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Examiners' report

GEOGRAPHY

H481

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Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Paper 3 series overview

This year's paper generated student responses to all questions with the usual frequency distribution of answers among the five Options. Hazardous Earth was the most answered Option followed closely by Disease Dilemmas and then Climate Change. Exploring Oceans and Future of Food received a smaller number of responses.

Across all the Options, there was a range in the quality of answers from the simply outstanding through to those that reflected a lack of preparation. Among the more successful candidates those whose real world exemplification was drawn not solely from the textbook. These were students who had extended their knowledge and understanding through researching other sources such as academic publications, magazines/journals and other textbooks as well as various reliable and authoritative on-line sources and media such as newspapers.

Although there was very little evidence of candidates running out of time, some scripts contained one very long essay in Section C which tended to leave the second essay reduced in effectiveness. Due to its brevity.

A finding that has increased in frequency this year was of a candidate who answered in Section A sub-part (a) from one Option and sub-part (b) from another Option. Candidates should be reminded that this is not allowed by the rubric and thus they find themselves penalised.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• wrote fluently displaying a strong command of spelling, punctuation and grammar • displayed substantial knowledge of an option's content • displayed authoritative understanding of an option's content • wrote with a sharp focus on the actual question set • knew case studies in detail and were able to selectively draw on that material • drew on material from beyond the endorsed textbook	• wrote less successfully in terms of use of paragraphs, sentence structure and vocabulary • were insecure in terms of their knowledge of an option's content often omitting key aspects • lacked conviction in their understanding of an option's content such as with regard to processes and or patterns • tended to write responses that did not focus on the question set but rather offered pre-learned material • knew case studies but tended to offer their material in full rather than select those elements that were especially relevant to the question

Two practical issues need to be noted as they made assessing student responses un-necessarily complicated. When extra booklets are used, too many candidates did not label which question they were answering. Examiners reported finding difficulties in knowing which question was being answered.

The second issue concerns that of the legibility of handwriting. Once again, examiners were faced with scripts containing words, phrases, paragraphs and in some cases whole pages of illegible material. Therefore, It was, not possible to follow a line of argument or know what a supporting example was. As a consequence, candidates are not communicating clearly and therefore placing themselves at a considerable disadvantage.

Section A overview

The two sub-parts of each Option in this Section test different Assessment Objectives (AO). Sub-part (a) tests AO3, geographical skills, whereas sub-part (b) tests AO1, knowledge and understanding. Answering sub-part (a) is best achieved through using three concise statements that focus on three separate limitations of the resource as a source of information concerning the particular focus in the question. Lengthy responses rarely target the limitations clearly, as well as consuming time that would be more successfully deployed in other parts of the paper.

The command word used in sub-part (b) is **Explain**. Candidates need to focus sharply on the knowledge and understanding of the topic and not drift into extended descriptions.

Question 1 (a)

Topic 3.1 – Climate Change

1 (a) Identify **three** limitations of **Fig. 1** as a source of information about the global energy balance. **[3]**

The resource was a short section of text focused on the global energy balance. Candidates tended to pick up on the need to verify the nature of the '…30 researchers…' and that the time between 1971 and 2018 was not that long when looking at global scale matters such as the earth's energy balance. More successful candidates identified the need for precision as to what is meant by terms such as '…before the industrial revolution…' or '…excess heat…'.

Question 1 (b)

(b) Explain how increasing atmospheric water vapour influences the climate system. **[6]**

The vast majority of responses recognised water vapour as a potent greenhouse gas that trapped heat in the atmosphere. An indication of strong knowledge and understanding was when a candidate knew that incoming short wave radiation cut through the atmosphere quite readily but that on absorption at the surface and re-emission, the radiation was then in long-wave form, which water vapour was able to trap. Effective responses made the link between water vapour acting as a greenhouse gas and changes in the climate system such as increased evaporation from the oceans leading to more water vapour in the atmosphere, that in turn increased absorption of long-wave radiation leading to more energy powering evaporation and so on. Examiners read many responses making authoritative use of positive and negative feedback in their answers. The latter arose when candidates linked increased quantities of water vapour to greater cloud cover. Clouds can reflect incoming radiation back out to space, decreasing warming.

Question 2 (a)

Topic 3.2 – Disease Dilemmas

2 (a) Identify **three** limitations of **Fig. 2** as a source of information about the percentage of deaths caused by air pollution in South and East Asia, 2017. **[3]**

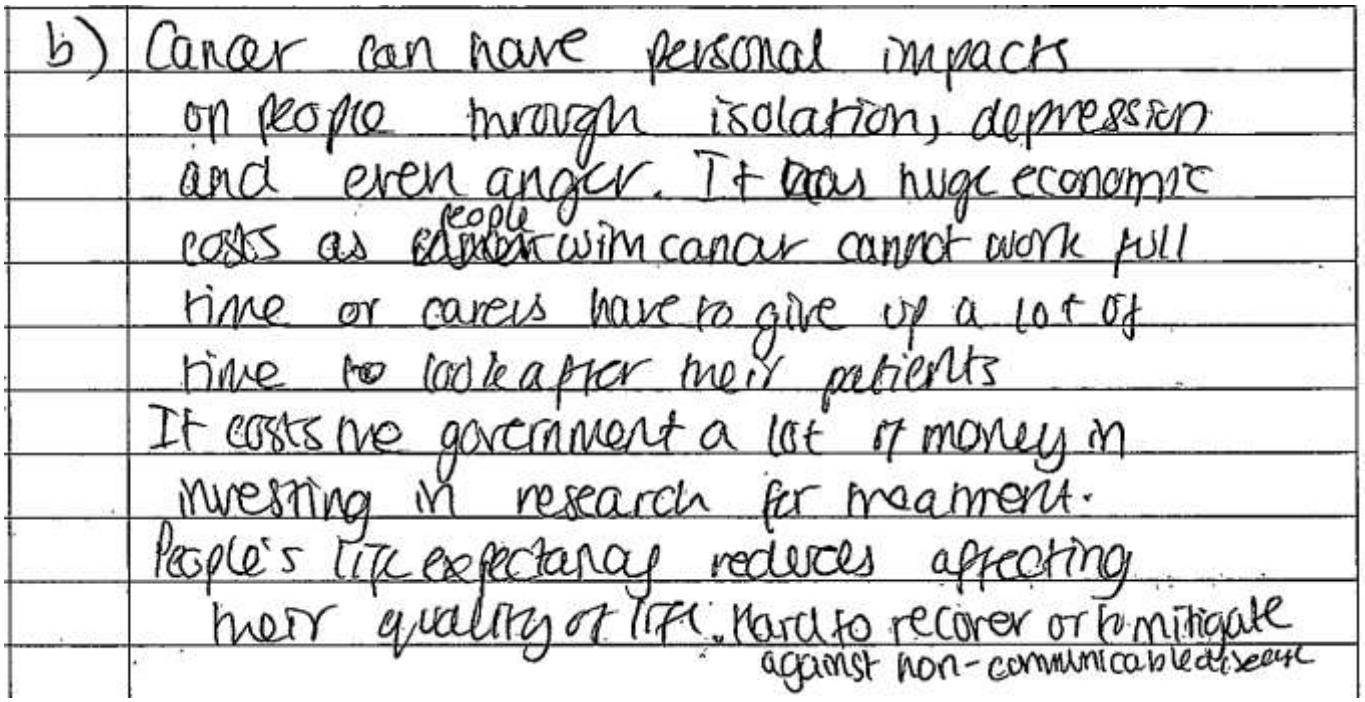
A choropleth map in grey scale was the resource in this question. Most candidates identified limitations such as the adoption of an average to represent a whole country, thereby ignoring contrasts between regions or urban/rural contexts or that within the same category different countries could experience very different absolute numbers of deaths from air pollution. Another often quoted limitation was the need to know how the individual countries defined a death as '…caused by air pollution…'.

Question 2 (b)

(b) Explain the socio-economic impacts of a non-communicable disease. **[6]**

It was important for a candidate to read this question carefully as the focus was on socio-economic *'impacts'* not *'causes'* of non-communicable disease. However, the vast majority did. There were many responses that highlighted not only the economic but also the social impacts of non-communicable disease such as cancers or cardio-vascular disease. Candidates referred to the impacts on individuals and families as well as on a country, with this contrast in scale of impacts a successful element in many answers.

Exemplar 1


b) Cancer can have personal impacts on people through isolation, depression and even anger. It has huge economic costs as people with cancer cannot work full time or carers have to give up a lot of time to look after their patients
It costs the government a lot of money in investing in research for treament.
People's life expectancy reduces affecting their quality of life. Hard to recover or to mitigate against non-communicable disease

The candidate has identified some appropriate social and economic impacts both for individuals and for the country. This represents 'reasonable' knowledge and understanding, Level 2. To achieve Level 3 a 'thorough' response would offer some figures of numbers of people and or costs. Phrases such as '…a lot of money…' are vague and unconvincing. Additionally, some candidates were offering comments about spatial impacts such as regional inequalities in the impacts of certain diseases.

Question 3 (a)

Topic 3.3 – Exploring Oceans

3 (a) Identify **three** limitations of **Fig. 3** as a source of information about the relief of the Indian Ocean Basin. **[3]**

Candidates were to review a map of the relief of the sea floor of the Indian Ocean. Most picked up on the absence of a scale for either vertical or horizontal aspects of the region. The lack of clarity on the key to allow them to distinguish between the features was also frequently mentioned.

Question 3 (b)

(b) Explain the pattern of circulation in the North Atlantic Ocean. **[6]**

This question tended to be either very well answered or not at all. The successful responses knew the pattern of flows around the North Atlantic including the names of flows (Gulf Stream, Labrador Current, North Atlantic Equatorial Current), knew the variations in salinity, temperature and density and could relate these to surface or deep flows of water. Technical terms such as 'gyre' were appropriately employed to aid explanations.

Question 4 (a)

Topic 3.4 – Future of Food

4 (a) Identify **three** limitations of **Fig. 4** as a source of information about types of soil. **[3]**

A table of data referring to soil types was the resource that was the basis of this question. Candidates were quick to pick up on the vagueness of terms such as Poor or Good to describe drainage. They also saw the single percentage values as limiting, suggesting that a range of values was more realistic in the real world. Many candidates saw the inclusion of only drainage and texture characteristics as another limitation.

Question 4 (b)

(b) Explain why geographical pinchpoints exist in the food supply chain. **[6]**

The identification and explanation of geographical pinch points was answered successfully by a minority of candidates. The more convincing responses made effective use of real world examples such as the blockage of the Suez Canal in 2021 by the Ever Given container vessel, the impacts of Brexit on some trade in produce and the disruption to grain exports from Ukraine following Russia's invasion of Eastern Ukraine. Some responses used the interruption in flights over part of Europe following the eruption of an Icelandic volcano in 2010 as an environmental example. A key point that authoritative answers tended to include was that with increasing globalisation of the food supply chain, the potential for pinch points to exist also increased.

Question 5 (a)

Topic 3.5 – Hazardous Earth

5 (a) Identify **three** limitations of **Fig. 5** as a source of information about the global economic cost of natural disasters. **[3]**

The bar graph generated much critical questioning of the resource. Common among the responses were the limitations concerning the absence of information such as what constituted a natural disaster, what the distribution of costs were among countries at different places along the development continuum (AC, EDC, LIDC) and what the actual cost were. Some candidates also answered with the need to consider the changing total of global GDP across the time scale represented by the graph. Technical limitations such as the relatively large gap between the percentages given on the y-axis and the potential for muddle towards the end of the x-axis were valid.

Question 5 (b)

(b) Explain how fossil record evidence supports the theory of continental drift. **[6]**

It was clear that nearly all candidates were aware of the fossil record evidence. The key determinant of what level a response reached tended to be the knowledge and understanding of the theory that there was once one 'super-continent' which successively broke up over geological time as well as details of the actual fossils found on either side of what are now oceans. Brachiopods in Australia and India and Mesosaurus in Eastern and Southern Africa and Eastern South America were examples often cited. Those offering detailed explanations made the points that these organisms were incapable of swimming across the vastness of the oceans now separating these land masses and so had to have been living in regions that were once joined.

Assessment for learning

Candidates need to recognise the need for them to learn some facts and figures and technical terms which can more successfully support their responses in sub-part (b). All five Options in their sub-part (b) questions have this requirement to reach into Level 3.

Section B overview

This Section is made up of a single question in each of the five Options. The key function of these questions is that they require the candidate to link content from the Option with some element from one of the compulsory topics in the Landscape Systems, Earth's Life Support Systems, Changing Spaces; Making Places or Global Connections.

It can often be the case that linkage is made clear through the inclusion of relevant real world examples.

Assessment for learning

These explicitly synoptic questions require the application of knowledge and understanding from across the specification. It is therefore, very much in a candidate's interest to practice this style of approach as soon as is possible depending on how a centre choses to organise the delivery of their course.

Additionally, in the exam, candidates are well served by spending a couple of minutes planning their responses in Section B. This might help focus their approach so as to directly link the two elements in the question.

Question 6

Topic 3.1 – Climate Change

6 Examine how climate change may influence human activity in **one** landscape system. **[12]**

For the majority of candidates, linking human activity in a landscape system with influences from climate change was done successfully. Many responses were set in the context of coastal landscapes that identified the increasing need to cope with the effects of sea level rise through engineering to 'hold the line' such as walls or groynes to assist in the accumulation of sediment. Mention was frequently made to another approach whereby there is a managed realignment or retreat of the coastline.

Most candidates identified both positive and negative influences of climate change. For example, in a glaciated context, the extra melt of glaciers and snow due to a warming climate was see as offering benefit to HEP schemes or the availability of water for uses such as drinking or agriculture. However, the negative implications were also considered by many, such as the reduction in water for these same human activities. Similar comments were set in the context of Dryland landscapes where either an increase in water might be a consequence in some locations of climate change but in other places, reductions in water were seen as having dramatic and devastating influences such as the need to abandon traditional practices such as nomadic herding or the forced out-migration of environmental refugees.

Question 7

Topic 3.2 – Disease Dilemmas

7 Examine how patterns of disease may be influenced by placemaking. **[12]**

The majority of candidates lacked the knowledge and understanding of 'placemaking', meaning that their responses were less successful than they could have been. Those that were secure in their grasp of the concept offered responses that looked at both the positive and negative influences placemaking might have on disease patterns. Improvements in infrastructure (water supply, sewerage, power) and housing were linked with reductions in disease, especially communicable ones such as cholera or tuberculosis. Negative links were identified in the growth of manufacturing in some EDCs when air quality fell giving rise to increases in lung and cardio-vascular diseases. The examples of Indian and Chinese cities were frequently cited.

Many candidates offered discussions about the contrasts in incidence of malaria in upland and lowland Ethiopia or the outbreaks in cholera following the earthquake in Haiti in 2010. These were less successful as they made little if any references to placemaking.

Knowing specific terms used in the Specification

It is important that candidates are familiar and secure in their knowledge and understanding of the terms used in the Specification, particularly when they occupy a prominent place in a component. In Topic 2.1 Changing Spaces; Making Places the whole of section 5 is focused on *placemaking* with three Key Ideas exploring various aspects of this concept. Placemaking is given an appropriately significant part in the endorsed textbook where it is described, explained and exemplified.

Question 8

Topic 3.3 – Exploring Oceans

8 Examine how alterations to the oceans caused by climate change affect the water cycle. **[12]**

The water cycle was well known by the majority of candidates and generally they used the idea of changes in the flows and stores of water to good effect in the context of climate change. Candidates were secure in their understanding of the transfer of water from the land to the seas via increased melting of land-based ice. There were still some responses claiming that melting sea ice increased the store of water in the seas and oceans. More authoritative answers made the point that as sea ice melts the albedo of the sea surface alters so as to allow increased absorption of solar energy. This in turn causes further temperature rises of the upper layer of the sea leading to more ice melt – a feedback set of processes. There were some responses making very effective use of the links between the oceans and atmospheric elements of the water cycle. As the oceans warm, leading to more evaporation, the water vapour in the atmosphere increases. There is then the potential for high levels of condensation which could lead to increases in precipitation. Less successful responses would have been helped had they used a systems approach to the water cycle and so organised their answer in terms of stores, transfers (flows) and processes.

Question 9

Topic 3.4 – Future of Food

9 Examine how risks to food security may influence patterns of social inequality in places. **[12]**

The concept of food security was well known and understood by the vast majority of candidates. The majority of candidates however, struggled to clearly link risks to food security with patterns of social inequality. They tended to write vague statements about how a decline in food security might exacerbate people's low socio-economic standing. More convincing responses often used real world examples to support their argument, with examples such as the impacts of reductions in food security affecting people during conflict (Ukraine, Syria and Afghanistan) or after a hazard (Nepalese earthquake in 2015). Some of the most successful candidates made the very persuasive comment that the loss of a harvest not only increased risks to food security in the same year but also threatened future years due to the loss of seed or loss of breeding livestock.

It was also encouraging to read of circumstances in some AC countries where food security risks could be significant among some groups living in inner urban areas and how this then made worse social inequalities.

Question 10

Topic 3.5 – Hazardous Earth

10 Examine how the risks from tectonic hazards can alter patterns of **either** international trade **or** global migration. **[12]**

The majority of candidates looked at the relationship between risks from tectonic hazards and global migration, reflecting the balance of choice in Topic 2.2 Global Connections. There were a noticeable minority of responses that included material on both global migration and international trade. This mis-reading of the question was unfortunate, as it nearly always resulted in a limited discussion on both of the alternatives.

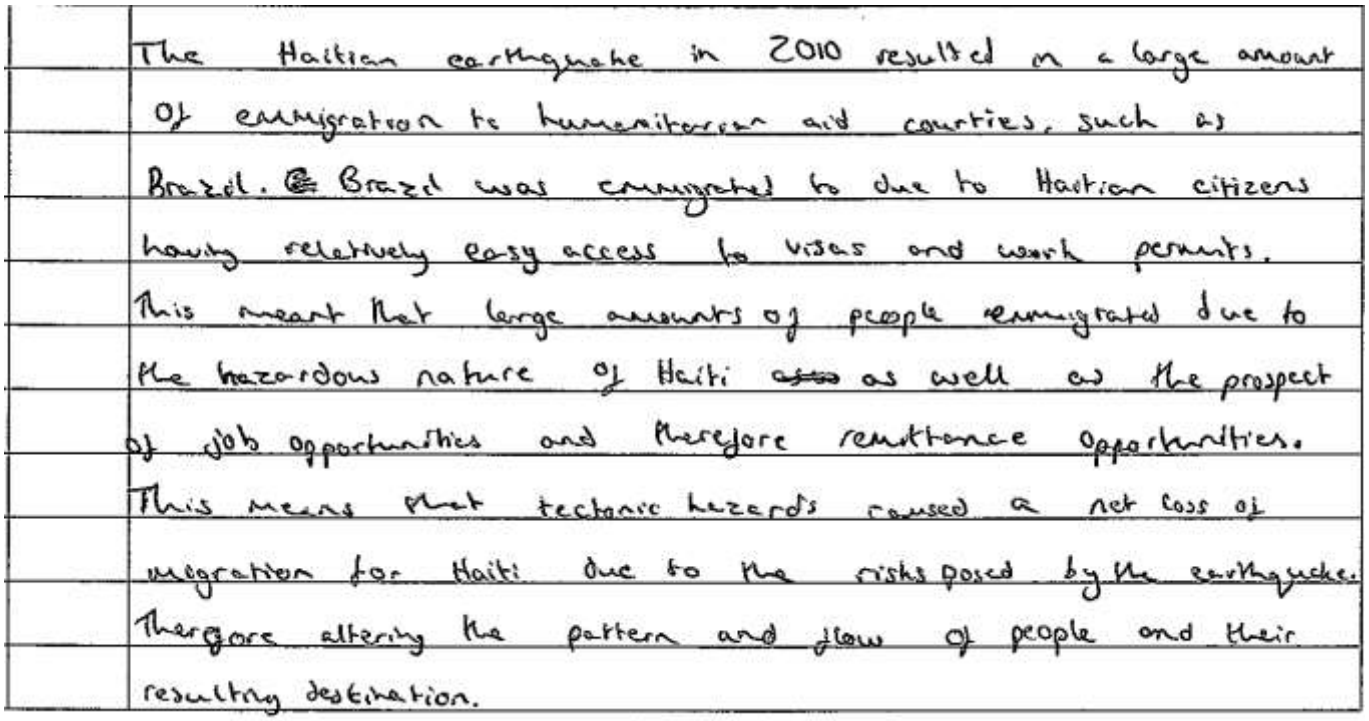
When focussing on global migration, candidates reaching the higher Levels tended to mention both negative and positive aspects of tectonic hazards. Emigration from Haiti to Brazil and the movement of people from the Democratic Republic of Congo to Rwanda following an earthquake and volcanic eruption respectively were frequently cited. Another example that was almost universally discussed with secure authority, was the impact of the inhabitants of Montserrat in the Leeward Islands following the eruptions from the Soufrière Hills since 1995. Some two-thirds of the island's population has left for locations such as the UK and the USA.

Many of the less successful responses were unable to focus on anything but internal displacement of people following a tectonic event. Many responses contained material that was more fiction than fact with claims that substantial out-migration occurred from Japan following the earthquake of March 2011.

Some candidate's answers discussed how, despite risks from tectonic hazards, some locations attracted migrants. In this context, the fertile soils that develop following the weathering of material erupted from volcanoes was quoted. There were also a minority of responses mentioning the continuing attraction of Southern California to migrants despite the presence of numerous relatively active faults marking the boundary between the North American and Pacific plates.

When discussing the alterations to patterns of international trade, responses tended to employ the disruptions to air transport following the eruption of Eyjafjallajökull in 2010 with its impacts on flower, fruit and vegetable trading flows. There were also effective comments about port destruction following seismic events in Haiti and Japan.

Exemplar 2



The Haitian earthquake in 2010 resulted in a large amount of emmigration to humanitarian aid countries, such as Brazil. Brazil was emmigrated to due to Haitian citizens having relatively easy access to visas and work permits. This meant that large amounts of people emmigrated due to the hazardous nature of Haiti as well as the prospect of job opportunities and therefore remittance opportunities. This means that tectonic hazards caused a net loss of migration for Haiti due to the risks posed by the earthquake. Therefore altering the pattern and flow of people and their resulting destination.

The response extract above represents the style of response frequently read by examiners. The candidate has focused on relevant material concerning the links between risks from tectonic hazards – in this response an earthquake – and global migration. The response offers knowledge and understanding of the topic that is 'reasonable' to 'thorough' that with a little more research would rise into top of Level 3/Level 4 'thorough' to 'comprehensive'. For example, the willingness of the Brazilian authorities to facilitate migration by eliminating quotas for migrants, the reduction in processing time and the availability of work. The estimates of numbers of migrants are of some 85,000 arriving in Brazil between 2010 and 2017. An extra point is that this migration was not permanent for everyone due to factors such as persistent racism and growing anti-immigrant sentiment associated with Jair Bolsonaro's political campaigns. Many Haitians moved again, Chile being a popular destination as well as flows making their ways through north-west South America and Central America towards the USA. Thus it can be seen that the impacts of a tectonic hazard can persist for many years.

Section C overview

In this Section each of the five Options consists of two questions, candidates choosing one each from two Options. The mark scheme for each question divides as 9 marks for AO1 (knowledge and understanding) and 24 marks for AO2 (application of knowledge and understanding, analysis and evaluation). While the skills looked for in this section are clearly towards the areas AO2 is focused on, there is still the need for candidates to support and exemplify their arguments with secure knowledge and understanding. That said, the principal issue for the majority of candidates was the generation of a well-argued discussion.

Question 11

Topic 3.1 – Climate Change

11* 'Adaptation is the most effective way humans can respond to climate change.' Discuss. **[33]**

Responses to climate change are often characterised as either adaptation or mitigation. The majority of candidates were secure in their understanding of these two terms although there were a significant minority who were not. Essays tended to be structured around examples of either strategy which meant that in some cases, the prose read like pages from a catalogue of adaptions and mitigations. These examples included; for mitigation, fuel shifts, carbon capture and storage and geo-engineering; for adaptation, coastal retreat and defence, more efficient water use and changes to building design. Discussions focused on Bangladesh and the UK for real world examples although there were some very effective references to schemes in places such as Denmark, Australia and Indonesia. It was encouraging when a response structured its adaptation sections in terms of the threefold framework of retreat, accommodate and protect as this led to a more comprehensive discussion.

Accessing the higher Levels in AO2 were made more possible when candidates suggested that adaptation and mitigation were not opposites but rather complimentary responses. In this context the contrasting circumstances of ACs and LIDCs in availability of resources was a valuable evaluative point. Additionally, candidates who made the pertinent point that adaptation tended to be achieved at local and regional scales whereas mitigation was most effective at national and global scales tended to place themselves in the higher Levels of the mark scheme.

Misconception

Adaptation is a response to climate change which aims to modify human behaviour and economic systems permanently so that vulnerability is reduced. For example, increased frequency of heat waves in large urban areas might encourage communities and planners to plant trees along streets for shade and maintain areas of parkland. Adoption of drought resistant crops or the managed retreat of human activities inland from coastlines are other examples.

Mitigation is the action taken to reduce or remove emissions of greenhouse gases such as carbon dioxide (CO_2) and methane (CH_4). Examples include the shift away from fossil fuels to renewables such as wind and solar energy, the promotion of carbon sinks such as afforestation and peatland restoration.

Question 12

12* 'Political organisations have the most influence in shaping the climate change debate.' Discuss. **[33]**

Responses focused on the political organisations involved in the debate about climate change, in particular the causes and consequences, ranged widely in their qualities. The most successful candidates showed themselves not only very knowledgeable about the political persuasions of a wide range of political players but also in their analysis and evaluation of their respective roles and influence. International governments in the shape of the UN, the IPCC, the EU and national governments such as the UK, the USA, China, India, Mauritius and Tuvalu were often included.

One structure that seemed to work well for those who adopted it was to chart the changing political landscape in terms of attitudes towards climate change through time. Starting with the role of scientists in the 1950s and concluding with the latest declarations from bodies such as the IPCC, candidates were able to assess their roles in shaping the debate. It was encouraging that many candidates were aware of how politics shapes the perspectives of elements in the media such as newspapers in the UK. Many were also perceptive in their evaluation of the role of national political leaders such as Trump, Johnson, Modi, Jinping, and Bolsonaro. It is important that because of the dynamic nature of political leadership in most countries, that candidates do keep up to date with swings in political power. Some less successful candidates few wrote about the former Brazilian president as if he were still in power. More might have been expected in responses of the role of the Green Party in UK politics and the policies of the three main political parties, Conservative, Labour and Liberal Democrat. Locally these parties as well as independent players can be very active, especially regarding schemes impacting on communities such as solar and wind farms.

The role of activist groups such as Extinction Rebellion, Just Stop Oil and Greenpeace were mentioned but perhaps not as well-known as they could be given the quantity of material available to research such organisations. Other NGOs such as the National Trust and Wildlife Trusts play active roles in national, regional and local politics.

Overall, responses were effective in their discussion but most could have given local organisations greater prominence, especially in the context of factors such as wind and solar farm construction, nuclear power plant development or transport developments.

Question 13

Topic 3.2 – Disease Dilemmas

13* 'Human factors are most influential in affecting the spread of disease.'
To what extent do you agree? **[33]**

Overall this was a popular and well tackled question. The question wording led the vast majority of candidates to an appropriate structure that discussed the relative strength of influence of human and physical factors. The more successful responses also picked up the phrase in the question '…the spread of disease.' with a good number highlighting the different types of diffusion such as relocation, expansion, contagious and hierarchical. These candidates, therefore, identified factors that either limited or encouraged disease spread. For example, in the case of Covid 19 the point that physical distance is no longer a limit when human carriers can travel throughout the global network of air routes while presenting no clear symptoms. Not unsurprisingly, many candidates were able to make very effective use of the Covid 19 pandemic as an example of various factors influencing disease spread.

There were many responses that highlighted how, so often it is a combination of both physical and human factors that influence the spread of a disease. Authoritative discussions of malaria in Ethiopia and cholera in Haiti provided examiners with much 'thorough' and 'comprehensive' application of knowledge and understanding to read.

Points about scale and or level of development helped many discussions into higher Levels of response as did the distinction between communicable and non-communicable disease.

Question 14

14* 'Strategies that deal with disease risk and eradication, at a local scale, are more effective than at any other scale.'
To what extent do you agree? **[33]**

The second of the two questions in the Disease Dilemmas Option was equally popular and successfully answered. The wording of the question invited the candidate to consider strategies to deal with disease risk and eradication at a variety of scales which the vast majority accepted convincingly.

Some successful evaluation was seen when candidates identified a contrast between global and national scales. These highlighted the efficacy of campaigns that have the backing of trans-national/international organisations such as the World Health Organisation or the United Nations via its UNESCO division. Therefore the worldwide targeting of smallpox and polio made for valuable material in support of large scale top-down strategies. Such content was made even more convincing when the role of trans-national pharmaceutical companies was included and in particular how a partnership between these large sized businesses and national governments needs global scale organisations such as WHO to broker them.

Exemplification highlighted the successful campaign aimed at eliminating the scourge of Guinea Worm in Ghana through the partnership of Ghana Red Cross women's clubs and local communities. The level of detail of the causes and consequences of Guinea Worm infection some candidates held was impressive, but in some instances the writing about the disease delayed a candidate from fully evaluating the campaign. It is also the case that this disease and the ways its eradication is being managed extends well beyond Ghana.

For example, in 1996 16 countries were known to be endemic for Guinea Worm disease but by 2021 only five countries remained endemic and in 2022 only thirteen cases were reported worldwide. It is an example of a very successful 'grassroots' strategy but its story involves much more that some individual student research could reveal.

The role of Non-Governmental Organisations (NGOs) was mentioned by many and while most of these operate at local scales in the communities they are aiming to assist, it should be remembered that in terms of their structure and especially fund raising, they operate across scales that are local, regional, national and in some cases internationally such as the French originated Médecins Sans Frontières (Doctors without Borders).

There were some interesting evaluations of strategies such as national scale immunisation campaigns that have succeeded but with local scale outbreaks occurring to disturb the pattern. Measles in the UK was mentioned by some candidates in this context.

It was also recognised by a small minority of candidates that the recent strategy to combat Covid 19 was a global scale one with researchers passing on their findings around the world so that work continued 24/7 to everyone's mutual benefit. The complexities of strategies to deal with the Covid 19 pandemic was identified by only a minority of candidates who recognised the commercial, political and academic factors operating in the race to manufacture viable vaccinations.

Question 15

Topic 3.3 – Exploring Oceans

15* 'It is only possible to use ocean resources successfully with political involvement.' Discuss. **[33]**

Among the relatively small number of candidates answering in this Option, political agreements were generally well known, such as The Commission of Antarctic Marine Living Resources (CCAMLR), the United Nations Convention of the Law of the Sea (UNCLOS) and the International Whaling Commission (IWC). Candidates were secure in their knowledge of the intended jurisdictions of these organisations and the extent to which they are supported or otherwise by various players involved in the use of ocean resources. Discussions focused on biotic resources such as fish, krill and whales were quick to give marks to the restrictions of catch in sustaining populations but also highlighted how politics soon affects how secure agreements can be. The withdrawal of Japan from the IWC and its resumption of commercial whaling in its territorial waters and Exclusive Economic Zone was frequently cited as an example of how difficult it can be to hold international political agreements together.

The refusal of nations such as the USA to sign or ratify UNCLOS was widely known and together with the establishment of marine reserves allowed candidates to discuss the challenges arising from the 'policing' of vast areas of the oceans.

Few candidates picked up on the term 'successfully' in the question wording. This offered much potential for convincing analysis and evaluation of what conservation and sustainability might look like in different contexts. For example, one area that was omitted by the vast majority of candidates was that of the use of near-shore ocean resources such as tidal barrages or off-shore wind farms.

Question 16

16* 'It is more important to prevent ocean pollution than to protect human economic activities.' Discuss. **[33]**

Most candidates were secure in their knowledge and understanding of pollution, with many identifying the basic distinction between point and non-point sources. Candidates could also justify enabling human economic activities, although the link with wealth creation and the ability to support components of human society such as education, health care and defence for example was rarely made.

Examiners read plenty of accounts of the accumulation of plastics in gyres such as the Great Pacific Garbage Patch and oil spills such as Deepwater Horizon in 2010. Details of these were presented in full and although there was a tendency for some to regard this as a 'case study dump' which while it targets aspects of AO1, needed to be analysed and evaluated for AO2. It was perhaps with pollution such as that emanating from the increasing levels of CO_2 in the oceans that candidates were most comfortable discussing why prevention of pollution is more important than protecting human economic activities. This was the key element if a response was to reach the higher Levels in AO2.

It might have helped candidates to deploy the idea of oceans as offering ecosystem services. These services can be divided into one of four types, provisioning, regulating, cultural and supporting. This approach would encourage evaluation as to the balance between prevention of pollution and the protection of economic activities, preferably in the context of some actual activities such as food supply. For example, if coral ecosystems are diminished due to bleaching caused by the warming of sea water then services such as food, prevention of coastal erosion and tourism are negatively affected.

Question 17

Topic 3.4 – Future of Food

17* 'The future of food depends upon key players and strategies.' To what extent do you agree? **[33]**

Key players were well identified by the majority of candidates tackling this question. Examples included nations and their roles in the geo-politics of food supply and demand, trans-national organisations involved in the production, transport and storage, processing and retailing of food, players involved in food aid such as governments and NGOs.

Candidates focused their consideration of 'future' in terms of food security which was a sensible approach. Discussions could therefore look at regions such as the Sahel or individual countries such as India. Organising such answers in terms of physical and human challenges allowed candidates to analyse and evaluate strategies such as water management, grazing regimes, agroforestry and planting of drought resistant varieties.

Generally, examiners were less convinced by the strategy elements in responses in terms of evaluating their role in the future of food. For example, much could have been made of whether short, medium or long term strategies might be the best approach. There was also potential in considering the relative merits of top-down or bottom-up strategies.

Question 18

18* To what extent is the global food system vulnerable to shocks? **[33]**

One effective way of starting this discussion was to outline what is meant by the 'global food system', something a number of candidates did well. One of two routes through the discussion were generally adopted by candidates. One taking the components of the food system in turn and assessing their vulnerability to shocks and the other structuring the response in terms of identifiable shocks and relating their impacts to the most affected components of the food system. Either of these approaches worked well.

Physical shocks discussed included climate change often seen in conjunction with extreme weather events, specifically issues focused on water, either too much or too little. Tectonic shocks were frequently identified with the short term interruption to air transport of food caused by the 2010 eruption of Eyjafjallajökull frequently cited. The opportunity for some convincing evaluation regarding the impact of ash fall following an eruption was taken up by only a minority of candidates. Here the contrast between the short term shock of disruption to food production caused by ash or lava flows covering vegetation and the longer term benefits to soil fertility as ash and lava weathers was an indicator of a top Level response. It was disappointing that more attention was not given to issues concerning soil such as over-cultivation and over–grazing and wind and water erosion.

Shocks arising from a human factor were generally well known and discussed. These included factors such as geo-political tensions and unrests, either between countries or within with the ongoing invasion of Ukraine by Russia, often linked with shocks to global trade in grain and plant oils for example. Issues arising from the UK's decision to leave the EU and the example of Cuba following the collapse of the USR in 1991 were also often written about.

Overall it was the ability of a candidate to focus on the command 'To what extent…' that determined the Level of response with those able to discuss factors such as the degree of resilience to shocks offering the more successful analysis and evaluation.

Question 19

Topic 3.5 – Hazardous Earth

19* 'Earthquake activity has a greater impact on landscapes than volcanic activity.' Discuss. **[33]**

It was the case that for the clear majority of candidates attempting this question, their preference was to discuss the impacts of seismic and volcanic eruptions on people and buildings. The question is clear in its focus of impacts on **landscape**. The specification is also clear with appropriate material outlined in Key Ideas 1b, 2a and 3b in the Hazardous Earth topic.

Those who structured their discussion on landscape tended to identify features such as escarpments and rift valleys, the impacts of landslides, volcanoes and flows of tephra covering former landscapes. There were those who offered convincing points about the impacts of landslides at relatively local scales, such as the blockage of rivers following the Nepalese earthquake in 2015. This local scale impact was seen in stark contrast to the impacts on coastal landscapes around the Indian Ocean following the 2004 Boxing Day earthquake and subsequent tsunami.

There were many effective accounts of the impacts of the eruption of Mount St Helens in 1980 not only on the volcano itself (some 400 metres was blown off its summit and a 2 -3 km crater created) but also on the surrounding area (about 600 km^2 of Washington State was covered by a pyroclastic flow) and further afield as ash was carried aloft in the upper atmosphere. Those who knew this example well were able to evaluate the interaction between the earthquake that triggered the massive collapse of the north face of the mountain and the resultant lateral blast. Impacts on the ecological landscape, mostly the forests and the rivers (many filled with lahars) were successfully discussed.

Products of effusive eruptions provided a rich source of material for a small minority of candidates who drew on the creation of shield volcanoes (the Hawaiian chain often cited) and large igneous provinces. The latter in the form of flood basalts are truly massive in their scale both in terms of the volcanic explosiveness and also their spatial extent. The Siberian Traps were the example most quoted with some 3 - 4 million km^2 of basalt having been discharged from multiple fissures over a period of some two million years spanning the Permian-Triassic boundary, around 250 million years BP.

Question 20

20* 'Levels of economic development determine the impacts people experience from volcanic eruptions.'
Discuss. **[33]**

This question, perhaps more than any other in the paper, generated responses that covered the entire range in quality of response. Among the Level 4 responses were those whose command of the content was so secure and expressed with such strong structure and fluency that examiners were excited to read them. Other candidates tended to regard this topic as an opportunity to write about 'why rich countries have fewer deaths from volcanic eruptions than poor ones.' without exploring why the reality is far from straightforward. For some this was the chance to 'write all they had remembered'' about one or two volcanic events without analysing or evaluating in the context of the actual question. Among the less successful candidates were those who left their response as simply that, comparing one eruption in an AC and one in an EDC or LIDC omitting any mention of the range in physical factors that influence impacts of eruptions nor indeed the diversity of human factors operating in the countries.

Considerable numbers of essays employed examples such as Pinatubo (1991), Nevado Del Ruiz (1985) and Mount St Helens (1980) to very good extent. Real world examples from a few decades ago can provided very relevant and appropriate material from which to highlight different analytical and evaluative points. For example, Pinatubo is located in the Philippines, an EDC. While the country possessed limited resources to manage such a catastrophic eruption (VEI 6), the local institute of Volcanology and Seismology (PHIVOLCS) and the United States Geological Survey were forecasting the eruption and its scale. The presence of the US military's strategically significant bases at Subic Bay (navy) and Clark (air), were key elements in generating forecasting and post eruption management.

A staple for many candidates was the comparison between the eruptions on Mt Ontake (Japan) in 2014 and Merapi (Indonesia) 2010. This comparison, as long as details were included, was capable of generating much convincing analysis and evaluation. For example, the unpredictable phreatic eruption in Japan was too often not referred to, neither was sufficient credit given to the efforts of Indonesian agencies to reduce the vulnerability of their people.

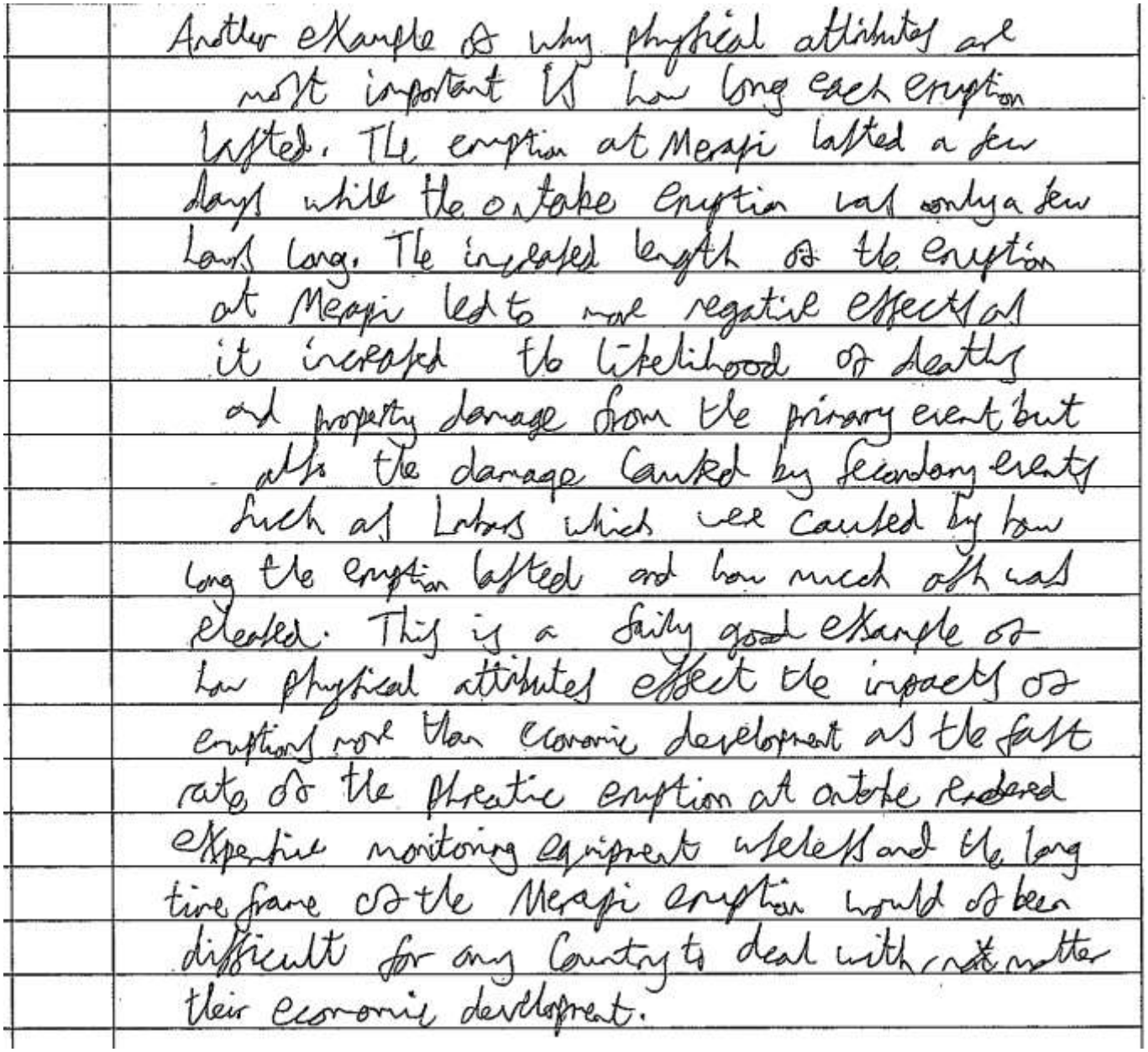
One component of some responses was the comparison between an EDC, Indonesia and a LIDC, Democratic Republic of Congo in terms of the management of volcanic eruptions. Thus candidates identified the relatively effective way the eruption of Merapi had been handled, especially the plans put in place to reduce vulnerabilities of the local population to future eruptions. This was contrasted with the comparatively chaotic impacts of the eruption of Mount Nyiragongo in 2002. This eruption was estimated to have been responsible for some 170 fatalities and led to more than 300,000 people fleeing the advancing lava to the neighbouring country of Rwanda.

There were a few candidates who made very effective use of the disaster-response curve to illustrate graphically the pre-, pro- and post eruption situation in countries at different locations along the development continuum. Candidates should be encouraged to use annotated diagrams to convey not just knowledge but also as a basis for their analysis and evaluation.

Misconception

Too often Indonesia was labelled as an LIDC which is of concern given its GNI per capita (purchasing power parity) of some $14,250 and Human Development Index of 0.707.

Exemplar 3


Another example of why physical attributes are most important is how long each eruption lasted. The eruption at Merapi lasted a few days while the Ontake eruption was only a few hours long. The increased length of the eruption at Merapi led to more negative effects as it increased the likelihood of deaths and property damage from the primary event but also the damage caused by secondary events such as lahars which were caused by how long the eruption lasted and how much ash was eleated. This is a fairly good example of how physical attributes effect the impacts of eruptions more than economic development as the fast rate of the Phreatic eruption at Ontake reduced expertise monitoring equipment usefulness and the long time frame of the Merapi eruption would of been difficult for any country to deal with no matter their economic development.

This candidate as part of their analysis and evaluation has drawn attention to the nature of the physical factors of volcanic eruptions as being significant in determining their impacts. The knowledge of the eruptions of Ontake and Merapi is secure and used to good effect to compare and contrast explicitly the two events. Towards the end of this paragraph the candidate relates the physical factor of type of eruption to the level of development with some very effective commentary that is clearly expressed. Overall, this paragraph is indicating Level 4.

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