GCE A LEVEL MARKING SCHEME

AUTUMN 2021

A LEVEL
GEOGRAPHY - COMPONENT 3
A110U30-1

INTRODUCTION

This marking scheme was used by WJEC for the 2021 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCE A LEVEL GEOGRAPHY

COMPONENT 3: CONTEMPORARY THEMES IN GEOGRAPHY

AUTUMN 2021 MARK SCHEME

Guidance for Examiners

Positive marking

Learners are writing under examination conditions and credit should be given for what the learner writes, as opposed to adopting an approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

The mark scheme for this component uses banded mark schemes.

Banded mark schemes

The mark scheme is in two parts to reflect the sections (A and B in the examination paper). Section A is 38 marks and Section B is 45 marks.

The first part of the mark scheme in each section is an assessment grid advising on bands and the associated marks that should be given in responses that demonstrate the qualities needed in the three AOs; AO1, AO2 and AO3 relevant to this component. The targeted AO(s) are also indicated, for example AO2.1c.

The second part of the mark scheme is advice on the indicative content that suggests the range of likely themes and specialised concepts, processes, scales and environments that may be included in the learner's answers.

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks. Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. Once the annotation is complete, the mark scheme can be applied. This is a two-stage process.

Banded mark schemes Stage 1 – Deciding on the band

Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance, if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

Banded mark schemes Stage 2 – Deciding on the mark

Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

Where the specialised concepts are integral to knowledge and understanding, they are underlined in the indicative content.

The mark scheme reflects the layout of the examination paper. Mark the chosen question in Section A and the two chosen questions from Section B. If the candidate has responded to both questions in Section A or more than two in Section B mark all the answers. Award the higher marks attained for the correct number of required questions; further, possible rubric infringement will be discussed at the marking conference.

Be prepared to reward answers that give **valid and creditworthy** responses, especially if these do not fully reflect the 'indicative content' of the mark scheme.

Section A: Tectonic Hazards - Generic Mark Bands (38 marks)

	AO1 [14 marks]	AO2 [20 marks]	AO3 [4 marks]
Band	*Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change at a variety of scales*	*Apply knowledge and understanding in different contexts either to analyse or interpret or evaluate geographical issues and information*	*Use a variety of relevant quantitative and qualitative skills to construct arguments and draw conclusions*
4	**10-14 marks** Demonstrates thorough and accurate knowledge; confident understanding of relevant concepts and principles throughout the response that is wholly relevant to the question Demonstrates knowledge and understanding through the use of appropriate, accurate and well-developed examples Wholly appropriate, accurate and relevant supporting geographical terminology is well used Well-directed and well-annotated sketch maps / diagrams are included and should be credited	**16-20 marks** Demonstrates sophisticated application of knowledge and understanding either to analyse or interpret or evaluate in order to produce a full and coherent response that is supported by wholly appropriate evidence Demonstrates application of knowledge and understanding through the synthesis of the connections between different elements of the question Demonstrates application of knowledge and understanding through the confident application of the specialised concepts throughout the response	**4 marks** The response uses wholly relevant qualitative skills to construct clear, coherent and appropriately structured arguments and conclusions

	AO1 [14 marks]	AO2 [20 marks]	AO3 [4 marks]
3	**7-9 marks** Demonstrates secure factual knowledge and reasonable understanding of relevant concepts and principles for large portions of the response that is mostly relevant to the question Demonstrates knowledge and understanding through the use of appropriate, generally accurate and developed examples The use of appropriate and mostly relevant geographical terminology is evident Appropriate, basically accurate annotated sketch maps / diagrams are included and should be credited	**11-15 marks** Demonstrates accurate application of knowledge and understanding either to interpret or analyse or evaluate in order to produce a partial but coherent response that is supported by mostly appropriate evidence Demonstrates application of knowledge and understanding through the partial synthesis of the connections between different elements of the question Demonstrates application of knowledge and understanding through the mostly relevant application of the specialised concepts	**3 marks** The response uses mostly relevant qualitative skills to construct structured arguments and conclusions where coherence is variable
2	**4-6 marks** Demonstrates straightforward knowledge with some inaccuracies; some understanding of relevant concepts and principles that is linked to the question Demonstrates knowledge and understanding through the use of limited examples that may not always be appropriate or accurate The use of geographical terminology is limited Annotated sketch maps / diagrams are basic and should be credited	**6-10 marks** Demonstrates some application of knowledge and understanding either to interpret or analyse or evaluate in order to produce a response which is limited in coherence and is supported by limited appropriate evidence Demonstrates application of knowledge and understanding through the limited synthesis of the connections between different elements of the question Demonstrate application of knowledge and understanding through limited application of the specialised concepts	**2 marks** The response uses limited qualitative skills to construct argument(s) and conclusion(s)that are superficial in structure with minimal coherence

	AO1 [14 marks]	AO2 [20 marks]	AO3 [4 marks]
1	**1-3 marks** Demonstrates poor knowledge with errors and minimal understanding and linkage to the question Basic use of examples or if evident, lack relevance to the question asked Geographical terminology is rarely used within the response	**1-5 marks** Demonstrates application either to interpret or analyse or evaluate in order to produce a response which lacks coherence and is unsupported by appropriate evidence Demonstrates application of knowledge and understanding through the superficial synthesis of the connections between different elements of the question Demonstrate application of knowledge and understanding through superficial application of the specialised concepts	**1 mark** The response uses qualitative skills superficially to construct an argument / conclusion that is incomplete and lacks coherence
	0 marks Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted

1. 'Tectonic processes operating at diverging and converging plate margins give rise to similar hazards.' To what extent do you agree? [38 marks]

AO1 [14] AO2.1c [20] AO3.3 [4]

Focus: 3.1.1/2/3

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the tectonic processes operating at diverging and converging plate margin and associated hazards:

- At converging plate boundaries tectonic plates collide (destructive margins). There are three types of boundary: oceanic-continental; oceanic-oceanic or continental-continental. Earthquakes (often high magnitude) occur at all three boundary types, explosive andesitic volcanic eruptions occur at ocean-continental and ocean-ocean margins due to subduction (causality)
- At diverging plate boundaries plates move apart (constructive margins) and basaltic, non-viscous magma rises to fill the gap. This mainly occurs at mid-ocean ridges but continental constructive boundaries, such as the East African Rift Valley system, also have active volcanoes with a wide range of magma types depending on local geological conditions. As plates separate tensional stresses result in shallow focus, low magnitude earthquakes and effusive volcanic eruptions characterised by hot (1000 -1200^{o}C) basaltic (mafic) magmas reaching the surface (causality)
- The characteristics of the earthquake hazard profile at diverging and converging plate margins: depth of focus, magnitude, frequency and geographical locations (place). Hazards generated by earthquakes include primary hazards of ground shaking and secondary hazards of liquefaction, landslides and tsunami (risk)
- The characteristics of the volcanic hazard profile at diverging and converging plate margins: magnitude, frequency and geographical locations (place). Primary hazards of lava flows, pyroclastic flows, ash and tephra falls and volcanic gases; secondary hazards of lahars, landslides, jökulhlaups and tsunami (risk)

AO2

Application of knowledge and understanding is deployed to discuss whether the tectonic processes operating at diverging and converging margins give rise to similar hazards. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Mechanisms of gravitational sliding and slab pull result in different processes occurring at diverging and converging plate boundaries (causality)
- Although both earthquake and volcanic hazards occur at both diverging and converging plate boundaries, the characteristics of the physical hazard profile vary between the two boundary types (causality / risk)
- Due to the tectonic processes occurring at converging plate boundaries (oceanic to oceanic and oceanic to continental) high magnitude earthquakes are generated therefore converging margins represent areas of major hazard. Tsunamis are most commonly generated by these earthquakes e.g. 2004 Boxing Day tsunami hazard (causality / risk). Explosive andesitic volcanic eruptions occur at ocean-continental and ocean-ocean margins due to subduction and typically have a moderate to large VEI (volcanic explosivity index) with an eruption column height that may exceed 50km and eject large volumes of material e.g., Fuego volcano in Guatemala, 2018 (causality)

- At continental to continental converging plate boundaries shallow earthquakes occur in a relatively broad zone, resulting in a high hazard risk e.g. Bam earthquake, Iran 1990 (risk)
- At diverging plate boundaries earthquakes are shallow and low magnitude and volcanic activity is often submarine posing little risk to people e.g. mid-Atlantic Ridge (place /risk)
- Hazards are the result of the interaction between geo-physical processes and human activity, the nature of that human activity is part of the hazard risk equation (place / risk)
- Localised circumstances may result in processes along divergent boundaries creating significant hazards e.g. liquefaction is a significant hazard in zones of loose sediments or e.g.Eyjafjallajökull, 2010, when magma and water created a plume of very fine volcanic ash and gas over 10 kilometres high causing significant disruption locally, regionally and globally e.g. Nyiragongo, 2002, in the East African Rift Valley, there was little warning of lava streams with speeds of 60 km/hr:the unrest in the country made it difficult to monitor the volcano and put emergency responses in place (vulnerability)
- The geographical distribution of converging plate margins often corresponds with areas of high population densities resulting in a higher hazard risk e.g. Pacific Ring of Fire (risk)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about tectonic processes operating at diverging and converging plate margins and associated tectonic hazards
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether the hazards arising from tectonic processes at diverging and converging plate margins are similar

Credit other valid approaches.

2. 'Impacts of volcanic activity are greatest at the local scale.' Discuss. [38 marks]
AO1 [14] AO2.1c [20] AO3.3 [4]

Focus: 3.1.2

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of volcanic activity and its impacts could include:

- Volcanic activity includes primary hazards of lava flows, pyroclastic flows, ash and tephra falls and volcanic gases and secondary hazards of lahars, landslides and tsunami (risk)
- Environmental impacts (weather, climate, ecosystems)
- Demographic impacts (deaths, migration)
- Economic impacts (disruption to production)
- Social impacts (homelessness, injury, bereavement)
- Primary and secondary effects
- Local, regional and global scale impacts (scale) (insert diagram from p.7 of 2020 m/s 'Influence of distance on volcanic hazards)

AO2

Application of knowledge and understanding to evaluate whether the impacts of volcanic activity are greatest at the local scale could include:

- The characteristics of volcanic activity: magnitude, predictability and frequency (risk) influence the scale of impacts. The greater the magnitude the more widespread the impacts are likely to be. High VEI eruptions (super-volcanoes) in past times e.g. Yellowstone / Taupo had significant local, regional and global impacts of different types at different scales
- However, global impacts associated with volcanic hazards, such as those associated with VEI8 events are so rare on the geological timescale that they have little bearing on normal, everyday life
- Variation according to the nature of volcanic activity (causality). Generally volcanic gases have a greater impact at the local scale (Lake Nyos, Cameroon 1986), lahars at a regional scale (Nevada del Ruiz, Colombia 1985) and ash at the global scale (Eyjafjallajökull 2010 which had a profound impact on aviation over European air space which in turn had global scale impacts on travel and the economy) (scale)
- The severity of impacts varies according to category of impact, for example social impacts may be more important at the local than global scale but the environmental impact of climate change is usually global (Mount Pinatubo 1991)
- The scale of impact may vary over time (time scales). Initially tsunamis associated with volcanic activity have local impacts, but over time these may spread more widely and have a more global impact (Anak, Krakatoa 2018)
- The globalisation of the world economy means that medium magnitude volcanic events are more likely to have widespread or even global economic impacts than they did in the past (globalisation) e.g. Eyjafjallajökull 2010
- The severity of impacts varies according to the perception of different groups of people, whether from the business sector or the local community (inequalities)

- The severity of impacts may be influenced by strategies to mitigate the effect of volcanic activity (mitigation / adaptation/ resilience)
- Positive impacts of volcanic activity including benefits for agriculture via mineral rich soils, minerals e.g. sulphur extraction and tourism are invariably greatest at the local scale (scale)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about the impacts of volcanic activity
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether the impacts of volcanic activity are greatest at the local scale

Credit other valid approaches.

Section B: Contemporary Themes in Geography - Generic Mark Bands (45 marks)

	AO1 [20 marks]	AO2 [20 marks]	AO3 [5 marks]
Band	*Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change at a variety of scales*	*Apply knowledge and understanding in different contexts either to analyse or interpret or evaluate geographical issues and information*	*Use a variety of relevant 'geographical skills' to construct arguments and draw conclusions*
5	**17-20 marks** Demonstrates wide ranging, thorough and accurate knowledge with a high order of conceptual understanding throughout the response that is wholly relevant to the question Demonstrates knowledge and understanding through the use of wholly appropriate, accurate and well-developed examples Wholly appropriate, accurate and relevant supporting geographical terminology is well used Well-directed and well-annotated sketch maps / diagrams are integrated and should be credited	**17-20 marks** Demonstrates sophisticated application of knowledge and understanding either to analyse or interpret or evaluate in order to produce a full, comprehensive and coherent response that is supported by wholly appropriate, wide ranging and relevant evidence Demonstrates application of knowledge and understanding through the sophisticated synthesis of the connections between different elements of the question Demonstrates application of knowledge and understanding through the confident application of the specialised concepts throughout the response	**5 marks** The response uses wholly relevant qualitative skills to produce well-constructed, coherent, sophisticated and logical arguments and conclusions

	AO1 [20 marks]	AO2 [20 marks]	AO3 [5 marks]
4	**13-16 marks** Demonstrates accurate factual knowledge and confident understanding of relevant concepts and principles throughout the response that is relevant to the question Demonstrates knowledge and understanding through the use of appropriate, accurate and developed examples Appropriate, accurate and relevant geographical terminology is evident Appropriate, mostly accurate and relevant annotated sketch maps / diagrams are included and should be credited	**13-16 marks** Demonstrates accurate application of knowledge and understanding either to interpret or analyse or evaluate in order to produce a coherent response that is supported by appropriate evidence Demonstrates application of knowledge and understanding through the synthesis of the connections between different elements of the question Demonstrates application of knowledge and understanding through the relevant application of the specialised concepts	**4 marks** The response uses relevant qualitative skills to produce clear, coherent and appropriately structured arguments and conclusions
3	**9-12 marks** Demonstrates secure, straightforward knowledge and reasonable understanding of relevant concepts and principles throughout most of the response that is mostly relevant to the question Demonstrates knowledge and understanding through the use of mostly appropriate, mostly accurate and developed examples Mostly appropriate, accurate and mostly relevant geographical terminology is evident but is variable in its use Appropriate, basically accurate and partial use of annotated sketch maps / diagrams are included and should be credited	**9-12 marks** Demonstrates partial application either to analyse or interpret or evaluate in order to produce a partial but coherent response that is supported by mostly appropriate evidence Demonstrates application of knowledge through the partial synthesis between different elements of the question Demonstrates application of knowledge and understanding through the partial application of some specialised concepts	**3 marks** The response uses mostly relevant qualitative skills to produce a structured response but where coherence is variable

	AO1 [20 marks]	AO2 [20 marks]	AO3 [5 marks]
2	**5-8 marks** Demonstrates some knowledge, but limited in scope with some inaccuracies; some understanding of relevant concepts and principles Demonstrates knowledge and understanding through the use of limited examples, which are mostly accurate but un-developed Limited geographical terminology is evident, not all of which is appropriate or accurate Basic sketch maps / diagrams are used but contain inaccuracies. Credit should be given when used appropriately	**5-8 marks** Demonstrates limited application either to analyse or interpret or evaluate in order to produce a limited response where most points are generalised or of limited relevance to the question. Limited synthesis between different elements of the question Demonstrates application of knowledge and understanding through the limited application of some specialised concepts	**2 marks** The response uses some qualitative skills to produce a response with superficial structure, with minimal coherence
1	**1-4 marks** Demonstrates poor knowledge with errors and minimal understanding and linkage to the question No use of examples or, if evident, lack relevance to the question asked Geographical terminology is rarely used within the response	**1-4 marks** Demonstration of application either to analyse or interpret or evaluate is poor, producing a response which lacks coherence and is unsupported by appropriate evidence Synthesis between different elements of the question is poor Demonstrates application of knowledge and understanding through the superficial application of basic specialised concepts	**1 mark** The communication in the response is incomplete
	0 marks Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted

Section B: Contemporary Themes in Geography

3. 'Variations in nutrient cycling are solely the result of differences in climate.' With reference to two biomes, evaluate this statement. [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.2.1/2

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

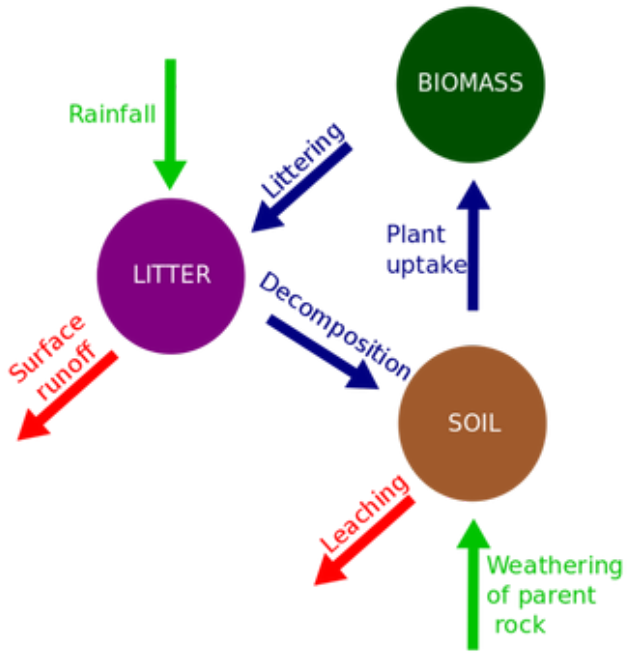
Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of variations in nutrient cycling could include:

- A generalised Gersmehl nutrient cycle model of a system with inputs of weathering and nutrients dissolved in rainfall, stores of biomass, litter and soil, flows of uptake by plants, fall-out as tissues die and release as litter decomposes and outputs through leaching and runoff



Gersmehl nutrient cycle

- Relative size of nutrient stores in two biomes
- Relative thickness of nutrient flows in two biomes
- The influence of temperature on the size of inputs, stores, flows and outputs (causality)
- The influence of precipitation on the size of inputs, stores, flows and outputs (causality)
- Seasonal variations in temperature and precipitation influence the growth of biomass, fallout and decomposition (causality)
- In the arctic tundra biome nutrient cycling processes are slower than in most other ecosystems due to low soil temperature, a short growing season and strong seasonal fluctuations (causality)

- The different sizes of the component stores, for example between the tropical rainforest biome with its large above-ground biomass store which contrasts with the smaller biomass store of the taiga forest biome where growth and biodiversity are lower due to the cold conditions.
    - The litter store for the tropical rainforest biome is small due to the rapid decomposition in the hot, wet conditions compared to the large litter store in the taiga forest biome where the cold conditions inhibit the breakdown and decay of litter.

The small nutrient soil store in the tropical rainforest biome results from rapid leaching due to high precipitation whereas the soil store in the taiga forest biome is very small due to the cold conditions which inhibit weathering.

AO2

Application of knowledge and understanding is deployed to evaluate whether variations in nutrient cycling between two biomes result solely from differences in climate. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- The recognition of the important influence of climate factors on both the stores and flows of nutrient cycles
- The influence of factors other than differences in climate on nutrient cycling including abiotic factors of geology, permafrost (although a function of climate) and pH and biotic factors of human activity, species migration and seed dispersal on the size of inputs, stores, flows and outputs (causality)
- The significance of differences climate in influencing nutrient cycling varies according to scale. On a small-scale, factors such as geology (in its influence on pH, leaching and runoff) can exert a greater influence (scale)
- The role of differences in climate in influencing nutrient cycling varies over time (time scales). Human activity may be seen to be increasingly influencing nutrient cycling through deforestation, harvesting, the application of fertilisers and livestock rearing
- Human influences may be seen as significant at present, but, over geological time, differences in climate may be seen as having greater influence (time scales)
- The significance of differences in climate in influencing nutrient cycling varies according to location (place). In more remote, less accessible areas the role of climate in influencing nutrient cycling may be greater
- Anthropogenic climate change may be linked to changes in rates of nutrient cycling. For example, climate change in the tundra accelerates decomposition and the release of nutrients into the soil stores. In this way, it may be argued that complex interconnections between people and climate make it difficult to isolate the significance of differences in climate alone (interdependence)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about the influence of differences in climate on the nutrient cycle
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and the depth of the question
- The skill in reaching conclusions about the role played by differences in climate in the nutrient cycle

Credit other valid approaches.

4. Climate change is the greatest threat to the Arctic tundra biome.' Discuss.

[45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.2.7

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of threats to the Arctic tundra biome could include:

- Threats to the Arctic tundra from climate change caused by human activity altering the thermal equilibrium of permafrost and carbon cycling. The tundra is a 'stressed' biome due to its extreme climate and the short and sensitive nature of its food chain. Plant populations will experience difficulties in adapting to the rate of warming. Caribou, musk ox and reindeer migrate in response to seasonal growth of lichens, mosses and grasses and will need to alter their grazing ranges to keep pace with the shifting biome (causality / place / risk / thresholds)
- With continued climate warming or disturbance e.g. Siberian wildfires 2020, the active layer may not freeze back completely in winter. If these conditions persist the permafrost will degrade. Studies show the Arctic warmed by 6°C during the 20th century, a figure higher than the global average Scientists predict widespread thawing of permafrost by 2100 (risk / feedback)
- There is concern that the incremental thawing of permafrost will reach a 'tipping point' of accelerated and irreversible change (thresholds). Carbon and methane-storing permafrost is now shrinking at an alarming rate as decomposition of organic matter becomes a source of heat itself, leading to an increase in soil temperatures, further decomposition and methane release. This positive feedback process is referred to as permafrost carbon feedback
- Threats to the Arctic tundra from mineral exploitation e.g. Norilsk in Russia is one of the largest arctic cities. The area is rich in nickel, copper, palladium and cobalt deposits that have been exploited since the beginning of the 20th century. The city is home to "Norilsk Nickel" the world's biggest mining and the metallurgical complex which contaminates the surrounding air, water and land with sulphur dioxide, nitrogen oxides, carbon monoxide, phenol, and chlorine. All vegetation is completely dead in an 8 km radius from the factory and with damaged and reduced growth in the surrounding 200 km. In June 2020 ground subsidence caused by rapid permafrost thawing caused a major oil spill from Norlisk Nickel's fuel storage tanks
- Threats to the Arctic tundra from tourism. The biome is very sensitive (resilience) and the driving of vehicles off road in summer causes widespread damage, leading to the death of small shrubs and the thawing of permafrost. Trampling by pedestrians favours the growth of grasses and willows at the expense of other plants. Although tourist numbers in the Arctic are still relatively low in comparison to other parts of the world, tourism is currently experiencing unprecedented attention in Arctic regions of Greenland, Iceland, Norway (Svalbard), Finland, Sweden, Canada, USA (Alaska) and Russia due to easier accessibility allowed by warmer temperatures and an increased demand for so-called 'last chance' or 'extinction' tourism ranging from dog-sledding to wilderness tours
- Threats to the Arctic tundra from military activity. Military bases and tracked vehicles will be posing great threat to the tundra as the thawing continues (risk)
- Physical impacts such as environmental degradation, loss of unique flora and fauna (feedback /place / risk / sustainability)
- Human impacts such as animal and human migrations, food supply problems, loss of unique heritage and culture (feedback /place / risk / sustainability)

AO2

Application of knowledge and understanding is deployed to evaluate whether the threat of climate change to the Arctic tundra is greater than other threats including mineral exploitation and tourism. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Variation in the nature of the threat (climate change, mineral exploitation, tourism) according to place, as more remote ecosystems at greater distances from human influences are more likely to be threatened by climate change than mineral exploitation and tourism
- Variation in the nature of the threat according to scale. Threats to the Arctic tundra biome from mineral exploitation and tourism are more likely to be more localised than the widespread threat from climate change
- Changes over time (time scales). Climate change, while a contemporary threat, is likely to have its greatest threat over the medium to longer term i.e. by 2050 and beyond. Mineral exploitation on the other hand is an existential threat. Also, with increased management of threats from mineral exploitation and tourism (sustainability), the threats associated with climate change may assume greater importance
- Interdependence of threats as threats associated with mineral exploitation and tourism may lead to climate change and climate change opens up opportunities for mineral exploitation and tourism (thresholds, feedback)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about threats to the Arctic tundra biome
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill of reaching conclusions about whether climate change presents the greatest threat to the Arctic tundra biome

Credit other valid approaches.

5. 'Climate variability is the most important constraint on human activity in India.' Discuss. [45 marks]

AO1 [14] AO2.1c [20] AO3.3 [4]

Focus: 3.3.3

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the climate variability and its constraints on human activity in India could include:

- Climate variability in terms of temperature e.g. over the period 1973–2008 in the Western drylands of Rajasthan temperature has shown a great variability with an average rise of about 0.5°C for the month of June. 2016 was the warmest year in India since climate data were officially compiled (risk). The six warmest years on record in India were recorded in the last 10 years
- Climate variability in terms of precipitation e.g. during the period 1973–2008 the average annual rainfall in the Western drylands of Rajasthan has shown a decrease of 50 mm (risk). In 2018 the annual rainfall over the country was 85% of the 1951-2000 average
- Climate variability in terms of the timing and amount of monsoon rainfall in India (causality / risk)
- Climate variability in terms of the distribution of extreme weather events (causality / risk) with an increase in the frequency of heavy rainfall events and more frequent droughts
- Climate variability has heightened India's vulnerability as its economy is heavily reliant on climate sensitive sectors such as agriculture (> 60 per cent of India's agriculture is rain-fed) and forestry
- The scarcity of water resources associated with an increase in temperature and a decrease in precipitation creates water stress conditions in regions such as the Western drylands of Rajasthan and is responsible for droughts. Droughts impact on agriculture and urban activities (e.g. Chennai 'Day Zero' 2019) as they can affect rain-fed agriculture, irrigation, electricity supply, sanitation and water contamination (causality / risk)
- The droughts and floods resulting from the variability in monsoon rainfall impact on agriculture and urban activities where they can affect rain-fed agriculture, irrigation, electricity supply, sanitation and water contamination. Sudden heavy rainfall in 2017 resulted in infrastructure damage in cities of Mumbai, Chandigarh and Bengaluru and unseasonal hail destroyed farm produce (causality/ risk)
- There is a link between climate variability (intense rainfall and associated flooding) and the incidence of water-borne disease e.g. cholera, which has a major impact on individuals, families and communities when it occurs (risk)
- Predicted impacts on human activity include: a decline in crop yields by the 2040s because of extreme heat; falling agricultural incomes, particularly in unirrigated areas that would be hit hardest by rising temperatures and a decline in rainfall; health impacts including malnutrition, child stunting (projected to increase by 35 per cent by 2050), malaria (likely to spread to where colder temperatures have previously limited transmission) and increases in mortality arising from heat waves impacting on the workforce, productivity and cost of healthcare (inequalities / risk / resilience)

AO2

Application of knowledge and understanding is deployed to evaluate whether climate variability is the most important constraint on human activity in India. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Climate variability is of key importance to many aspects of human activity in India
- The constraints associated with climate variability will not be felt in isolation, but in the context of other constraints presented by the physical environment, human environment and resource base of India (interdependence)
- The impact of climate variability on human activity will vary according to the adaptive capacity of the economic sector and region (resilience / place). The vulnerability of arid regions to climate variability is further accentuated by low levels of economic development. Many of India's poorest live in areas prone to climatic shifts and in occupations that are highly climate-sensitive
- The impact of climate variability on human activity will vary spatially (place)
- The impact of climate variability on human activity depends on the economic sector with the primary sector at greater risk than the tertiary sector e.g. agriculture is a high priority in India and the impact, if it follows the predictions, is expected to be widespread and severe
- Changes over time as climate is likely to become more variable over time due to global warming, whereas other constraints, such as relief, will not vary (time scale)
- Strategies to mitigate against climate variability such as the adoption of drought resistant crops or irrigation schemes may reduce the constraints of climate variability. The advent of the Indira Gandhi Canal in western Rajasthan helps the region to cope with high variability in rainfall as improved water security in the region can be attained through expansion of canal network (mitigation/ resilience)
- Although there has been significant climatic variability, famine has not been the widespread threat that it has been in the recent past. Most Indians are better off than their parents as there has been a general uplift in conditions (resilience), albeit that there's much still to achieve
- In addition to climate variability, there are significant economic, political and social constraints on human activity in India

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about the constraints of climate variability on human activity in India
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether climate variability is the most important constraint on human activity in India

Credit other valid approaches.

6. 'Economic change in India is primarily due to political factors.' To what extent do you agree? [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.4

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of economic change in India and political factors influencing economic change could include:

- Economic change refers to recent changes in the size and structure of India's economy
- Since 1991 India has achieved average GDP growth rates of 6-7 per cent annually. In 1991, India's GDP was ranked 16th in the world; it is currently ranked the sixth largest in the world, pushing France into seventh place
- Since 2014 (apart from 2017) India's economy has been the world's fastest growing major economy. The tertiary sector dominates (59 per cent), followed by manufacturing (26 per cent) and agriculture (15 per cent)
- Agribusiness plays an increasingly significant role in agricultural exports. They control much of the chain, from seeds and fertilisers to finance, distribution and marketing
- Manufacturing includes the growth of modern steel, pharmaceuticals, textiles, clothing, and a substantial high-tech electronics sector
- The services sector includes financial services, software services, accounting services and entertainment industries like Bollywood. The growth of service industries includes call centres, back office jobs, outsourcing from Europe / US (globalisation)
- After independence and Partition (whereby British India separated into India and Pakistan) in 1947, India's aim was to develop economically without the participation or influence of foreign capital. Economic policies had a strong anti-export bias. Socialist governments ensured a high level of state control over key industries, which in turn led to excessive bureaucracy and very slow economic growth. A major economic crisis in 1991 forced the governing Congress Party to borrow money from the International Monetary Fund (IMF). This opened up the economy (causality)
- To attract larger foreign investments in India, the Special Economic Zones (SEZs) Policy was announced in April 2000 (globalisation)
- Achieving self-reliance in defence manufacturing is a key government target, with the BJP planning to spend US$130 billion on defence industries over the next 5 years and encouraging partnerships with foreign investors (causality/ globalisation)
- Political tensions with neighbouring Pakistan and China are seen as a catalyst for the development of India's aeronautical, satellite and nuclear technologies (risk)
- The National Highways Act has been modified to help reduce tolls on national motorways, bridges and tunnels. The government is also implementing a new policy that aims to improve India's telecommunication systems. All these much-needed infrastructure changes will promote economic development (interdependence)
- The Hindu nationalist strategy of India's current ruling party, the BJP, has diverted attention away from economic reforms such as land reform or reducing trade barriers (inequalities)

AO2

Application of knowledge and understanding is deployed to evaluate whether economic change in India is primarily due to political factors. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- The influence of political factors on economic change varies by sector. The agricultural sector is also influenced by physical factors e.g. Punjab and Haryana have fertile soils and access to groundwater. Service sector growth has been strongly influenced by globalisation (causality)
- The influence of political factors on economic change varies by location (place). Economic change in SEZs is primarily due to political factors but one of the initial reasons for the growth of the IT industry in Bengaluru was its more temperate climate - at a time when computers were sensitive to heat and dust, this was very important
- The influence of political factors on economic change varies by scale. At the meso scale state governments may be the most important influence e.g. the government of Karnataka offers attractive subsidies and tax concessions attracting American companies, but at the micro scale GE had good relationships with Bengaluru-based Wipro and located there in the 1980s. Narayana Murthy moved from Pune to build Infosys in Bengaluru closer to his hometown in Kolar
- Changes over time. Initially political factors were paramount but forces of globalisation have become increasingly important (time scales)
- In addition to the political factors responsible for economic growth, other factors include the emergence and investment policies of TNCs (globalisation); India's large, youthful population giving it a demographic dividend; the growth of an urban, educated, middle-class population whose members have become consumers themselves and who provide a large market for new consumer goods; lower labour costs; a highly skilled and educated workforce; technological factors, particularly the speed and distance over which communications and movement can now take place due to changes in computer, transport and communication technologies (causality)
- Interdependence of factors (interdependence). A combination of political (state support), economic (subsidies, tax concessions), social (education levels), demographic (positive demographic dividend) and environmental factors (attractive climate) have led to economic change in the case of Bangalore (Bengaluru)
- The overwhelming impact of COVID-19 on recent economic change

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about political factors influencing economic change in India
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether economic change in India is primarily due to political factors

Credit other valid approaches.

China

7. 'Climate variability is the most important constraint on human activity in China.' Discuss. [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.3

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the climate variability and its constraints on human activity in China could include:

- Climate variability in terms of temperature. China's mean annual air temperature has increased by more than 1.0 °C in the past three decades, higher than the global average (risk)
- Climate variability in terms of precipitation. The East Asian summer monsoon (EASM) is a major source of moisture to eastern China. Over the past few decades, the EASM has exhibited a weakening trend, marking a major climate shift in eastern China since the late 1970s (causality / risk)
- Climate variability in terms of the distribution of extreme weather events (causality / risk). From mid-June to July of 2016, China endured a series of extreme precipitation events, including the tail-end of Typhoon Nepartak, a Category 5 super typhoon
- The droughts and floods resulting from the variability in monsoon rainfall impact on agriculture and urban activities where they can affect rain-fed agriculture, irrigation, electricity supply, sanitation, water contamination, loss of property and lives (causality/ risk)
- The effects of climate variability have been felt by many different sectors of China's economy. China's government estimates that direct economic losses from extreme weather events cost the country 1 to 3 percent of gross domestic product each year (causality/ risk) affecting living standards
- Rapid urbanisation means that many of China's infrastructure networks (among the world's largest) are increasingly vulnerable to flooding and drought. China's infrastructure hotspots (geographical regions most vulnerable to serious economic impact from climate change) are Beijing, Tianjin, Jiangsu, Shanghai and Zhejiang. Nearly 80 million Chinese city dwellers live in coastal zones at risk of sea-level rise (this compares with 30 million in India and 20 million in the US) (risk)
- There is a link between climate variability (intense rainfall and associated flooding) and the incidence of water-borne disease e.g. malaria, dengue fever, which has a major impact on individuals, families and communities when it occurs (risk)

AO2

Application of knowledge and understanding is deployed to evaluate whether climate variability is the most important constraint on human activity in China. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Climate variability is of key importance to many aspects of human activity in China
- The constraints associated with climate variability will not be felt in isolation, but in the context of other constraints presented by the physical environment and resource base of China (interdependence)
- Constraints on one type of economic activity may impact on others. Drought may render land less productive and can lead to food insecurity and problems with agriculture. This can, in turn, bring economic hardship and can lead to outmigration (interdependence)
- The impact of climate variability on human activity will vary according to the adaptive capacity of the individual, society and region (resilience). The vulnerability of arid central regions of China to climate variability is further accentuated by low levels of socioeconomic development (inequalities)
- The impact of climate variability on human activity will vary spatially (place)
- Changes over time as climate is likely to become more variable over time, whereas other constraints, such as relief, will not (time scale)
- Strategies to mitigate against climate variability such as policies to limit building in hazardous areas like floodplains and alleviate non-climate pressures such as overuse of freshwater resources together with large scale projects such as the Three Gorges Dam or the South-North Water Project will reduce the sensitivity and increase the resilience of China to climate variability (mitigation /resilience)
- Although there has been significant climatic variability, famine has not been the widespread threat that it has been in the recent past. Most Chinese are better off than their parents as there has been a general uplift in conditions (resilience), albeit that there's much still to achieve
- The impact of climate variability on human activity depends on the economic sector e.g. agriculture is a high priority in China and the impact, if it follows the predictions, is expected to be widespread and severe. However, a plentiful water supply is vital for industrial development, therefore a lack of water resources has impacts far beyond the agricultural sector
- In addition to climate variability, there are significant economic, political and social constraints on human activity in China

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about the constraints of climate variability on human activity in China
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether climate variability is the most important constraint on human activity in China

Credit other valid approaches.

8. 'Economic change in China is primarily due to political factors.' To what extent do you agree? [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.4

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of economic change in China and political factors influencing economic change could include:

- Economic change refers to recent changes in the size and structure of China's economy
- Between 1949 and 1976 government locational decisions were dominated by Marxism-Leninism, with a socialist, collectivist and centrally planned agenda. After the death of Mao Tse-Tung (Mao Zedong) in 1976, China's economy took a major change in direction. In 1978, Deng Xiaoping, the new leader of the Chinese Communist Party, introduced the 'Open Door' policy, which was designed to overcome China's isolation from the world's economies. The country had become increasingly aware that the world, and south-east Asia in particular, was developing and leaving China behind. China moved towards a socialist market economy. The development of economic activity in China includes the development of manufacturing industries, service and financial industries and agriculture. Rapid economic growth in China, initially due to the expansion of the manufacturing sector, is increasingly driven by the service sector (causality)
- Since 1979, five special economic zones (SEZs) and 14 open cities have been established. These offer reduced restrictions on land, labour, wages, taxes and planning regulations to overseas firms, especially those involved in high-technology industries. The result has been the emergence and dominance of economic activity in coastal areas, which have received most of the internal investment as well as having imported capital, technology and entrepreneurial skills, at the expense of the interior. The PRC has established special economic zones in Shenzhen, Zhuhai and Shantou in Guangdong Province, Xiamen in Fujian province and designated the entire province of Hainan a special economic zone (causality)
- Between 1949 and the late 1970s manufacturing in China was undertaken almost entirely by state-owned enterprises (SOEs), mainly heavy industries such as oil, chemicals, power, iron and steel. In order to reduce regional disparities, industry was dispersed. The 1980s focus on increased productivity forced SOEs towards reform. Large SOEs have improved their management and smaller SOEs eventually privatised (causality)
- Chinese President Xi Jinping consolidated his position of power in 2017, when he was elevated to the same status as former Chairman Mao. He is maintaining the politburo's grip on the economy (causality)
- The government has accorded top priority to the mitigation of climate change and it leads the world in renewable energy (mitigation)
- The government has been instrumental in implementing the Western China Development project, created in 2000, to help the western provinces to catch up with coastal areas. The main components of the strategy include the development of transport, hydropower plants, energy, and telecommunications, enticement of foreign investment, increased efforts on ecological protection, promotion of education and retention of talent flowing to richer provinces (causality)
- Hong Kong's economy has experienced setbacks due to months of anti-government protests. Businesses have been forced to shut for days at a time, transport has been disrupted and tourists have stayed away. The government has forecast the city will experience its first annual recession since the global financial crisis in 2009 (risk)

AO2

Application of knowledge and understanding is deployed to evaluate whether economic change in China is primarily due to political factors. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- The influence of political factors on economic change varies by location (place). Although established by a communist government, SEZs were deliberately located far from the centre of political power in Beijing, minimising political influences. More specifically, the original four zones were sited in coastal areas of Guangdong and Fujian that had a long history of contact with the outside world through outmigration, and at the same time were near Hong Kong, Macao and Taiwan (place / identity). The choice of Shenzhen was especially strategic because it is situated near Hong Kong, the key area from which to learn capitalist modes of economic growth (globalisation). The current disruption to Hong Kong's economic change which is down to political factors resulting in the change in Hong Kong's political status
- Changes over time including the recent Sino-US trade war operating as important constraint on economic activity (time-scales)
- The growth in economic activity in these coastal locations, which minimise costs and maximise export opportunities, has been reinforced by the investment decisions of TNCs (globalisation)
- China's physical geography also has a role to play. Agriculture is concentrated on the plains and deltas to the east. Raw materials such as coal also influence the location of manufacturing industry: although coal deposits are widely scattered (some coal is found in every province), most of the total is located in the northern part of the country (causality)
- During Mao's era, rural industries called town and village enterprises (TVEs) produced heavy goods such as iron, steel, cement, chemical fertiliser and farm tools. After 1978 these enterprises expanded to develop a wider range of businesses. Many Chinese farmers preferred to invest their resources in rural industry rather than agriculture. This encouraged the growth of small businesses run by the most successful peasants. A new entrepreneurial class began to emerge and TVEs have become the backbone of development in rural areas (causality)
- In addition to the political factors responsible for economic growth, other factors include the emergence and investment policies of TNCs (globalisation); high levels of rural-urban migration; the growth of an urban, educated, middle-class population whose members have become consumers themselves and who provide a large market for new consumer goods; lower labour costs; a highly skilled and educated workforce; technological factors, particularly the speed and distance over which communications and movement can now take place due to changes in computer, transport and communication technologies (causality/ interdependence). A combination of political (state support), economic (subsidies, tax concessions), social (education levels) and environmental factors (environmental concerns) have led to economic change
- The overwhelming impact of COVID-19 on recent economic change

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about political factors influencing economic change in China
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether economic change in China is primarily due to political factors

Credit other valid approaches.

9. 'Climate variability is the most important constraint on development.' Discuss with reference to two or more Sub-Saharan African countries. [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.9

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1
Knowledge and understanding of climate variability as a constraint on the development of two or more Sub-Saharan African countries could include:

- Climate variability includes variations in temperature and precipitation spatially and temporally
- The influence of climate variability (increased frequency, intensity and magnitude of droughts, intense rainfall and flooding, rising temperatures) (risk)
- Climate variability has an adverse effect on food and water security, water quality, energy and sustainable livelihoods (risk)
- Floods and droughts have led to crop failures and chronic year-round food deficits
- Crop failures result in food insecurity and malnutrition, particularly among vulnerable rural communities (where a high proportion of SSA population live) dependent on subsistence agriculture (risk)
- Women are impacted disproportionately because of their role as water collectors: droughts result in longer journeys to collect water (inequalities)
- Floods and droughts have resulted in the disruption of hydropower generation along rivers such as the Zambezi River (a 2019 record low discharge at the Victoria Falls of 109 cumecs is a 60th of 1977 discharge levels) affecting electricity generation in Zimbabwe and Zambia
- Floods result in water pollution and the increased incidence of malaria, cholera and diarrhoea (risk)
- Drought has affected the reproduction and migration of wildlife on which the rural population depend for their subsistence
- Increasing droughts and floods disrupt water supplies (availability, quantity and quality) which are critical for human and industrial use
- Droughts lead to land degradation, loss of soil fertility and forest fires e.g. Malawi's forestry sector (both commercial plantations of eucalyptus and indigenous Miombo woodlands which provide important source of wood, fuel and food for local people)

AO2

Application of knowledge and understanding is deployed to discuss whether climate variability is the most important constraint on the development of two or more Sub-Saharan African countries. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- SSA countries are particularly vulnerable to the effects of climate variability because of their low adaptive capacity (resilience / adaptation).
- The constraints associated with climate variability will not be felt in isolation, but in the context of other constraints presented by the physical environment and resource base of the countries selected for discussion together with the influence of economic, political and social factors (interdependence)

- Constraints on one type of economic activity may impact on other areas of development. Drought may render land less productive and can lead to food insecurity and problems with agriculture. This can, in turn, bring economic hardship and can lead to outmigration, placing increased pressures on urban centres (interdependence)
- The impact of climate variability on development will vary according to the adaptive capacity of the individual, society and region (resilience) and strategies to mitigate against climate variability (mitigation)
- Changes over time as climate is likely to become more variable over time, whereas other constraints, such as relief, will not (time scale)
- Constraints associated with climate variability vary spatially (place) and between different groups (inequalities). Crop failures due to climate variability result in food insecurity and malnutrition, particularly among vulnerable rural communities. Women are impacted disproportionately because of their role as water collectors: droughts result in longer journeys to collect water (inequalities). In urban areas floods result in water pollution and the increased incidence of malaria, cholera and diarrhoea, particularly in slum communities e.g. Bwaise slum, Kampala, Uganda
- The interdependence of climate variability and other factors. Floods and droughts have resulted in the disruption of hydropower generation along rivers e.g. Shire River, one of Malawi's major energy sources. Increasing droughts and floods disrupt water supplies (availability, quantity and quality) which are critical for human and industrial use
- Climate variability may be associated with benefits e.g. development of climate resilient crops (adaptation / mitigation)
- In addition to climate variability, there are significant economic, political and social constraints on the development of Sub-Saharan African countries

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about the influence of climate variability on the development of two or more Sub-Saharan African countries
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether climate variability is the most important constraint on development in two or more Sub-Saharan African countries

Credit other valid approaches.

10. 'National governments are more effective at promoting development than international agencies.' With reference to two or more Sub-Saharan African countries, to what extent do you agree? [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.14

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of strategies introduced by national governments and international agencies to promote the development of two or more Sub-Saharan African countries could include:

- Most SSA countries have a national development plan which covers health, education, water, trade and infrastructure and identify its priorities e.g. through its Growth and Transformation Plan (GTP), Ethiopia aims to reach lower middle-income status by 2020-23. During the first 5 years (GTP I 2010/11-2014/15), Ethiopia's economy registered an annual average GNI growth rate of over 10 per cent
- There are a wide variety of international aid agencies and NGOs working to promote development in SSA countries. Large International NGOs (INGOs) including OXFAM, Save the Children, Christian Aid, World Vision and Islamic Relief have a recognised lobbying role. INGOs fund local NGOs on the ground in different SSA countries. Aid contributes to national development plans by providing infrastructure, improving governance and accountability, encouraging capacity building, providing basic services, technological support, encouraging trade and increasing empowerment (globalisation)
- International organisations (IGOs) such as the World Bank, WTO and International Monetary Fund (IMF) aim to encourage national governments to reject protectionist policies and adopt a free trade approach. The World Bank provides direct grants and loans to SSA countries, and each country receives an allocation (globalisation)
- UN agencies include the World Food Programme, UNICEF, UNHCR and UNDP.The UN has been a major driver of social development in all Sub-Saharan African countries through its MDGs, now superseded by the SDGs (globalisation / sustainability)

AO2

Application of knowledge and understanding is deployed to evaluate whether national governments are more effective at promoting development than international agencies in two or more Sub-Saharan African countries. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- The interdependence of the work of national governments and international agencies (interdependence). National governments are likely to have a better understanding of what can/will get done as aid agencies may be unaware of a country's political complexities
- The effectiveness of strategies introduced by national governments to promote development varies spatially and according to the countries selected for discussion. Ethiopia's strong governance contrasts markedly with the corruption of the government of the DRC (place) where strategies introduced by international agencies are likely to be more effective

- The relative importance of factors may vary according to scale. National government strategies may be more effective at the national scale whereas NGO strategies may have considerable success at the local scale (spatial scales). NGOs operating at the local level avoids the politicisation of aid
- The effectiveness of national government strategies may be more effective in some regions of a country than others because of ethnic divisions e.g. northern Nigeria (place)
- The effectiveness of strategies introduced by national governments to promote development varies temporally. Political instability disrupts the effectiveness of national government strategies, as with the recent political instability in South Sudan (causality / place)
- The influence of international agencies such as the IMF and World Bank may hamper attempts by national governments to promote development. The IMF channels loans from wealthy countries to those that apply for help, but in return recipients must agree to operate free market economies open to outside investment and are likely to demand fiscal prudence beyond what a national government is willing to commit to (globalisation)
- Often the role of the IMF and World Bank ~~is~~ was controversial as they imposed strict financial conditions on borrowing requiring governments to cut back on social programmes such as health care, education and sanitation (SAPs). More recently countries have been encouraged to draw up more collaborative Poverty Reduction Strategy Papers (PRSPs) (time-scales)
- The effectiveness of strategies introduced by national governments to promote development varies by interest group. In most sub-Saharan African countries women are often at a disadvantage because the structural, financial institutions of the country do not allow women to develop as entrepreneurs. Microfinance schemes offered by NGOs such as BRAC working in Sierra Leone provide microloans and enterprise loans to women (and some men) to help them engage in income generating activities (inequalities)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about strategies introduced by national governments and international agencies to promote the development of two or more Sub-Saharan African countries
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether national governments are more effective at promoting development than international agencies in two or more Sub-Saharan African countries

Credit other valid approaches.

11. 'There is limited correlation between the global distribution of fossil fuels and the global pattern of energy demand.' Discuss this statement. [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.4.1/3.4.3

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the global distribution of fossil fuels and global patterns of energy demand could include:

- The global distribution of fossil fuels is uneven (inequality)
- Fossil fuels are formed over geological time from the decayed remains of animals and plants. They are concentrated in specific locations where geological conditions influenced oil and gas traps and the formation of deltaic swamps in which coal formed (causality)
- Coal is the most widely distributed and abundant fossil fuel in the world. By region, Asia Pacific holds the most proved reserves, split mainly between Australia, China and India. The US remains the largest single reserve holder
- Natural gas provides a source of relatively clean and relatively cheap energy. The largest reserves are concentrated in the Russian Federation and in Iran and Qatar in the Middle East. The US has been the world's biggest producer of natural gas since 2010
- Although the US is now the world's biggest oil producer, the greatest concentration of recoverable reserves are recorded in Venezuela (47.3 thousand million tonnes), Saudi Arabia, Canada and Iran
- Global patterns of fossil fuel demand correlate with development and are currently concentrated in HICs, NICs and BRICS

AO2

Application of knowledge and understanding is deployed to discuss whether there is limited correlation between the global distribution of fossil fuels and global patterns of energy demand. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Spatial variation in the degree of correlation. Some countries have both an abundance of fossil fuels and a high demand for energy e.g. USA; some have limited fossil fuels but a high demand for energy e.g. Japan, France and yet others have an abundance of fossil fuels but a relatively low demand for energy e.g. Algeria, Libya, Nigeria (inequalities)
- Changes over time (time scales). Technological changes increase the availability of fossil fuels through the development of unconventional oil sources such as shale gas, tar sands and extra-heavy oil e.g. a decade ago the US was heavily dependent on imported crude oil, but a combination of the fracking 'revolution' and the opening up of new drilling areas has transformed the situation
- Fossil fuels are finite and there is a general consensus between industry leaders and analysts that world oil production will peak between 2010 and 2030 (sustainability). As a result, countries are increasingly using alternatives to fossil fuels to meet energy demand e.g. the UK oil industry is predicted to be in its last decade of oil and gas production. The proportion of the UK's power generation mix made up by fossil fuels has fallen to a record low after renewable energy became the UK's largest source of electricity (39%) in the third quarter of 2019 (mitigation / adaptation)

- Changes over time due to changes in energy demand (time scales). There is a strong positive correlation between GNI per capita and energy usage. Demand for energy is driven by a combination of population growth, economic development and increased living standards, particularly in the NICs, BRICs, MINTs and Middle Eastern states at present (globalisation). However, energy demand within developed economies such as Europe, North America and Japan is predicted to stabilise, or in some cases decrease e.g. Sweden (see following bullet point). By the 2030s, India is predicted to emerge as the world's largest growth market for energy with countries in Africa playing an increasingly important role in driving energy demand
- Although at present, most energy demand is met by fossil fuels, meeting UN emissions targets and economic growth (the Environmental Kuznets Curve) has been associated with the increased use of renewables to meet demand as a major pathway to a more sustainable energy future (sustainability) e.g. Sweden's economy is very energy intensive due to its broad manufacturing base and high living standards. Sweden has one of the lowest carbon economies of all OECD countries. Sweden's electricity supply is virtually carbon free as 92 per cent of electricity is generated from renewables, predominantly hydropower and biomass. Greater efficiency (in 2000 per capita usage of electricity was 15.7 mWh/capita which had fallen to13.5 mWh/capita usage of electricity by 2014) has reduced the demand per capita and reduces costs. Sweden seeks to achieve a fossil fuel independent fleet by 2030 (adaptation / mitigation)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about the global distribution of fossil fuels and global patterns of fossil fuel demand
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether there is limited correlation between the global distribution of fossil fuels and global patterns of energy demand

Credit other valid approaches.

12. 'A country's energy mix is mainly determined by its physical geography.' To what extent do you agree? [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.4.2/6

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of a country's energy mix and its physical geography could include:

- The energy mix of a country is the specific combination of different energy sources it uses to meet its energy consumption needs
- The physical geography of a country (causality) influences its energy mix for security and economic reasons, including specialised location factors (place) of geology, climate, relief and locations with favourable conditions for energy generation from tides, waves, geothermal energy and biofuels (causality) e.g. Botswana has significant reserves of coal estimated at over 200 billion tons, the country's amount of solar insolation is one of the highest levels in the world, and as the country is landlocked and high pressure dominates, average wind speeds are too low to make wind energy attractive. Iceland utilises hydropower from glacial meltwater and geothermal energy from tectonic processes: 87 per cent of Iceland's electricity comes from hydropower and the remaining 13 per cent from geothermal power
- Some countries are heavily dependent upon a narrow range of energy sources e.g. Iceland; some depend upon a more diversified energy mix e.g. Japan. For some countries, they can exploit their physical geography to supply energy e.g. Iceland; others rely on imports e.g. Japan due to a lack of usable domestic resources (risk)

AO2

Application of knowledge and understanding is deployed to discuss whether a country's energy mix is mainly determined by its physical geography. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- The influence of stage of development on a country's energy mix. As a country develops and energy demand increases, the energy mix will change (causality)
- In LICs energy consumption is low and based on burning fuelwood and other biomass. The use of traditional sources of energy such as fuelwood and animal dung by developing countries is due to their low cost as well as accessibility (causality) compared to other energy sources; lower level of technology will also limit the use of other sources of energy
- As economies develop, increasing manufacturing (as in China following the Open-Door Policy), rapid urbanisation and rising living standards lead to growing energy demand and a broadening of the energy mix (causality). Traditional sources of energy such as fuelwood and animal dung diminish in importance in emerging economies and fossil fuels replace traditional sources e.g. in Vietnam the contribution of traditional sources of energy is declining, with fossil fuels, wind, solar, nuclear and biofuels taking a greater share

- Advanced economies dominated by tertiary and quaternary activities increasingly depend on secondary energy supplies, such as electricity, generated from a wide mix of fuels
- The influence of security of supplies on a country's energy mix (risk). Oil crises and subsequent rises in oil prices in 1973 and 1979 led many countries to develop alternative energy sources e.g. biofuels in Brazil, which are dependent on the country's physical geography e.g. the expansion of France's nuclear power capacity from 1974 due to the lack of indigenous energy resources (adaptation)
- The role of government policies on a country's energy mix. International emissions' targets such as those set out in the Paris Agreement (2016) have led countries to implement energy policies to mitigate against climate change (sustainability) and depend more on the energy sources available from their physical geography e.g. wind, wave, solar and biofuels. In many countries e.g. Sweden, Denmark, UK there has been a shift towards cleaner fossil fuels and renewables. Government taxation policies can promote renewable energy, as in Germany, through community grants and subsidies (mitigation)
- The influence of environmental concerns. High levels of air pollution in cities has been the catalyst for China's ambition for a cleaner energy mix (sustainability) although its abundant coal reserves remain an important energy source
- The influence of geopolitical factors e.g. German public distrust following the Fukushima nuclear disaster in 2011 (risk) has led to the policy decision to phase out nuclear power in Germany by 2022 (adaptation / mitigation) e.g. the decision by the US to increase domestic oil and gas production in order to reduce dependence on the Middle East and improve energy security (adaptation / mitigation)
- The influence of localised conditions (scale). While part of the national mix, a country's energy sources might be strongly influenced by a particular local source of energy e.g. small scale HEP; biomass in rural areas e.g. West Wales, Devon; biofuels in cities e.g. Växjö, Sweden
- The influence of changes over time (time-scales) as technological developments lead to the availability of new sources of energy both due to a country's physical geography and as the result of energy innovations e.g. battery storage
- The Climate Emergency and COVID-19 have impacted on energy-mix usage especially the demise in fossil fuels (risk)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about the influence of physical geography on a country's energy mix
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions on whether a country's energy mix is mainly determined by its physical geography

Credit other valid approaches.

13. 'The characteristics of the world's major climate types are the result of the global atmospheric circulation.' With reference to two climate types, to what extent do you agree? [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.5.1/2

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the characteristics of two of the world's major climate types and the global atmospheric circulation could include:

- Global atmospheric circulation gives rise to the low- and high-pressure belts and the planetary wind systems associated with the Earth's three major convection cells: the Hadley, Ferrell and Polar cells. These make up the tricellular model that controls atmospheric movements and the redistribution of heat energy. On the earth's surface, there are seven latitudinal pressure belts. They are the Equatorial Low, the two Subtropical highs, the two Subpolar lows and the two Polar highs. With the exception of the Equatorial low, the pressure belts form matching pairs in the Northern and Southern Hemispheres. The troposphere thins towards the poles and the tropopause is broken into three distinct zones. At these points, the powerful eastward moving high altitude winds called jet streams occur (causality)
- Winds blow from high pressure to low pressure, however, as a result of the Coriolis force caused by the Earth's rotation, winds are deflected to the east in the Northern hemisphere and to the west in the Southern hemisphere (causality) e.g. prevailing south-westerly winds characterise UK's cool temperate west coast margin climate
- Ocean currents are set in motion by the wind blowing across the surface of the oceans (causality) e.g. the Humboldt current has a cooling influence in the climates of the Galapagos Islands, Ecuador and Peru. It is also responsible for the dryness of the coastal areas of these three countries since the current cools the marine air which, in turn, causes little or no precipitation. Differences in the density of sea water are also very significant in large scale ocean currents e.g. thermohaline circulation. A distinction may be made between surface currents and those at depth
- Seasonal movement of the ITCZ and associated pressure belts result in seasonal variations in each climate type (time scales)
- The Monsoon climate is marked by a distinct hot wet and a cooler dry season determined by the annual movement of the ITCZ between the tropics and associated movement of pressure belts and seasonal reversal of winds consequent on this (causality). This climate type is most clearly seen in the Indian subcontinent.
- The cool temperate west coast margin climate (marine) of the UK is characterised by relatively mild temperatures (average seasonal range 5–20ºC) with high humidity and precipitation (averaging 600 mm) throughout the year. The main influences on the cool temperate climate are the result of global atmospheric circulation: the influence of the mid-latitude low-pressure belt and the atmospheric conditions along the polar front as well as the influence of the upper jet stream and the seasonal shift of the pressure and wind belts (causality)

- The Savanna climate type is characterised by high temperatures of 35–25ºC all year, a hot, wet season and a marginally cooler, dry season. The main influences on the climates of tropical regions are the result of global atmospheric circulation: the overhead or near-overhead position of the sun giving high insolation throughout the year, the position and seasonal movement of the ITCZ together with the tropical pressure belts' wind systems and the path of the upper jet streams affecting the path of low-pressure systems (causality)
- The climate of the Arctic is characterized by long, cold winters and short, cool summers. The high latitude of arctic environments results in very low temperatures with average temperatures ranging between -5ºC and -10ºC, long dark winter months when temperatures fall below -20ºC and high winds. Arctic regions are dominated by high pressure and subsiding air leading to low mean annual precipitation of below 150 mm. During the short growing season daylight hours are long, but the sun's angle is so low that temperatures rarely rise above 10ºC.
- The AO1 content refers to likely world climate types that will be covered, but allow any major climate type

AO2

Application of knowledge and understanding is deployed to evaluate whether the characteristics of two of the world's major climate types are the result of the global atmospheric circulation. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Although global atmospheric circulation gives an important indication of broad climate types in terms of pressure systems and winds and drives ocean currents, there are other important influences including: continentality (the differential heating of land and sea affecting pressure patterns and seasonal wind directions) and altitude (influencing both precipitation and temperature) (interdependence)
- The role of world ocean currents which are influenced by the distribution of the land masses as well as the Earth's tilt and rotation (causality)
- The influence of continentality. The Monsoon climate regime is most clearly seen in the Indian subcontinent, because of the size of the landmass and its relief (causality)
- The influence of altitude. The cool temperate climate is modified by altitude: temperatures are lower and precipitation totals are significantly higher over upland areas in the face of prevailing moist westerly winds coming off the ocean, e.g. in the Cambrian Mountains of Wales. Conversely, precipitation totals are lower in rain-shadow areas, e.g. lowland East Anglia and summer temperatures are higher (causality)
- The influence of periodic changes associated with ENSO, NAO and the Indian Ocean Dipole
- The cool temperate climate is also influenced by the position and interaction at the margins of different air masses (causality)
- Anthropogenic climate change is having an increasing influence on climate types, mainly associated with extremes of precipitation and temperature (place / thresholds)
- At the micro-scale human activities have an influence on temperature, wind, precipitation and humidity in urban areas (scale)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about two of the world's major climate types and the global atmospheric circulation
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill in reaching conclusions about whether the characteristics of two climate types result from the global atmospheric circulation

Credit other valid approaches.

14. 'The environmental impacts of reaching atmospheric tipping point are likely to be greater than the economic impacts.' Discuss. [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.5.7

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the likely environmental and economic impacts of reaching atmospheric tipping point could include:

- The tipping point is the theoretical point after which the effects of climate change or catastrophic environmental changes become irreversible (risk / thresholds) affecting food production, energy supplies, infrastructure and health
- Tipping point may be referred to in terms of CO_2 / CH_4 / H_2O levels (ppm), but is more likely to be discussed in terms of temperature e.g. + 2° C over the long-term average (threshold)
- Tipping point may be placed in the context of global and/or regional climate and sea-level changes (scale)
- A 2018 IPCC report concluded that the impacts of 1.5 ° C of human-induced global warming above pre-industrial levels are anticipated to be far greater than expected. The effects of a 2° C increase will be even more severe (causality)
- Extremely hot days, such as those experienced in the northern hemisphere in the summer of 2018, will become more severe and common, increasing heat-related morbidity and mortality, causing more forest fires e.g. Siberia, se Australia and California 2020 and lowering productivity among workers (causality / risk)
- Increases in temperature and changing precipitation patterns are associated with the spread of vector-borne diseases (causality)
- Increased threats to ecosystems - insects, which are vital for pollination of crops, and plants are almost twice as likely to lose half their habitat at 2°C compared with 1.5°C. Corals would be 99 per cent lost at the higher of the two temperatures (risk). Ecosystems provide provisioning services (e.g. food), regulating services (e.g. CO_2) and supporting services (e.g. soil formation)
- Coastal flooding - sea-level rise would affect 10 million more people by 2100 at 2°C compared with 1.5°C, placing a forecasted 10cm additional pressure on coastlines (risk). Coastal flooding would destroy many urban areas as approximately 40 percent of the world's population live within100 km of the coast
- Ocean fisheries – marine fisheries catches would be 3m tonnes lower at 2°C, twice the decline at 1.5°C, due to elevated acidity and lower levels of oxygen (risk). Oceans provide approximately 20 percent of human dietary protein
- Reduced snow and altered rainfall patterns may reduce hydropower and tourism potential
- Other predicted impacts include large-scale singular events (e.g. ice sheet collapse), river flooding, decreased crop yields and increased water insecurity and restrictions (risk) adversely affecting food and water security, water quality and energy supply (causality)

AO2

Application of knowledge and understanding is deployed to evaluate whether the environmental impacts of reaching atmospheric tipping point are likely to be greater than the economic impacts. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- The interdependence of environmental and economic impacts. Reaching atmospheric tipping point is likely to have a profound effect on the ecosystems that provide food therefore the economic activity of food production is directly linked to the security of ecosystems
- The relative importance of environmental and economic impacts may vary temporally (time scale). Initially the impacts on the environment may be greater but over time the economic impacts are likely to be increasingly felt
- Atmospheric tipping point may be associated with economic benefits e.g. development of climate resilient crops (resilience / adaptation / mitigation) and the growth of crops in more northerly latitudes (place) and the opening up of Arctic sea routes
- Mitigation through technological and political solutions and adaptation aim to minimise the environmental and/or economic effects (mitigation / adaptation)
- The environmental and economic impacts of reaching atmospheric tipping point are likely to vary spatially (place) e.g. the dramatic impacts in the Arctic
- The environmental and economic impacts of reaching atmospheric tipping point are likely to vary between different groups (inequalities) e.g. indigenous groups such as Sami, Scandinavia
- The environmental and economic impacts of reaching atmospheric tipping point are likely to vary according to the adaptive capacity of an area (resilience / adaptation)

AO3

Skills evidenced could include:

- The skill in presenting well-constructed, coherent and logical arguments about the likely environmental and economic impacts of reaching atmospheric tipping point
- The skill in constructing relevant diagrams and tables which can be annotated to meet the requirements of the question
- The skill in covering both the breadth and depth of the question
- The skill of reaching conclusions about whether the environmental impacts of reaching atmospheric tipping point are likely to be greater than the economic impacts

Credit other valid approaches.