession and flooding. The candidate applies this knowledge and understanding to produce a full and coherent interpretation that is supported by evidence and comes to a rational, substantiated conclusion. Level 4 16 marks.

(d) Evaluate the view that without hard engineering there is little future for coastal communities threatened by coastal recession and flooding.

(20)

The Hard engineering strategies are a significant strategy type used by many local councils or government in coastal areas to prevent the effect of coastal recession and flooding. However, this is not the only type of strategy that can be put into place and have a positive impact on the local community, soft engineering can still be effective.

The use of hard engineering strategies used in places such as New Brighton of the building of a sea wall to protect the coastal area has been widely effective. The future of the Brighton coast seems to be safe as flooding and coastal erosion have little impact now on the coast of local communities attracting many tourists. However this cost the Brighton area over £1 billion ~~to~~ ensuring in some areas they would not have been sustainable.

Another positive impact that has been due to the addition of hard engineering strategies is within a coastal town on the East coast of England, Great Yarmouth. Great Yarmouth is a popular holiday destination for many families to visit. However, the risk of flooding and coastal recession problems has meant that the local council has started to act and add groynes and revetments. This at first seemed to be an unattractive addition to the coast, however local tourist boards stated that they would much rather the coast to be safe for attracting tourists than not safe preventing tourists. This has meant that the future of the Great Yarmouth coastline has had a positive impact and the future is positive for this community.

However, the addition of hard-engineering to coastlines is not always positive. For example, the Groyne on Dom Beach in the Netherlands which was built in hope of preventing flooding. The Dutch government believed that by doing

paid £1.5 billion a year on this project, it would prevent flooding. However, despite this acquisition, the government revised that the sea level rise will mean coastal flooding can not be prevented and that it will still be a problem. This has meant that despite the hard engineering put into place, the risk of coastal flooding is still a hindering problem for the government and coastal communities.

Furthermore, the decision to not use hard engineering strategies in coastal areas in places such as Happisburgh where no active intervention was used has meant the rates of coastal recession have stay across and the future looks bleak for communities living there. Additionally, Birling Gap has had similar experience with No active intervention and no hard engineering strategies in place which has led to peoples homes being destroyed and parts of the coast hotel. This has

had a negative effect on the local community as a whole as less tourists are likely to visit leading to a negative effect on the economy through the loss of the hotel.

However, despite hard-engineering strategies used in many coastal areas, soft engineering can still be effective in dealing with coastal recession and flooding. For example, the use of dune stabilisation in Conbar sands has meant coastal flooding as well as recession is less likely to affect the local community. Conbar sands is a popular tourist destination with a large annual impact. Dune stabilisation to the sand dunes has meant that even without hard engineering strategies in place, the local community has a future.

(Total for Question 3 = 40 marks)

TOTAL FOR SECTION B = 40 MARKS

In conclusion, the use of hard engineering strategies can make the chances of a local community further more secure from coastal flooding and recession, however this is not always the case as seen in the Netherlands. Despite this, futures are safer with hard engineering.

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The response starts by stating that a variety of strategies can help protect coastal communities. The response starts with an examination of hard defences in Brighton and although acknowledging the success at this location it raises the issue of cost and that for other communities these types of defences may be unaffordable. The response then continues with an examination of the success of the defences at Great Yarmouth showing that initial doubts can be overcome. The candidate then evaluates these positive examples with a negative example of hard engineering in this case flood control in the Netherlands and highlights that despite the vast cost of such schemes the threat of continual sea level rise creates an on-going problem for decision makers in the Netherlands. It then highlights the case that when other strategies are used such as No Active Intervention the future is bleak for these coastal communities. Finally, the candidate examines the role of soft engineering in Camber sands and argues that in some places soft engineering can be equally as effective as hard engineering. Overall, the response was wide ranging and was focused on the question.

ResultsPlus
Examiner Tip

It could have been improved with some more substantial AO1 knowledge and perhaps a more focused conclusion.

Question 4 (a)

This question was answered well by most of the candidates. Some took the approach of explaining the impacts caused during the construction of the wind farm, whilst others looked at the impacts of visual and noise pollution on the local communities. Others explained the benefits that having a wind farm might have bought. All of these approaches allowed the candidates to achieve full marks.

4 Study Figure 4a in the Resource Booklet.

(a) Explain **one** possible impact on local communities of the development of onshore wind farms.

(3)

One possible impact on local communities of onshore wind farm development is disruption to daily life during construction. As development involves moving large, heavy machinery in it will likely cause delays due to traffic and an increase in the pollution, again as a cause of these queues. This will impact communities as they'll have to adapt to ~~change~~ increased traffic waiting times and longer journeys.

ResultsPlus
Examiner Comments

The candidate receives one mark for noting that there would be disruption to daily life during construction and 1 mark for explaining what has caused this (the large heavy machinery) and one mark for the development of this in terms of delays and longer journey times.

ResultsPlus
Examiner Tip

Candidates are reminded that in such questions where there is **one** impact, they should focus on only one impact (in this case delays) as opposed to other impacts (such as pollution).

Question 4 (b)

The Principal Examiner was pleased that many centres had taken on board the advice given in the 2018 Examiners Report when centres were advised to ensure that their candidates should be able to distinguish between adaptation and mitigation strategies. As a result, it was pleasing that there were very few answers that examined mitigation strategies (such as the use of renewable resource such as wind farms) and the vast majority of responses were focused on adaptation strategies. Many explained the role of water conservation, but it is important for candidates to understand that the words 'such as' does not limit them to just water conservation. Any suitable adaptation strategy such as flood management or the growing of drought resistant crops was also acceptable.

This demonstrates accurate and relevant geographical knowledge and understanding of how adaption strategies may help communities cope with a changed climate. The candidate's understanding addresses a broad range of geographical ideas which are detailed and fully developed. Level 3 6 marks.

(b) Explain how adaptation strategies, such as water conservation, may help communities cope with a changed climate.

(6)

provide strategies to

Adaptation Strategies aim ~~to~~ to live with the effects of climate change. As ~~the planet warms~~ global warming increases through the enhanced greenhouse effect ~~the~~ more water is evaporated into the atmosphere which results in an increase in droughts ~~in~~ across the world (eg: in the Sahel region). Water conservation through sustainable approaches (such as those seen in Singapore) can reduce the reliance on conventional stores - river and resivours and provide different strategies. For example in Singapore ~~they~~ they use water collection from roof tops and recycling of grey water to ensure they can collect the maximum amount of water. ~~In~~ In Sadi Arabi desalination plants are used commonly ~~in order to~~ due to fossil water aquifers running out which also provides an alternate solution. ~~to~~ ~~to~~ ~~Engineering~~ Another strategy is seen globally - using high-tech drip-fed irrigation. Strategies to only irrigate ~~farm~~ when needed and in a controlled manner can be vital to farmers/agriculturalists.

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Examiner Comments

This was a very comprehensive answer, and it was pleasing to see a variety of named examples such as the Sahel and Singapore.

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Examiner Tip

Candidates are reminded that if the question stem has 'such as water conservation' the answer can be on any adaptation strategy and not just water conservation.

Question 4 (c)

As with question 4b this was answered well by the majority of candidates. There was a wide range of social problems such as outbreaks of disease as well as economic problems such as women being kept from the workforce due to the need to fetch water. Others took the view that water insecurity could lead to lower crop yields impacting both on household income and then household health. Key to a high mark was the use of case study material to support their answer.

This demonstrates accurate and relevant geographical knowledge and understanding of how water insecurity can cause both social and economic problems. The response addresses a broad range of geographical ideas, which are detailed and fully developed. Level 3 7 marks.

(c) Explain how water insecurity can cause both social and economic problems.

(8)

Water insecurity is a lack of ~~&~~ water of sufficient quality and quantity (less than 1700m³ per person).

This has a number of social problems. For example, negative health implications as decreased amount of water may cause salt water encroachment, polluting water and making it unsafe to drink. Lack of water may also expose sea beds having health implications. For instance, the dried up sea bed of Aral Sea, blows salt in nearby villages and causes respiratory problems which are responsible for 60% of diseases deaths. Additionally, if there is a lack of water in developed countries this imports elevation as some girls may have to travel miles to fetch water, so have no time to attend school. This later has economic impacts as less of the population can access high paid jobs. Economic problems caused by water insecurity also includes inability to power a countries infrastructure, for example, Aswan Dam powers 12 ~~electricity~~ energy stations in Egypt which powers half of Egypt, without this water, the country

would fail to power industry. Another example is Las Vegas where 90% of its water comes from River Colorado to power electricity and water fountains etc. However, water levels of falling in Colorado as millions of people rely on it for water, meaning if las vegas looses power it will have significant ecoromic impacts as tourism will decrease.

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Examiner Comments

The candidate defines what they understand by water insecurity (although other definitions such as water scarcity were accepted) and then explain how this can contribute to poor health and even how overextraction can lead to health hazards such as in the Aral Sea. The candidate then develops their ideas on the economic impacts of water insecurity by examining at a variety of scales these impacts from a household impact of having to fetch water, to a country scale in terms of the impact of lower electricity production. It finally examines the possible impact of water insecurity on Las Vegas – a city dependent on piped water from the river Colorado.

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Examiner Tip

The answer could have been improved with perhaps some case study detail on mortality rates or the % of girls not finishing school.

Question 4 (d)

This question was also answered well by the majority of the candidates. Most were able to explain the differing roles of land use (urban and forested areas) on the resultant shape of the hydrograph as well as geology. However, a substantial minority unfortunately did not appreciate the other contributing factors to the shape of the storm hydrographs shown in the resource shown such as the reservoir, catchment slope and area and even drainage density. Indeed, only the very best appreciated that the urban area covered only a small proportion of catchment X and would therefore have only some contribution to the shape of the storm hydrograph for catchment X. Centres are encouraged to ensure that their candidates are aware of the complexities of storm hydrographs and go beyond the rather deterministic GCSE approach that some candidates adopted. Centres are also encouraged to ensure that their candidates use the resources that are given to them effectively. Many answers simply referred to the peak discharge being 'higher' and lag time being shorter. Only the best analysed the resource to compare either the differences in lag time (3 hours or a 20% increase) or the difference in peak discharge (2 cumecs or nearly a 60% increase). The best answers also used technical language to describe the shape of the hydrograph in terms of rising limb, lag time, peak discharge as well as the terms of the hydrological cycle such as interception, infiltration and throughflow.

This demonstrates accurate and relevant geographical knowledge and understanding throughout of the extent to which land use affects the shape of the storm hydrographs. It applies knowledge and understanding to geographical information/ideas logically, making relevant connections/relationships to produce a full and coherent interpretation that is relevant and supported by evidence which is drawn together coherently in order to make rational judgements. Level 3 11 marks.

(d) Study Figure 4b and 4c in the Resource Booklet, which show two neighbouring upland river catchments and their hydrographs following a local storm event.

Assess the extent to which land use affects the shape of these storm hydrographs.

(12)

Figure 4b and 4c show 2 different catchments with different hydrographs after a storm. The shape of storm hydrographs can be effected by land use, relief, size of catchment as well as vegetation cover.

Land use can effect the shape of the storm hydrograph because the increase in urbanisation (people moving into cities) is increasing. Figure 4b shows an urban area on the flood plains of the river. Therefore, as urban sprawl (cities expand outwards) increases they can reach flood plains of the river. Therefore, there is more impermeable ground such as tarmac and concrete. Therefore, rainwater cannot ~~precipitate~~ infiltrate the soil. Therefore, surface runoff increases. Consequently, the water reaches the river at a much faster rate. Therefore, peak discharge is much higher as shown in the graph in 4b at 5.2 cumecs and the lag time is shorter. Therefore, this can lead to flashier floods in the location of figure 4b.

The landuse in figure 4C includes a reservoir. Therefore, the flow of the tributary is managed before it joins the main river. Therefore, after precipitation if the rainfall is intense the reservoir can store the water for longer. This will lead to a smaller river discharge after a storm as seen in the graph in figure 4c at 3.4 cumecs. Therefore, lag time is longer. Consequently, floods are less likely or less flashy if they occur.

Vegetation cover also affects the shape of storm hydrographs figure 4b shows a more sparsely vegetated area with short vegetation (grassland) this is impacted further by geology as rock there is impermeable. Therefore, less interception takes place and the rain water cannot infiltrate. Consequently there is more overland flow leading to a steeper rising limb on the hydrograph. Whereas figure 4C has taller vegetation (coniferous forest) which can intercept and permeable geology so water can infiltrate and percolate reaching the river more slowly so peak discharge decreases.

Overall, land use plays a key role in the shape of storm hydrographs because areas that may become urban have more impermeable surfaces increasing runoff. However, other factors also play a key role such as vegetation, geology. Land use affects the shape of the hydrograph significantly as shown in figure 4B

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Examiner Comments

It is pleasing to see that this candidate recognises that the question requires an assessment and outlines the factors that they will assess in the essay. The candidate correctly explains how urbanisation has affected the shape of the hydrograph of catchment X and how the reservoir has affected the shape of the storm hydrograph in catchment Y. The candidate then assesses the role of land use by examining the role of vegetation and then attempts an assessment in a final concluding paragraph.

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Examiner Tip

The answer could have been improved if the candidate had used the data given to them as well as realising the complexities of the factors affecting the shape of the storm hydrographs shown.

Question 4 (e)

This was a question that challenged the candidates to be able to synthesise their knowledge and understanding of not just the carbon cycle but also their understanding of how human activity is disrupting the carbon cycle and the likely impacts of these activities on the carbon cycle now and in the future. Most candidates were able to successfully compare the impacts of deforestation (biological carbon cycle) with the combustion of fossil fuels (slow carbon cycle) on the processes within these carbon cycles. The best answers noted how the impacts of human activity on the processes of one cycle (the geological cycle) could have impacts on the processes of the other cycle. Others correctly noted that whilst the impacts on biological processes could already be observed, the impacts on geological processes will only become apparent in the future.

This demonstrates accurate and relevant geographical knowledge and understanding of the view that human activities are having a greater impact on shorter term biological processes than on longer term geological processes. The candidate applies this knowledge and understanding to produce a full and coherent interpretation that is supported by evidence and comes to a rational, substantiated conclusion.

Level 4 19 marks.

(e) The processes of the carbon cycle operate at longer and slower (geological) and shorter and faster (biological) timescales. ← peatland. ← metamorphic
← decomposition, respiration, photosynthesis & combustion

Evaluate the view that human activities are having a greater impact on shorter term biological processes than on longer term geological processes. ← phytoplankton!

(20)

Human activities such as burning fossil fuels, is increasing the concentration of greenhouse gases in the atmosphere. By ~~increasing~~ increasing the concentrations of greenhouse gases in the atmosphere, the greenhouse ~~gas~~ effect is enhanced, causing increased global warming. Humans are also impacting on the carbon cycle by ~~deforesting~~ deforesting areas and drying peatland.

The shorter term carbon cycle is comprised of respiration, decomposition, photosynthesis and combustion of organisms on earth. This cycle can be very quick, up to a few seconds at it's quickest. However, human activity is changing the way this cycle functions. The deforestation of important forested areas is removing an important sink and source of the cycle. Plants both respire and photosynthesise, so they remove and add carbon to the atmosphere. In Brazil, particularly in the amazon rainforest, this is a large problem. Deforestation accompanied by droughts is removing a trees at an alarming rate, 20% of the rainforest has already been cleared. The amazon rainforest sequesters large amounts of carbon of earth, so without there'll be now be large concentrations of carbon in the atmosphere, and not enough sinks to take up the carbon.

The continued burning of fossil fuels by humans is also releasing vast amounts of carbon dioxide into the atmosphere. This is causing the acidification of oceans, as more CO_2 is dissolving into waters creating a weak carbonic acid. Therefore the decreasing pH of waters is starting to kill of phytoplankton, and important sink of carbon in the short term cycle. Phytoplankton can only survive in the certain pH's, and won't be able to survive in ocean waters that's acidic. Phytoplankton sequester 5-10 Gt of carbon every year from the atmosphere, and are also important to the long term carbon cycle. Without important carbon sinks such as the trees or phytoplankton, the short term carbon cycle will be greatly altered.

The long term carbon cycle consists of volcanoes releasing CO_2 into the atmosphere during eruptions, the CO_2 outgassed dissolving in rainfall and creating weak acid rain. This acid rain then dissolves reactive rock like limestone, and the sediment is carried away to oceans. Sediment builds up on the ocean floor over millions of years to create sedimentary rock or fossil fuels. At zone plate boundaries, these are then either subducted to form magma, or metamorphised to form metamophic rock. Both of these release CO_2. Human activities is removing stores of carbon from the

long geological carbon cycle, such as fossil fuels being burnt, or sedimentary rock being used for cement making. Carbon stored in rocks is the largest store of carbon on the earth, and we are increasingly exploiting it, thus changing the way the long term cycle functions. The long term carbon cycle takes a very long time to adjust, and if it is disturbed it is very unlikely the effects can be undone. For example, with the short term carbon cycle, more trees can be planted and peatland can be stored to provide more carbon sinks. But we cannot easily form fossil fuels again or sedimentary rock. These things take thousands, if not millions of years to readjust.
It may be harder to realise the effects we are having on the long term cycle, as not it such a slow cycle, but we are definetly seeing detrimental effects to it.

In conclusion, the short term cycle is being heavily changed by human activity such as deforestation. We can see the effects this having on the cycle, however, we can to some extent prevent the cycle from changing further. The slow carbon cycle takes thousands of years to adapt to changes in carbon concentrations and stores. However, we are rapidly increasing concentrations and depleting stores, and the long term cycle holds the

most carbon out of other stores. Effects on the cycle are pretty much non-reversible. Overall, it seems that as of now we are having the greatest impact on the short carbon cycle, however, we cannot truly tell how we are impacting on the long term cycle, and what affects this will have on it in the future.

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Examiner Comments

This starts out by correctly identifying both aspects that candidates should have tackled in answering the question. The candidate firstly examines the impact on the biological cycle and examines the impact of deforestation on the biological processes such as respiration and photosynthesis. The response then examines how the release of carbon is then impacting upon the biological processes in the ocean and then correctly notes that this would also have an impact in the geological carbon cycle. The long-term cycle is then explained and crucially the candidate makes the point that changes to this cycle are difficult to reverse and also that it is harder to quantify the effects due to the time taken within the cycle. A sound conclusion makes the point that the most apparent impacts are on the short-term cycle but people have the ability to reduce this and therefore the impacts on the slower cycle may be more important in future but at the present time we do not know.

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Examiner Tip

The answer could have been improved through the use of AO1 knowledge such as the amount or rate of deforestation and perhaps the change in pH of the ocean.

Paper Summary

Based on their performance on this paper, candidates are offered the following advice;

- Ensure that you have a glossary of key terms of the specification – a substantial number of candidates were not secure on the meaning of the words cliff profile or periglacial.
- Use the resources that are given to you to substantiate the points that you are making. In particular, study carefully any data in the form of tables and graphs and try to manipulate the data given to you.
- Ensure you have a balanced understanding of the case study material for the tectonics section – the question can be on any type of tectonic hazard and not just earthquakes. Simply learning the impacts and management of the Haiti 2010 and Tohoku 2011 seismic events is unlikely be sufficient to answer all the questions that may be set.
- Questions such as 4b which give a steer with the words 'such as' does not mean you can only write about the steer – in this case any adaptation strategy was appropriate.
- Ensure that you read the 8 mark explain AO1 knowledge questions carefully looking for key words such as 'and' which means that for top band marks both elements in the question need to be addressed. This was particularly true for 4c.
- Ensure that when the 6 mark resource question has key words such as 'contribute' there are likely to be other factors or processes that are relevant to the answer.
- Ensure that in the 20 mark evaluate questions you come to a conclusion that is a logical outcome of your argument (i.e. is rational) and has a key piece of information supporting your conclusion (i.e. is substantiated).

Centres and candidates are also advised to take advantage of the resources available at

https://www.pearsonschoolsandfecolleges.co.uk/a-level-geography-place-context-examples

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