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Examiners' Report
June 2024

GCE Geography 9GE0 01

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June 2024

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Introduction

Examiners report 9GE01 June 2024

The 2024 series was the first series taken since 2019 when the cohort had also taken high stakes examinations at GCSE. As such it was therefore the closest series since 2019 and the start of the pandemic.

This return to the demand of a 2019 paper does not seem to have had a significant impact on the responses seen this year. There was little evidence of either incomplete papers or blank questions. This is again testament to the hard work of the candidates and the professionalism of the teachers who have prepared them for a 'normal' series of examinations.

In general the June 2024 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'). The numbers attempting the glaciation question has slightly plateaued at around 8% of the cohort.

There was, however, an increase in the number of candidates using extra paper in completing their responses. This may have been the result of 1b allowing answers on a range of tectonic hazards and not simply a focus on managing volcanic as was the case in 2023.

Question 1 (a)(i-ii)

This was a stepped question that was similar to that set in 2022 but without the interquartile range. The majority of candidates were able to correctly calculate the mean as well as the median.

Common errors included errors in calculating to one decimal place as well as misunderstanding that the median of 11 values was the sixth value. Many who gave wrong answers to this question added either the fifth and sixth or the sixth and seventh and then divided by two.

Centres are again 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)

Candidates found this question accessible, probably because it allowed them to use a range of the case studies they had learnt from the spectrum of levels of development. Most answers could explain how high levels of development allowed communities to either have aseismic buildings, better levels of education or better immediate responses, all of which then led to a reduction in the impacts of tectonic events.

The very best answers outlined at the start of the essay what they understood by the term levels of development and then used this definition in their assessment of the extent to which this could explain the impacts of tectonic hazards. In particular those obtaining the very highest marks went beyond a two case study approach (often Haiti 2010 and Tohoku 2011) and instead not only assessed the impact of a range of development levels but also the type of impacts (social or economic) that the tectonic event caused. These also assessed other factors such as the magnitude of the earthquake or the population density of the area.

The development of a country/community is vital in understanding the impacts of tectonic hazards. Developments may be economic or social, and varies between place, typically high income and low income countries.

Firstly, there are typically more inequalities in lower developed countries, which decreases the understanding of impacts. Education and adequate literacy skills are necessary in order to decrease vulnerability and increase resilience to tectonic hazards. Educating individuals on how to respond to and protect themselves from hazards will decrease the risk of a disaster. For example, Japan educates their children on safety and use practice drills to help reduce mortality rates. This is evident after the 2011 earthquake and tsunami, in which only 15000 people died. On the other hand, lower developed countries may not have the money or resources to educate their population on safety, increasing their vulnerability to the impacts of tectonic hazards. For example, the 2004 Indian Ocean tsunami, triggered by a 9.1 earthquake, killed 200,000 people. This occurred in areas lacking development. Furthermore, uneducated populations may not be able to read safety pamphlets and may view science with suspicion. However, the cost for Japan reached $300 billion, whilst the Indian ocean tsunami cost $10 bil

The Degg Model suggests a disaster occurs when a hazard meets a vulnerable population, which conveys the importance of a high disaster threshold.

Informal Settlements and poor housing exacerbate the impacts of tectonic hazards. For example, during the Nepal 2015 earthquake 98% of houses were owner-built and lacking regulations. This exacerbated the impacts as material caused further damage and left 4 million homeless. More developed countries will have the money and technology to modify tectonic events, such as earthquake-proof buildings and stricter regulations. Less developed countries may also use at risk low-lying land, or build on floodplains to accomodate increasing population, which ~~increases~~ worsens the impacts of hazards.

Furthermore, more developed countries will have warning and communication systems, such as the USA during the St. Helen eruption in 1980, as well as media, which allowed people to safely evacuate. Japan also had ocean monitoring to track the tsunami in 2011, decreasing the impacts. *

* Furthermore, more developed nations can use the hazard management cycle

Overall, development is important as more developed nations often experience less social impacts, but more economic impacts, and less developed experience more social impacts due to a lack of education and preparation, high population densities and less wealth meaning less possessions and property to lose

(Total for Question 1 = 16 marks)

TOTAL FOR SECTION A = 16 MARKS

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant knowledge and understanding of the importance of levels of development in understanding the impacts of tectonic hazards. The candidate also produces a full and coherent interpretation that is relevant and supported by evidence drawn from Japan, the Indian Ocean and Nepal. The candidate also makes supported judgements about the importance of the level of development throughout the response as well as on the relative importance of economic and social impacts.

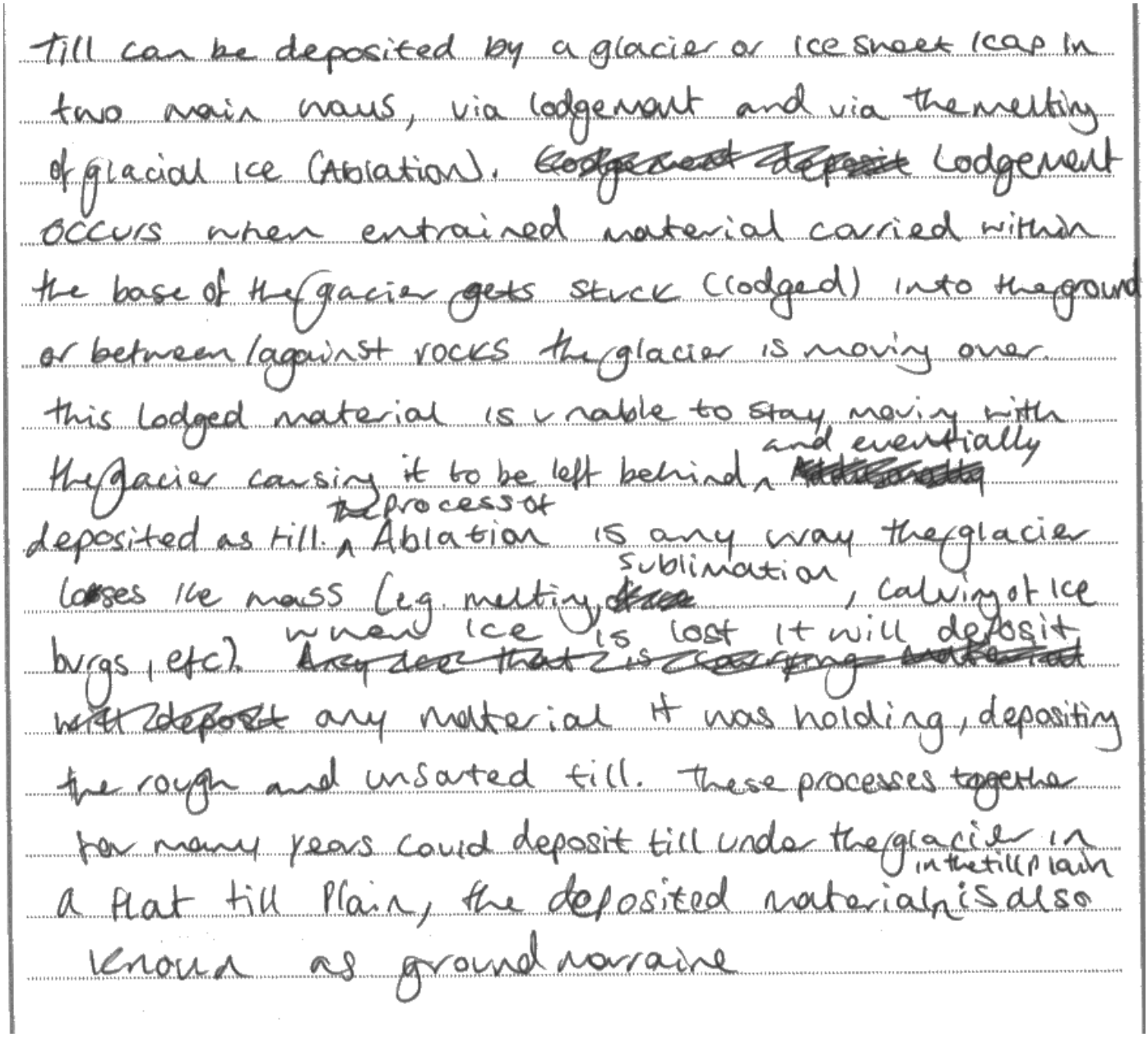
Level 3 10 marks.

ResultsPlus
Examiner Tip

The candidate ensures that their understanding of development is outlined at the start of the essay. The response could have been improved if the candidate had more accurate AO1 knowledge on the impacts of their chosen tectonic events as well as assessing other contributing factors such as the magnitude of the event (Tohoku 2011) or the frequency of the event (Indian Ocean 2004), both of which played significant roles in effecting the impacts of these tectonic events.

Question 2 (a)

Some candidates found this question challenging. Although 'lodgement' and 'ablation' are clearly stated in the specification many candidates found it difficult to explain these key processes. Centres are reminded that good practice is to create a glossary of the key terms in the specification and ensure that their candidates regularly review these terms and definitions. It had been hoped that by using a 'classic' case study of the Laurentide ice sheet candidates would have found this question more accessible. Furthermore it was also clear that many candidates had difficulties relating the theory of such processes to the reality of how these glacial features actually present themselves. Centres are advised to always use contemporary images of the features that they are teaching to aid the understanding of all glacial features.



till can be deposited by a glacier or ice sheet (cap in two main ways, via lodgement and via the melting of glacial ice (Ablation). ~~Lodgement deposit~~ Lodgement occurs when entrained material carried within the base of the glacier gets stuck (lodged) into the ground or between/against rocks the glacier is moving over. this lodged material is unable to stay moving with the glacier causing it to be left behind, and eventually deposited as till. The process of Ablation is any way the glacier loses ice mass (eg melting, sublimation, calving of ice bergs, etc). When ice is lost it will deposit ~~any deposit that is carrying material~~ any material it was holding, depositing the rough and unsorted till. These processes together for many years could deposit till under the glacier in the till plain a flat till Plain, the deposited material is also known as ground moraine

ResultsPlus
Examiner Comments

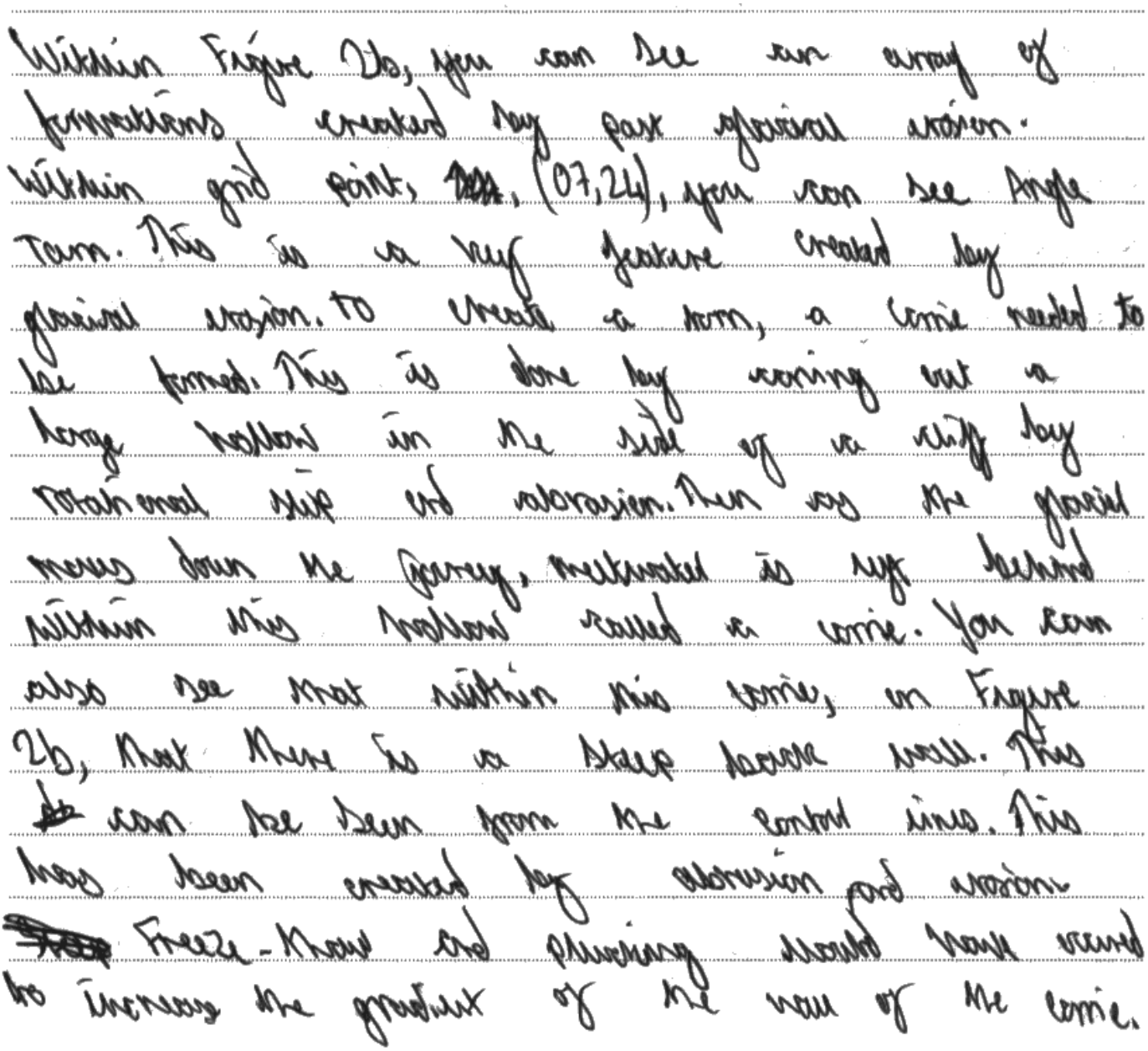
This demonstrates accurate and relevant geographical knowledge and understanding of how the processes of lodgement and ablation have created the relict till plain. The candidate applies this knowledge and understanding to find fully relevant connections/relationships between the resource and the question. Level 3, 6 marks.

ResultsPlus
Examiner Tip

This response was awarded full marks as it recognises the contribution that both lodgement and ablation play in creating the flat till plain shown in the resource. To aid their revision, candidates are encouraged to find real world examples of the features listed in the specification and annotate these photographs to aid their understanding of the processes that have led to their formation.

Question 2 (b)

In contrast to 2a the candidates found this question more accessible probably as a result of the familiarity of the subject material (upland glacial features in a UK context) as well as the use of an OS map. The best answers recognised that such relict landscapes have not just erosional features such as cirques and aretes but also contemporary features such as screes formed by subaerial processes. It was also pleasing to see many candidates using OS map references to aid their response and so demonstrate the mark scheme requirement of relevant connections to the resource.


Within Figure 2b, you can see an array of formations created by past glacial action. Within grid point, [illegible], (07,24), you can see Angle Tarn. This is a very feature created by glacial erosion. To create a tarn, a cirrie needed to be formed. This is done by scouring out a large hollow in the side of a hill by rotational slip and abrasion. Then as the glacial mass down the gorge, meltwater is left behind within this hollow called a cirrie. You can also see that within this cirrie, on Figure 2b, that there is a steep headwall. This can be seen from the contour lines. This has been created by abrasion and erosion. Freeze-thaw and plucking should have occurred to increase the gradient of the rear of the cirrie.

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding of the contribution of glacial erosion to the formation of the landscape and has relevant connections/relationships between the resource and the question. Level 3, 5 marks.

ResultsPlus
Examiner Tip

The candidate could have improved their answer by developing their explanation of the landscape by examining how other features such as the arete or screes evident in the OS map were formed.

Question 2 (c)

This was a question found accessible by most candidates who were able to demonstrate their knowledge and understanding of why some glacial landscapes have a greater economic value than others. The best candidates noticed that it was a comparative question and so used factors such as accessibility being a key factor that allowed some glacial landscapes to have large numbers of visitors and so have a greater economic value than other landscapes which had the same characteristics but due to their inaccessibility had a lower economic value. Other successful answers focused on the limited economic value of active landscapes compared to the range of economic opportunities that relict glacial landscapes offered.

There are different economic values to glacial landscapes due to different factors, such as if they are relict or active, a lithology, slope, and previous exploitation.

Active glacial landscapes can vary greatly in economic value. The Alps is renowned for skiing and has a strong tourist economy with over 300 ski cabins built onto it, this creates a large income for local people and the ski resorts due to large tourist influxes. Other active glacial landscapes like ~~the arctic~~ Antarctica have economic value as well. Due to how it has not been exploited it ~~has~~ may likely has lots of resources, such as minerals or oil that can be obtained, however the Antarctic Treaty has prevented ~~large~~ countries from exploiting it so it could be argued that the economic value is low due to protection. *

Relict ~~fast~~ glacial landscapes have many economic values as well. For example, in the UK, relict glacial landscapes have very ~~thin~~ tough terrains for crops and so forestry companies use the land to grow fast-growing pine varieties of tree to produce soft timber and other resources such as paper. This creates an area that can be used for ~~both~~ forestry purposes. In other countries, ~~and~~ the area is used for farming for local use, with growth of crops like quinoa, and animals are kept such as goats. Relict glacial landscapes are ideal for animal rearing, as the steep and thin soiled area is not well suited for large scale crops. The thin soils are ~~illegal~~ economically beneficial for quarrying however.

Glaciers ~~extend~~ reveal rock and minerals that are easy to access and provide value for quarrying. However, ~~many~~ relict glacial landscapes are also useful for tourists, as well as active landscapes, for activities such as climbing and walking. ~~tourism~~ Active glacial landscapes do attract a larger tourist market however and so have a greater economic value.

* Norway also uses its active glacial landscapes to use the meltwater to for hydroelectric power stations, to generate electricity for the area, this provides a greater economic value than relict areas.

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding of why some glacial landscapes have greater economic value than others. It has a broad range of geographical ideas, which are detailed and fully developed. Level 3, 8 marks.

ResultsPlus
Examiner Tip

The response explained economic value of active landscapes such as the Alps but then contrasted this with those which have protection such as the Antarctic. The response explained the economic value of relict landscapes such as the UK as well as those which can then be used for mining and quarrying. This is a good example to show candidates that in such questions, to ensure top marks, they must have a wide range of supported reasons.

Question 2 (d)

This question was answered well by the majority of the candidates and it was pleasing to see that as in 2023 many opposed the view. The best answers started by outlining what they meant by 'fragile' and then then evaluated their case study material to support (or to oppose) their view. Centres are to be congratulated on ensuring their candidates understand that by reading the question carefully they are able to open up the question by focusing in one key word, in this case **always**. The best answers focused on why their chosen landscape was more fragile (and candidates successfully argued either way) and then examined whether this was **always** the case.

(20)

Both active and relict glaciated landscapes are dynamic areas. Both have ~~unique~~ endemic species and large tourist appeal. ~~Alongside~~ Alongside tourism, they are also facilitate access for scientific research, as such they are very valuable and quite fragile.

This appeal for tourism is felt in both landscapes. In active glaciated landscapes, areas like the Matterhorn ski resort are a popular holiday destination. Despite the Matterhorn winning the European Solar prize for sustainability, the ~~[illegible]~~ ski resort does put a huge amount of pressure on the resources, through ~~[illegible]~~ water use and also disposal of waste. This pressure on active glaciated landscapes has the ability to destroy the fragile active environment, however, tourism also affects relict glaciated landscapes. ~~Relict~~ Relict glaciated landscapes are also vulnerable to tourism. ~~[illegible]~~ ~~by~~ tourists ~~and~~ littering are all likely to damage the relict landscape ~~[illegible]~~ as it is fragile. ~~However active landscapes have to worry about the same threats as relict landscapes, with the addition of~~ These landscapes are very similar in fragility when surveying the effects from tourism, ~~but active glaciated landscapes~~

Climate change is a much larger threat to active landscapes. With the loss of albedo and a positive feedback loop, it is no surprise that 95% of glaciers are in retreat. This retreat of glaciers has not only disrupted the fragile balance using the loss of ice, it has also caused the amount of natural disasters, such as avalanches have devastating effects on the natural plant species and topography. On the other hand climate change is not a cause as of now to relict landscapes. In the future they could face issues if the temperature increase increases too much. An example could be the loss of endemic tree species in Yellowstone park. This three paragraph supports the view that active glaciated landscapes are more fragile, due to their much larger vulnerability

Next paragraph on next page please put in this gap

On the other hand, relict glaciated landscapes are a much more diverse ecosystem. The harsh abiotic factors of the active glaciated landscapes makes it difficult for many species to survive - this is why areas like the antarctic ice are known as the deserts of. As relict glaciated landscapes have a much higher level of species diversity, it means the area is more vulnerable

to changes. For example, economic development of one small area of relict glaciated land, is likely to destroy a creatures habitat, compared to active, where it is less likely. Affecting this species habitat could have severe knock on effects in the food chain, possibly causing extinction of a species, or certainly reduction in numbers. This higher presence of species in relict glaciated landscapes ~~has meant a~~ means it is much more fragile than glaciated which has many less species.

In conclusion, I agree with the statement to a large extent. Whilst both landscapes are very dynamic and require specific conditions in order to keep the conditions favourable, active glaciated landscapes have the ability to feel effects more. The reason active glaciated landscapes are more fragile is because of the effect from temperature. Even in France, you can see yellow layers in glaciers, from where pollution from the industrial revolution impacted the area. Temperature is a far reaching impact, impacting glacier landscapes by reducing the albedo effect. Whilst relict landscapes are more fragile in terms of species abundance & diversity, frameworks like UNESCO's world heritage designations protect this

disruption of species, but not temperature effect.
~~leading to the~~

* from previous page ↓

Climate change does not just have the primary effect of positive feedback and the reduced albedo effect, it also has knock on effects. Changes to thermohaline circulation also effect the active glaciated landscapes. With the arctic ocean predicted by IPCC to be ice free by 2037 (medium confidence) it is clear that ~~the~~ thermohaline circulation has a large effect. Its ability to raise local temperatures threatens active glaciated landscapes a lot more than relict, whose species diversity and conditions enable it to react a lot more positively to these changes, making it less fragile.

(Total for Question 2 = 40 marks)

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding of the extent to which active glacial landscapes are always more fragile than relict landscapes. 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.

ResultsPlus
Examiner Tip

This was a cogent answer that sought to explore the reasons why active glacial landscapes are always more fragile than relict landscapes. The response considers both sides of the argument and then has a thoughtful conclusion where they justify their position. This is good practice as sometimes a good answer is spoiled by a rushed and inconsequential conclusion. However, the response could have been improved by having stronger AO1 knowledge to develop their arguments.

Question 3 (a)

As with question 2a some candidates found this question challenging as they were insecure in the knowledge of emergent coastline. Centres are reminded that good practice is to create a glossary of the key terms in the specification and ensure that their candidates regularly review these terms and definitions. As a result some candidates either tried to explain the features in terms of tidal changes or ignored the term 'emergent coastline' completely and instead explained how caves are formed. These answers unfortunately were rarely given any credit.

The best answers correctly identified the features of raised beaches and fossil cliffs/caves but also examined the word ‘contribute’ and explained how these features were the result of both sea level change as well as historic marine processes of both erosion and deposition. Others identified that there might be contemporary subaerial processes occurring of the fossil cliff faces.

(6)

Post glacial isostatic adjustment can cause land to rise in previously glaciated areas causing marine regression and thus sea level to drop. This can result in the formation of raised beaches as the previous sea floor is uncovered.

Marine regression can also form features such as relic cliffs as cliffs previously on the coast are further from the sea due to sea level decline. This decline can also be caused by eustatic sea level drop during the ice ages when more water is stored in glaciers. during the last glacial maximum glaciers covered 30% of the earths surface meaning sea level was low.

Sea level change can also be caused by tectonic processes, when fault lines slip the sea floor can be forced down causing the sea to retreat.

Emergent coastlines can be found in Northern Scotland - principally due to isostatic adjustment.

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding of the contribution of sea level change to the formation of the emergent coastline. 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.

ResultsPlus
Examiner Tip

This response correctly identified the processes of isostatic adjustment as well as possible eustatic and tectonic processes being responsible for the sea level change. This showed high level thinking as there was not a date for the resource and so it could have been during an ice age as the candidate suggested. The answer could have been improved if they then developed their ideas on how both historic and contemporary processes have shaped this coastline.

Question 3 (b)

As with question 2b this question was found to be accessible by the majority of candidates who were successfully able to explain how sediment transport and deposition contributed to the formation of this landscape. As noted in last year's report, candidates must explain the processes of sediment transport such as traction or saltation or deposition such as gravity settling or flocculation and not just list them. The best answers realised that there were more features than just a spit and were able to successfully explain how vegetation succession both stabilised the spit or helped to create the salt marshes.

The landscape shown in figure 3b is a recurved spit with a salt marsh behind it. The recurved spit has been created via a process called longshore drift. The constructives waves attack the beach at a 45° angle, usually dictated by the prevailing wind. Sediment is deposited on the beach and due to the 45° angle of the waves, the beach extends past the headland, forming a spit. Over time, the spit grows longer until the waves run out of energy and refract around the end of the spit, creating a recurved spit. The spit then acts as a natural barrier against incoming waves, creating calmer waters behind. This promotes the growth of vegetation, and in this case, a salt marsh. There is also a river that flows from North to South and feeds into the marshland. This provides a constant source of fresh minerals and sediment that the marshland uses to grow.

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding of how sediment transport and deposition contribute to the formation of the landscape. Applies knowledge and understanding to geographical information logically to find fully relevant connections/relationships between the resource and the question. Level 3, 6 marks.

ResultsPlus
Examiner Tip

This answer starts with sound explanation of the formation of the spit as well as how wave refraction causes the spit to become recurved. The response then examines the role of the spit in creating the conditions needed for a salt marsh to develop. The answer could have been improved if there had been greater use of technical language such as gravity stelling or flocculation – both key depositional processes that create these coastlines.

Question 3 (c)

Some candidates found this question challenging as they did not understand what the term 'mass movement' meant. This was also part of a recurring theme in this paper where it was clear that some candidates were not secure in the terminology contained in the specification. Centres are reminded that good practice is to create a glossary of the key terms in the specification and ensure that their candidates regularly review these terms and definitions. As with the 3c question in 2023, mass movement is detailed in various parts of the specification but specifically in 2.6B.

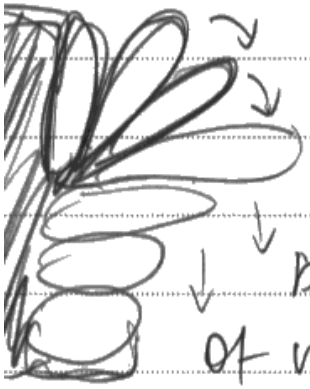
Unfortunately some candidates confused mass movement with longshore drift. These answers rarely scored well.

The best answers explained how mass movement played a part (ie **role**) in the creation of rotational scars, talus scree slopes, terraced cliff profiles as well as its role in the creation of stacks.

mass movement such as ~~slumping~~ rotational slumping, is caused due to saturated sediment and cliffs with water. these are pulled down by gravity due to their weight. this can ~~cause~~ create rotational scars or terraced cliff faces which are distinctive landscapes. Weathering works to weaken cliffs, and often results in mass movement of cliffs to create terraced cliff faces.

Sliding can also occur due to the positioning of the lithology of rocks and sediment layers.

if there are weakness and faults in between rock layer, these can be exploited by processes such as weathering which lead to rock falls, which cause talus scree at the bottom of cliffs.



vertical bedding planes will also lead to rockfalls, which create natural rock raft at the bottom of cliffs, or the large pieces of rock sediment.

This process is driven by gravity, and aided by weathering (e.g. mechanical - freeze thaw weathering) which creates scree ~~dust~~ (smaller sediment sizes) and deposits built along a landscape to make it distinctive.

ResultsPlus
Examiner Comments

This demonstrates mostly accurate and relevant geographical knowledge and understanding of the role of mass movement in creating distinctive coastal landforms. Understanding addresses a broad range of geographical ideas, which are detailed and fully developed. Level 3, 7 marks.

ResultsPlus
Examiner Tip

The response accurately explains how rotational slumping, sliding and rockfalls create distinctive landforms such as terraced cliff profiles as well as talus scree slopes. The response was aided by some useful diagrams. The answer could have been improved if the candidate had used some named examples to support their explanations and considered the role of other factors such as lithology or geological structure.

Question 3 (d)

In contrast to the previous questions the majority of candidates were able to produce sound coherent answers to this question. The question allowed candidates to either argue that the view was correct as the loss of costly infrastructure in countries with a high level of economic development was greater than those with a lower level of economic development. Equally candidates also argued that countries which have a high level of economic defences also have the ability to build defences and so have fewer consequences. The best candidates looked carefully at the key word 'consequences' and contrasted both the social and economic consequences that countries of levels of economic development faced as well as absolute and relative costs. Unfortunately some candidates examined the effects of coastal recession and although there are some coastal flooding issues along the Holderness coast many of the areas selected such as Mappleton were not thought to be an appropriate example for this particular essay question.

P1: agree hurricane katrina - cost $125 bn, 1800 deaths P2: disagree kiribati - LIC may lose homes P3: partly London 3m underground Thames barrier P4: Bangladesh developing 46% pop below (20)

Higher levels of economic development can lead to greater consequences of coastal flooding as a place may have more expensive infrastructure to lose. However high levels of economic development can also mean a country is able to protect themselves against coastal flooding which a developing country may not be able to do.

Higher levels of economic development can lead to higher costs of short term coastal flooding due to the high cost to rebuild. Hurrican Katrina hit the US (a highly developed country) bringing a 10m high storm surge which flooded 80% of New Orleans for weeks. This resulted in 1800 death and cost $125 bn to rebuild, in comparison cyclone sidir hit Bangladesh with a 9m storm surge but only cost $1$38 bn. This shows economic development can lead to greater economic losses. However social losses can be reduced more effectively in developed countries, New orleans did have some defences reducing the power of the wave and were able to evacuated leading to 1800 deaths. Where as Bangladesh was less prepared, over 5000 died as a result of the storm surge. This suggests higher levels of economic development do not always make consquence of coastal

flooding greater.

lower levels of economic development can often increase the risks of long term coastal flooding. Kiribati is made up of 33 low lying islands, it is a developing nation that is severely threatened by rising sea levels. The islands are no more than 4m above sea level meaning climate change threatens that the whole country could be submerged. Low economic development mean locals have to build coastal defences themselves out of sand bags, these can be ineffective and residents are having to move their homes back every 3-5 years. 90 climate refugees are being sent to New zeland every year due to Kiribatis lack of ability to defend its self to coastal flooding. This shows that lower levels of economic development can cause greater consequences of coastal flooding.

Higher levels of economic development can cause greater risks of coastal flooding but can also help to manage and reduce consequences of coastal flooding. 3million people work and live underneg below sea level in London, meaning they are all vunerable to storm surges brought by the Thames river. However, the UKs high level of development meant the Thames barrier could be built to protect them, the Thames barrier can close in the event of a storm protecting london also controlling river flow.

This mechanism was used in 2013 when a storm surge hit London due to a series of low pressure systems hitting the east coast of England. The thames barrier was effective leading to minimal damage. However, the threat of rising sea levels caused by climate change means defense like the Thames Barrier will need to be continually updated to keep protecting areas vunerable from coastal flooding.

Arguably developing countries are at the greatest risk from coastal flooding caused by rising sea levels due to their inability to protect themselves as defences like the thames barrier are too expensive. Bangladesh is a low lying developing country at great risk from coastal flooding. 46% of Bangladeshes population live less than 10m to above sea level meaning they are all at risk. If sea levels rise many of the coastal flood plains used for farming could be degraded by salt water encroachement. This could result in Bangladesh 40 million farmers losing their livelyhoods. This shows developing countries are at great risk of coastal flooding.

In conclusion, countrys with a higher level of economic development are at risk of coastal flooding but can minimse consequences with innovative defences like the Thames barrier. However less economically developed countries are at greater risk as they are unable to minimise consequences effectively.

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding of the extent to which the higher the level of economic development the greater the consequences of coastal 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.

ResultsPlus
Examiner Tip

The response starts by examining the impacts of Hurricane Katrina and then contrasts these short term impacts with the longer term impacts faced by Kiribati. The response then examines the use of management such as the development of the Thames barrier and is contrasted with that in Bangladesh. Although there is a conclusion this could have been developed by perhaps examining the difference between absolute and relative costs as well as short and long-term impacts.

Question 4 (a)

This question was answered well by most of the candidates. Although the resources were from the Met Office, the question did not specify a geographical region and so responses that detailed the impact of drought on tropical rainforest ecosystems were acceptable. The best answers explained that a reduction in rainfall would reduce net primary productivity and so reduce biodiversity.

4 Study Figure 4 in the Resource Booklet.

(a) Suggest **one** possible impact of the changes shown on forest ecosystems.

(3)

there is a predicted fall in the summer precipitation from 0% in 2030 to -35% in 2100. This might lead to the loss of forest ecosystems as plants and trees do not have the water necessary for photosynthesis and so to survive in the summer months.

ResultsPlus
Examiner Comments

The candidate receives one mark for noting that the predicted drop in precipitation and then two marks for the development that there would be a loss of forest ecosystems due to the lack of water for photosynthesis.

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)

Some candidates found this question challenging. A minority wrote about the impact of coastal hard engineering strategies and so therefore rarely achieved any marks. The best answers detailed the issues with channelisation and river straightening whilst others noting the word **some** in the question explained how the building of dams may reduce the flood risk downstream but increase the risk upstream.

(b) Explain why hard engineering may increase the risk of river flooding in some places.

(6)

Channelisation leads to man made channels being built in urban areas where river channels are straightened by using concrete blocks to make straight unnatural river systems - a form of hard engineering. This decreases the chance of flooding in that area, but this causes changes to the natural harmony of the river - leading to ~~counter~~ flooding elsewhere - further down the river course - as more water leads to higher peak discharge so exceeds the bankfull discharge ~~for~~ for larger ~~discharge~~. This has been seen in areas ~~as~~ such as Upton-upon-Severn.

Furthermore hard engineering such as ~~Mega Dams~~ mega dams can increase flooding. This can be seen in the creation of the Aswan Dam in Egypt. Due to the hard engineering preventing river flow and holding it back - this leads to river ~~discharge slowly down~~ ~~significantly~~ water surplus leading to river flooding of vast areas. This can be seen by the displacement of the Nubian people within Egypt due to the river flooding in the place.

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding why hard engineering may increase the risk of river flooding in some areas. The candidate's understanding addresses a broad range of geographical ideas which are detailed and fully developed. L3, 5

ResultsPlus
Examiner Tip

This response clearly explained how both channelisation and the building of dams can increase flood risk in other areas. It was pleasing to see named examples such as the Aswan Dam and the Nubian people.

The answer could have been improved if the exact locations of the increasing flood risk were identified.

Question 4 (c)

As with question 4a this was answered well by the majority of candidates. It was pleasing to see that what had appeared to be a challenging question when a similar question was set in 2018 was found to be accessible for most students in 2024 and is testament to the teaching of this 'new' topic in the last 6 years. The best answers explained the variety of the pumps in the ocean as well as making some comparison with the size of stores/fluxes with other parts of the carbon cycle.

(c) Explain the role of photosynthesis in the ocean on the carbon cycle.

(8)

Photosynthesis plays a key role in the Biological ocean pump. The ocean pumps also play a key role in the carbon cycle as they sequester carbon from the atmosphere (the smallest store of carbon) and they then store the carbon in the oceans (the 2nd largest store of carbon.

The Biological pump is the sequestration of carbon via plants and animals. The first stage of the biological pump begins with plankton and algae. Both of these organisms photosynthesis and in order to do this they live at the surface of the ocean and absorb CO_2 from the atmosphere. As they are primary producers they are then eaten by larger marine life. This transfers the carbon along the food chain. Some of this is released via respiration into the

ocean and stored in the ocean. Most the carbon stays within the animal. Creatures with shells use the carbon to create their shells. When these animals die their shell remains. Carbon is then stored as a shell. When other animals die their bodies sink to the ocean floor and over millions of years are compressed by the weight of the sea and sediment, eventually turned into rocks like limestone. The carbon is now returned to the lithosphere

ResultsPlus Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding of the role of photosynthesis in the ocean on the carbon cycle. The response addresses a broad range of geographical ideas, which are detailed and fully developed. Level 3, 8 marks.

ResultsPlus Examiner Tip

The response correctly explains the biological pump and uses good technical language in doing so. The solubility pump is briefly explained and then the long term or slow carbon cycle is explained. Candidates are reminded that in such questions the use of terminology such as sequestration and primary producers aids the explanation of such scientific processes.

Question 4 (d)

This question was also answered well by the majority of the candidates. Although it is mainly changes in sea surface temperatures that are the main cause of coral bleaching, authors such as Anthony *et. al.* (2008) have also linked acidification to coral bleaching and so in terms of this question was acceptable. The best answers went beyond coral bleaching and assessed the impact on calcification and the subsequent impact on marine food chains. This was then related to the impact on those communities who are dependent on marine resources, in particular countries with a lower level of economic development.

Ocean acidification is happening due to the enhanced greenhouse effect. More carbon is released into the atmosphere creating positive feedback which ~~is then~~ disrupts the natural dynamic equilibrium. ocean acts as a carbon sink therefore ocean acidification can reduce this rate ~~affecting~~ creating positive feedback into the atmosphere affecting people and marine.

~~The impact of~~

ocean acidification has direct impacts on flora and fauna marine ecosystems and organisms and has indirect impact on food and income. Increasing the temperatures in the world means that oceans ~~take~~ absorb this influx leading to increased sea temperatures and increased levels of carbon this reduces the level of pH. Coral reefs are unable to grow if pH is lower than 7.8. The lack of growth of coral reefs means that ecosystems die out reducing biodiversity and diverse food webs. The lack of coral reefs also impact humans as many narrow developing countries depend on them for their income as tourism. ~~Not~~ for The Maldives over ~~200~~ 220000 of the population are dependent on the annual influx of 1 million the coral atolls provide. This leads to unemployment meaning people can't afford the basics to have a good quality of life especially in developing countries as there's no alternative employments.

ocean acidification leads to the death of marine organisms such as fish. This reduces biodiversity and leads to losses in the food web disrupted natural systems. The loss of fish due to ocean acidification is disrupting humans as 6% of the worlds GDP is fish. Jobs such as fishing are reliant on the predictable growth of fish which ocean acidification reduces. Also, in these developing countries the loss of fish means peoples diets are affected, fish provide over 3billion in the world their protein. Therefore without the constant supply of fish qualities of life reduce.

one could argue that the threat to forest health due to deforestation such as the deforestation of the Amazon has a greater impact on people and the marine environment. Deforestation leads to ~~desert~~ desiccation or an area as ~~therefore~~ there is less moisture due to less evaporation and transpiration from trees. This results in increased wildfires destroying ecosystems and carbon sinks. The New York Declaration 2014 found that over 13million acres of forests are removed annually. This ~~redu~~ releases carbon ~~into~~ in the atmosphere leading to increased melting of permafrost leading to higher sea levels destroying natural ecosystems and a loss of livelihood for people. ~~People are dependent~~ over 1.6billion people are dependent on forests as they provide food, income, regulate the atmosphere and have cultural importance. This shows deforestation leads to great impact to people and the environment.

Overall, increasing ocean acidification impact the ecosystems within the ocean both flora and fauna resulting in detrimental impacts to humans as they lose their source of food and income

ResultsPlus
Examiner Comments

This demonstrates accurate and relevant geographical knowledge and understanding throughout to assess the impact of increasing ocean acidification on people and marine ecosystems . 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, 9 marks.

ResultsPlus
Examiner Tip

It is pleasing to see that this candidate recognises the complex role of the ocean in the carbon cycle. The response initially concentrates on the impact of coral reefs and then argues that they consider that the decline in forest health plays a more significant role in causing issues for people and marine ecosystems. The response could have been improved with more AO1 understanding of the impact of ocean acidification alongside perhaps a greater assessment of the impacts.

Question 4 (e)

This question was answered well by the majority of candidates who were able to successfully link transboundary water conflicts such as those on the river Nile and Mekong with understanding of future water stress caused either by climate change or increased demand for both agriculture and industry. The key to obtaining a high mark, however, was the recognition of the key word 'inevitably' which allowed candidates the opportunity to argue that if treaties were in place these water conflicts could be managed.

This demonstrates accurate and relevant geographical knowledge and understanding of the view that transboundary water conflicts will inevitably increase in the future. 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.

(e) Evaluate the view that trans-boundary water conflicts will inevitably increase in the future.

(20)

Trans boundary water sources are water sources accessible or that flows through multiple areas, interally or internationally. These can cause conflicts over water usage as demand grows, conflicts will.

International trans-boundary water conflicts will inevitably increase as growing populations require more water. As population increases, more people are going to require access to water, increasing stress. This means that as countries grow they may come into conflict with other countries over trans-boundary water sources. This is also paired with rising affluence where middle class growth leads to more consumption to use dishwashers and washing machines, leading to conflict as growing countries such as India and China require water. ~~this~~ The Mekong river travels through many countries in Asia, beginning in the Himalayas and so China requires access as their water stress grows following booms in population. China built dams upstream to divert water to the country putting more stress on locations ~~more stress on~~ like Laos and Cambodia who need the water for fishing and irrigation for rice fields. This inevitably causes conflict as when these countries see rapid growth in population and affluence, they will require more water and oppose China's actions. In addition China's dams led to further conflict as it led to flooding of northern, poor Indian villages, further growing tension. Despite this policies have been put in place in

attempt to reduce conflict. Countries at the Mekongs mouth, including Thailand, Laos and Cambodia have cooperated to establish agreed access to the water source that may lead to some future stability. However due to the rising water stress in china and future water scarcity that may reach South East Asia, water conflicts over the control of the Mekong river will inevitably increase.

National trans-boundary water conflicts will inevitably increase as different areas need water for their own people. Internally, local governments will have large conflict over access to water as each one will feel they have more needs than others. This will lead to illegal usage and growing tensions. This means that as water stress grows due to climate change, wider farmland and livelihoods may be damaged by rising temperatures, conflicts over abstraction will grow. The Colorado river in the USA and a small part of Mexico flows through many many arid areas in South West USA. This means that many different players will want water and ultimately lead to increasing conflicts. California is the largest of these states with the highest population and so requires the most access to its water. Despite being granted 25% of flows, California exceeded its 5.4 km³ usage, going 1 km³ above, increasing tensions leading to the US government forcing the state to reduce its usage to legal limits. This not only emphasises current tensions but due to the arid climate in and around the Mojave desert, as water scarcity in the area worsens, conflicts will too. In contrast some efforts by the Nevada government has had some growth in demand tensions as water saving schemes provide

financial benefits as less water is used in households. However ultimately conflicts will increase internally as different states want more water and the river has international impacts following the flooding of Mexico as dams are built in the USA.

Finally national trans-boundary conflicts may not necessarily increase as governments create solutions. Internal transboundary conflicts are much easier to solve as its one large government body that has final say, leading to less conflicting compassion and more action. This means these areas can work together much easier allowing for future problems to be solved. In Australia, the Murray-Darling basin provides large water dependence for many players, causing conflict over high upstream usage. But the government was forced to get involved as farmers upstream required large usage for irrigation for crops. This posed a large problems because towns and farmers downstream faced threat of water scarcity and dams built to store more water had little impacts. However, the governments ability to have control over all parties ensured that some of the problems were solved as farmers upstream were forced to reduce usage to keep water for everyone downstream. In addition 24/7 warnings at the river mouth prevented the river flows to ensure that the conflict could be solved. This shows how if a transboundary water conflict is internal, the inevitability of increasing conflict is obstructed as higher structure can lead to more laws for all parties whilst maintaining adequate supply, reducing risk of increasing tension.

Overall, it is not inevitable for transboundary conflicts to increase as internally, problems can be solved more efficiently than international impacts ~~as a result of campaigns makes solving the issues much more difficult as compared with those not [illegible]. However evidence for success explains how despite the difficult solutions, the conflicts aren't inevitable.~~ and result in conflicts not being inevitable as the central government can make key decisions to solve the conflicts whilst despite likelihood of international conflict over water not being fully solved, the set up of inter-governmental organisations, such as the Mekong and Murray-Darling river basins, more communication can solve problems.

(Total for Question 4 = 40 marks)

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Examiner Comments

Through the development of the conflicts in the Mekong river as well in the Colorado Drainage basin the candidate suggests that conflicts are inevitable and then uses SE Australia to argue that with management these can be reduced. Although there is a conclusion which argues that conflicts are not inevitable this conclusion was not to the fore throughout the essay. Candidates are encouraged to plan carefully their answers and so argue one side or the other consistently throughout the response.

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 'lodgement' and 'mass movement'.

· Use the resources that are given to you to substantiate the points that you are making. In particular, study carefully any map evidence given to you to support your explanations.

· Questions such as 4b which examine perhaps some of the less accessible material will feature more often as the examination series becomes more mature coupled with the need to examine all aspects of the specification.

· 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 (ie is rational) and has a key piece of information supporting your conclusion (ie is substantiated) and is substantiated in the essay.

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