

ENVIRONMENTAL MANAGEMENT

Paper 8291/11
Paper 11

Key messages

Candidates could improve by being more precise in their answers by adding detailed information from the data provided and their subject knowledge.

In **Section A**, candidates should consider the command word for the question, using it to instruct them on how to write their response.

In **Section B**, candidates should include anomalies in their descriptions of patterns in data.

In **Section B**, candidates could develop their responses further by including detailed case studies and examples which could be critically evaluated.

General comments

There was a good response to all questions on the paper, with candidates scoring slightly higher in **Section B** compared to **Section A**. Candidates generally performed better on **Question 1** (structure of the Earth and natural hazards) than **Question 2** (greenhouse effect and climate change). Topics that were found most challenging were using paleomagnetic data, evidence for plate tectonics, and scientific monitoring of the atmosphere.

In **Section B**, **Question 5** was the most popular choice from the optional questions, with fewer choosing **Question 3** and far fewer choosing Question 4. Candidates used some subject specific vocabulary in their responses in **Section B**. The responses where candidates were selective on the content covered allowing time to increase the depth of their answer were more successful than those who wrote a broad and general response on the subject.

Comments on specific questions

Section A

Question 1

- (a) (i) Many correct responses were given with candidates able to consider the relative movement of the two plates on the map and correctly name the type of boundary.
- (ii) Many good responses to this question included the idea that magma was rising in the mantle and described the overall movement as a convection current. Candidates could develop this further by describing the origin of the heat to show a wider understanding of the internal processes of the Earth. Some candidates were vague in their description of the plate movements, sometimes describing the plates moving in opposite directions; this could also be a description which would relate to a conservative plate boundary.
- (iii) Candidates needed to understand how to include evidence in their response and to be able to explain evidence. The evidence available for candidates to describe included the symmetrical data of the polar reversals either side of the mid ocean ridge and some candidates were able to include this. To explain the pattern, candidates needed to refer to the fact that the pattern was formed as the new sea floor was forming at the ridge and then moving apart on both sides. A number of candidates erroneously described the areas of normal and reversed magnetic polarity being able to repel in order to push the plates away from each other.

- (b) (i) This question was usually answered well. The majority of candidates were confident in using the distance and time data to calculate the speed at which the plate was moving. Many candidates rounded the answer appropriately. A very small number of candidates calculated the speed incorrectly by dividing time by distance.
- (ii) Many good responses to this question included a wide range of strategies which a country like Iceland could use to protect its people from volcanic hazards. Many candidates outlined strategies from the syllabus very successfully including chemical analysis, tiltmeters and seismic activity. Some candidates could have improved their answer by ensuring that they included four distinct strategies. Strategies such as building volcano proof buildings, barriers or channels have not been widely used in managing volcanic hazards.
- (c) Stronger answers were characterised by candidates using what they had found out from **Fig. 1.3** and linking it to their knowledge of post-Pangaea plate movement. Some excellent responses identified the distribution of fresh water reptiles and considered how the nature of organism migration meant that these fossils could not have been distributed if the continents had always been in their present location and therefore the continents must have been together to allow movement of the organisms across the land. Responses which needed some development included an explanation that the evidence shows the continents were together but now apart; this describes the movement but does not explain the significance of the evidence.

Question 2

- (a) (i) Many candidates made a good attempt to analyse the data in the sea level change graph. The most successful candidates noted that they were looking for the largest increase and therefore calculated the increase from the minimum at 2020 to the maximum at 2060. Some candidates only considered the maximum value for 2020 and 2060 and therefore their increase was 0.06 m too small.
- (ii) The vast majority of candidates were able to calculate the range between the maximum and minimum predicted value for 2080 and many clearly showed their working for this calculation.
- (iii) Many excellent responses gave impacts that were clearly linked to **Fig. 2.2**. Candidates described how the sea would reach the 0.5m contour causing a loss of beach material and restricting access to the fishing platform. The best responses then included the idea that at high tides or during storms the waves could reach the road or the hotels and described the consequences involved. Some candidates needed to improve the precision of their answer by referring to the high tide as in regular sea conditions the water would not reach the road. A few candidates considered the impact on the city centre which could not be determined from the map.
- (iv) The best answers outlined how named gases were emitted from named human activities and went on to include that these greenhouse gases limited or reduced the escape of outgoing radiation, which led to an increase in global temperatures causing glaciers to melt. Candidates who needed to improve their response often stated that the heat all gets trapped in the atmosphere suggesting that none can escape, which is not the case. Some candidates discussed ozone here which does not link to the enhanced greenhouse effect. Many candidates described how ice caps and polar ice may melt and a few mentioned the thermal expansion of water.
- (v) A few candidates formed a well-linked response to this question where they correctly described afforestation and went on to discuss how, with a greater number of trees, the photosynthesis rate would increase and this would lead to greater storage of carbon by plants due to plants using carbon dioxide. This in turn would reduce the amount of carbon dioxide in the atmosphere meaning less heat radiation would be absorbed. A number of candidates needed to build on their description of afforestation to explain why it is effective; some needed to add more detail to the idea that trees can “clean” the air. The idea that afforestation is the opposite to deforestation needed more detail for the candidates to demonstrate their understanding.

- (vi) Stronger answers were characterised by candidates considering the issues surrounding global monitoring rather than considering the challenges of reducing emissions. Many good responses included the sources of pollutants being both natural and human, including examples comparing the acidic emissions in industry to acidic volcanic emissions. Some candidates repeated the question by stating that monitoring was difficult. They needed to elaborate by considering how the measurement itself or the calculations may be difficult. The idea that historical data was limited and therefore comparisons hard to make was well explained by many candidates.

Section B

Question 3

- (a) **Fig. 3.1** showed the data on the frequency of deadly landslides and the average precipitation over a twenty-year period and the question asked candidates to describe the data and explain the relationship between these variables. Generally, some responses gave a clear description of the patterns in the data, describing general trends and selecting values which supported the trends. A few candidates developed this further by identifying anomalies within the data and identifying that at times there was a delay between a peak precipitation and a peak in landslide frequency. Some excellent responses were able to apply their knowledge of landslides to explain the role of precipitation in triggering landslides and some excellent responses suggested reasons which would lead to the anomalies identified.
- (b) A range of strategies described using subject specific vocabulary formed the first part of some good responses to this question. Effective strategies discussed included slope angle reduction, drainage, afforestation and surface protection; many candidates were able to describe how each of these methods could be used. Responses that needed more development in this area included candidates who discussed the disaster management after a landslide rather than slope management to reduce the risk of landslides. The key area where many candidates needed to develop their answer further was in using examples of countries of differing economic development. Here, many of the examples were limited to a named country rather than a specific project or area, and often only the difference in funding was discussed rather than level of demand for land, insurance costs, value of land, expertise in planning and materials available. Some excellent responses included a case study from a LEDC and one from a MEDC and discussed specific differences between the two settings, following on from this a consideration of the success of the management in each situation.

Question 4

- (a) There were some good responses to this question where candidates effectively used the information provided in **Fig. 4.1**. Some candidates gave detailed descriptions of the patterns the deep ocean currents made using the continents and named oceans as reference points. Some candidates repeated their descriptions where they needed to give additional information, which limited the credit they could achieve. Candidates could improve their responses by explaining the effect of ocean currents on global climate; ideas such as the ocean being able to store heat energy from the sun and currents helping to distribute this heat around the Earth were included by a small minority of candidates.
- (b) Some candidates met many of the requirements of this question by writing a balanced discussion on the extent to which renewables could replace fossil fuels along with the reasons why fossil fuels would still have a role in society. The majority of candidates were able to explain the benefits that using renewable energy would bring, including the long-term output of renewable energy schemes and the reduction in carbon dioxide emissions due to fewer fossil fuels being burnt, while some discussed how different types of renewable energy would be suited to different locations. To improve their responses, candidates needed to balance these ideas by considering the limitations of renewable energy sources and why fossil fuels would be of use. This might include the challenge of getting planning permission for renewable schemes due to their impact on the local environment. In isolated locations, where vehicles are too far from electric charging points, improving efficiency in systems would mean the amount of fossil fuels needed would be much lower. Some candidates compared the use of renewables in MEDCs and LEDCs, although this was often limited to a statement that MEDCs could afford renewable projects while LEDCs could not and would therefore need to use fossil fuels. This needed more consideration, the long-term ongoing costs of importing fossil fuels being significant.

Question 5

- (a) Many candidates chose to answer this question and many covered the requirements well. The challenges surrounding a growing population and the unreliable nature of solar and wind power were discussed. Some candidates discussed the cost of installing more renewable schemes, which was not relevant as the schemes had already been built. Few candidates discussed the fact that the island had used a range of sources so that at times when one was limited another source would be of greater use. The joined-up nature of the sources on the island was often missed as was a suggestion that a national grid would allow electricity to reach all parts of the island.
- (b) A range of considerations which governments must take into account when planning an energy policy supported by an evaluation of examples was seen in good responses to this question. Those candidates who provided balance between social responsibilities, environmental concerns and the country's economy gave the strongest responses. Candidates covered ideas on population and providing an affordable electricity supply for people to maintain a good quality of life. The environmental impacts of different sources of energy combined with a country's commitment to international treaties showed some balance in the government's responsibilities. Many candidates focussed fully on the economic concerns, looking at the cost of building renewable schemes, being able to maintain productivity in countries relying on manufacture and the cost of importing fuels. These answers could have been improved by providing a balanced argument between environmental responsibilities and the needs of society. Some ideas on LEDCs and MEDCs needed some development as some responses were limited to all LEDCs being crowded with no space for a renewable scheme; the idea of rural and urban settings and the differences in meeting the needs of each area could have been discussed. The concept of a national grid would have developed discussion in some responses, as often candidates described electricity needing to be produced at the exact location it was needed.

ENVIRONMENTAL MANAGEMENT

Paper 8291/12
Paper 12

Key messages

- In **Section A**, candidates should consider the command word for the question, using it to instruct them on how to write their response.
- The data provided within each question in **Section A** should be used as evidence to incorporate into responses.
- Candidates need to make sure that they understand the data provided and manipulate it to use in answers.
- Candidates should consider the whole question and be selective when choosing what to include in responses in **Section B**.

General comments

There was a good response to all questions on the paper with candidates scoring slightly higher in **Section B** compared to **Section A**. Candidates generally found **Question 1** (structure of the Earth and natural hazards) more straightforward than **Question 2** (climate). Topics that were found most challenging were designing buildings for earthquake prone areas, how seismic wave data provides evidence of Earth structure, air pressure and the formation of tropical cyclones.

In **Section B**, **Question 3** was the most popular choice of optional questions, with fewer choosing **Question 5** and far fewer choosing **Question 4**. Candidates used subject specific vocabulary well in their responses in **Section B** and were able to provide balanced explanations supported by well selected examples. In order to achieve greater credit, candidates should consider including more details associated with named examples and provide more depth in their evaluation of these situations.

Comments on specific questions

Section A

Question 1

- (a) (i) Many correct responses were given with candidates able to link the relative movement of the plates to the named boundary. Candidates were able to demonstrate their understanding of the three types of boundary and understood the link between the type of boundary and how the plates would move.
- (ii) This question was usually answered well. Many candidates were able to describe the relative movement between the two plates and the idea that the plates were moving in opposite directions. Others simply stated that the plates were moving and needed to add more to their descriptions of this movement to gain credit. Many candidates used a range of ideas to explain that it was the build-up of pressure or energy between the plates which would lead to an earthquake or that friction between the two plates prevented plates moving smoothly past each other.
- (iii) Many good responses to this question included an identification of a risk associated with earthquakes and a description of why this would be a hazard. For example, candidates often discussed buildings falling down due to the ground shaking and that this caused loss of life and/or loss of property. Some good answers included describing how a tsunami may be caused by seismic activity and the hazard that this would cause to coastal communities. Some candidates

discussed volcanic hazards and although increased seismic activity is associated with volcanic activity, earthquakes do not cause volcanoes to erupt.

- (iv) Candidates found this question quite challenging; the stronger candidates were able to give a particular design feature of a building and describe how it would work to reduce the destruction associated with an earthquake. For example, some candidates suggested that shock absorbers could be used in the foundations of the building and that this would help as it would isolate the moving ground from the building, or that flexible piping could be used for gas mains as this would prevent rupture which could lead to fires. Many candidates described general characteristics such as a strong building without linking to how this would be achieved.
- (v) This question was answered successfully by the majority of candidates; most candidates used the data from **Table 1.1** and clearly understood what the data in the table meant. Candidates used the information to give a range of suggestions to account for why there was a difference in number of deaths between the two earthquakes. Candidates who answered very successfully gave four clearly different reasons for the data. A small number of candidates discussed distance from epicentre as a reason for the difference in number of deaths. This factor would account for a difference in magnitude between two earthquakes, but as the data shows the earthquakes are of similar magnitude, the distance from the epicentre would not be relevant.
- (b) Candidates who answered this question well did so by linking the data provided in **Fig. 1.2** with their knowledge of the internal structure of the Earth. Some responses included a description of the P waves travelling all the way through the outer and inner core and being detected on the other side of the Earth and this being due to P waves being able to travel through the liquid outer core. Other strong responses included describing the waves as bending or refracting when they travel through the Earth and linking this to changing densities of the layers within the Earth. The least successful candidates often repeated the information given at the beginning of the question and needed to develop their answers further.

Question 2

- (a) (i) Many candidates gained some credit for completing the table. Candidates often correctly identified the 60°N latitude as having low pressure but selected high pressure for the equator. Candidates needed to use **Fig. 2.1** and the direction of air movement to deduce what the air pressure would be rather than rely on their knowledge of the expected air pressure.
- (ii) Many candidates answered this question correctly even in cases where they had identified the equator as being an area of high pressure in **Question 2(a)(i)**. Candidates were confident in describing how the Sun's rays would be concentrated at the equator and would heat the air particles which makes them move away from each other thus reducing density and causing the air to rise.
- (b) (i) The most successful candidates were able to describe the tropical cyclone as an area of intense low pressure and many candidates referred to low pressure in their answers, followed by a reference to the violent storms associated to gain full credit. Other candidates discussed only the location of the cyclones.
- (ii) Many good responses included two distinct features of the distribution of the formation areas of the cyclones. Some candidates needed to mention two different factors as their answer included the tropic of Cancer and the tropic of Capricorn; this could be improved by identifying that the cyclones develop over oceans.
- (iii) Stronger answers were characterised by candidates using what they had found out about the global distribution of tropical cyclones and linking this to their explanation as why tropical cyclones occurred there. For example, some candidates linked the occurrence of low pressure near the equator allowing the air to rise with a strong vertical movement. The distribution of tropical cyclones over warm tropical oceans provided the water vapour which would be able to rise. Weaker answers gave general descriptions of weather patterns/characteristics without linking to the global distribution.
- (iv) The best answers gave a description of the characteristic sequence of weather associated with a tropical cyclone. Many good responses gave a description of the range of weather conditions

associated with tropical cyclones. Some candidates needed to give a broader answer considering the range of weather conditions.

- (v) Many excellent responses gave impacts that were clearly linked to the weather conditions associated with tropical cyclones and were clearly related to the setting of a low-lying coastal settlement. Others needed to add more detail as some responses were vague or in some cases described the impact of drought conditions rather than answering the question.

Section B

Question 3

- (a) **Fig. 3.1** showed some effects of a large explosive volcano which has forced sulfur dioxide into the stratosphere. Generally, many responses gave a clear description of the impact that each aspect of **Fig. 3.1** would lead to and there were many excellent responses. Candidates considered how the ash would have a local effect on buildings, the environment and health. They gave detailed explanations of the impact that the sulfuric acid would have on the natural and built environment when it reacted with water vapour to form acid rain. Candidates were able to bring together the increased reflection and increased absorption of solar radiation and explain how this would cause global cooling. Many responses then developed this further by linking to the consequent reduction in rate of photosynthesis and food supply issues. Candidates often linked these impacts to their understanding of Earth's energy budget. Some candidates needed to focus on the information given in **Fig. 3.1** and look at these impacts rather than write generally about the impact of volcanoes.
- (b) A range of local and global impacts caused by urban pollution linked to evaluated management strategies were seen in good responses to this question. Although candidates were able to give general impacts of urban pollution, often the impacts were vague and candidates could improve their answers by linking the source of a specific pollutant to the impact it would cause. A range of management strategies were suggested, including methods to reduce traffic on roads, increasing bike use or pedestrianisation and improvement of public transport provision. To improve these responses, candidates could bring in examples of where they have seen these strategies used, along with a detailed evaluation considering the extent to which they have been successful.

Candidates discussed the protocols and international agreements in depth and included many details in their answers. Strong responses often reflected on why certain agreements have been more successful than others and a few candidates developed their answers further to consider the challenges associated with managing the global impact of urban pollution.

Generally, answers were well organised, giving a balance of local and global impacts along with a range of management strategies. For further improvement, candidates needed to critically consider the success of projects by referring to examples which have been successful and those which have not.

Question 4

- (a) There were many good responses to this question where candidates effectively used the information provided in the profile and linked it to the setting where the profile was taken and the processes occurring in the soil. Candidates described the decaying leaves in the deciduous woodland as falling in autumn and being rapidly decayed by the work of earthworms. This was effectively compared with the tropical rainforest which had a thicker decaying leaf layer due to the continuous leaf fall. Candidates considered the role of precipitation in each setting and linked this to the leaching of minerals. Many candidates explained the role of chemical and biological weathering when looking at the breakdown of the bedrock. Some good answers included manipulation of the data provided and linked this to their explanations.
- (b) Candidates were able to explain why soil erosion occurred and could link this to a variety of farming practices. A small number of candidates used examples such as The Dust Bowl, USA as a case study to support their discussion; others discussed desertification in the Sahel and how soil erosion has occurred there. Some candidates expanded their causes of soil erosion and also considered urbanisation and increased rate of construction along with the associated deforestation. Weaker answers listed a range of situations which would lead to soil erosion and could improve by explaining how these caused soil erosion and by linking to examples. Most candidates were able

to provide a range of strategies to reduce soil erosion and used examples including terracing, afforestation and use of natural manure. These were often well explained. Further improvement could be made by referring to case studies and critically evaluating whether the strategies have been successful and how the success could be measured.

Question 5

- (a) **Fig. 5.1** presented data on the percentage of countries that experienced their hottest and coldest temperatures recorded in each decade (ten-year period) from 1960–2010. Many candidates were able to describe the patterns in the data; they could use data from the graphs to support their patterns and could make observations of the way each graph was similar and different. To improve their answers, candidates could have considered that the range in temperature was likely to be constant since as the coldest days decreased the hottest days increased. The most effective responses aimed to link precipitation and temperatures by discussing evaporation rates. Candidates could improve their answers by linking the data to weather conditions such as droughts and hurricanes.
- (b) Candidates were required to link their strategies to reducing the contribution of countries to climatic change. In some cases, candidates gave a broad response, covering all aspects of atmospheric pollution, which limited the time they could spend on contribution to climatic change. The strongest answers considered how strategies carried out by governments would reduce greenhouse gas emissions and illustrated with examples where efficiency of buildings was improved to reduce the amount of fossil fuels being burnt, vehicle use was limited to reduce fossil fuel consumption and coal fired power stations were replaced with a range of renewable energy schemes. Candidates could improve their answers by linking these strategies to the reduction in carbon dioxide emitted which, in turn, reduces carbon dioxide levels in the atmosphere leading to a reduction in global warming. This connection was, at times, vague and often candidates described pollutants in general rather than by naming a specific pollutant. There was an opportunity for critical evaluation of examples to decide whether the strategy would reduce the country's contribution to climate change. Some good responses considered afforestation as a strategy, illustrating this with a named case study. This could be developed by including a clear link between afforestation and increasing photosynthesis rate and the idea that this strategy would increase storage of carbon within the growing forest. The most successful responses maintained balance between a range of strategies, contrasting those which were successful with those that were not.

ENVIRONMENTAL MANAGEMENT

Paper 8291/13
Paper 13

Key messages

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In **Section B**, **Question 3** was the most popular choice of optional questions, with fewer choosing **Question 5** and far fewer choosing **Question 4**. Candidates used subject specific vocabulary well in their responses in **Section B** and were able to provide balanced explanations supported by well selected examples. In order to achieve greater credit, candidates should consider including more details associated with named examples and provide more depth in their evaluation of these situations.

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Section B

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to provide a range of strategies to reduce soil erosion and used examples including terracing, afforestation and use of natural manure. These were often well explained. Further improvement could be made by referring to case studies and critically evaluating whether the strategies have been successful and how the success could be measured.

Question 5

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ENVIRONMENTAL MANAGEMENT

Paper 8291/21
Paper 21

Key messages

- Candidates need to be aware of the equal balance between **Section A** and **Section B** of the paper and plan their time and answers accordingly.
- In **Section A**, candidates should note the number of marks available for each part question. This would give them an indication of the amount of content and detail expected.
- Candidates should be clear about the differences in meaning of command words such as state, suggest, explain, describe, outline and assess, to be sure that instructions are followed carefully.
- Candidates should avoid repeating the question in their answer to make best use of the time available during the examination. When asked to show working for calculations, candidates should always do so as credit may still be obtained for steps taken even if the final answer arrived at is incorrect.

General comments

There was a reasonably good response to all questions on this paper and performance was relatively even across the two sections. Topics which were found to be most challenging were the explanation of eutrophication and the effects of dam building. A significant number of candidates had difficulty describing changes to a food web.

Many answers showed a good understanding of terms and attention to detail, with effective use of exemplar material. The more successful responses included effective use of appropriate examples to illustrate key points along with supporting details using appropriate terminology.

Comments on specific questions

Section A

Question 1

- (a) (i) The main difficulty was with the second part of the question 'increased dam building in India' where candidates suggested that rivers flowed from the sea inland and therefore from Bangladesh to India. Consequently, answers focused on the results if the dam burst in India, rather than the consequences of interrupted river flow.
- (ii) This was generally well answered with strong responses discussing salt water intrusion and the effect on soil and crops. Weaker answers were not developed in terms of the impact of the changes such as destruction of buildings and migration of people.
- (b) (i) This was generally well answered with most candidates understanding the relationship between population growth and water scarcity.
- (ii) Most candidates were able to correctly calculate the answer. Candidates should show their working and should be cautious about rounding up unless specifically asked to do so.
- (iii) In general, candidates were familiar with the term water demand. Weak answers gave dictionary definitions of demand rather than related to the topic of population.
- (iv) Weaker responses gave long lists of domestic examples. Good answers referred to the domestic, industrial and agricultural sectors and gave appropriate examples for each.



Question 2

- (a) (i) This was well answered by the majority of candidates.
- (ii) The calculation was generally completed correctly. Errors were made in the interpretation of the scale of the graph or using the combined totals of each bar.
- (iii) The term eutrophication was most often given.
- (iv) Good responses detailed the processes involved in eutrophication including blocking of sunlight, reduced photosynthesis, decomposition and reduction of oxygen. Weaker responses were confused as to the sequence and often referred to different causes of the oxygen depletion.
- (v) Many varied and often quite detailed examples of pollution were suggested.
- (b) (i) Most correctly identified primary consumers. A significant minority took the term primary to mean the top and incorrectly named shark and dolphin.
- (ii) The most common error was to try and explain why tuna might be missing rather than the consequences.
- (iii) Candidates demonstrated a good understanding of different strategies to conserve marine ecosystems, and used examples such as the Great Barrier Reef. Some weaker answers referred to land based examples.

Section B

Question 3

- (a) Good responses to this question on the effects of human activity included positive and negative aspects of human involvement. Common errors were to use a marine example rather than refer to a terrestrial ecosystem, or importantly to not sufficiently consider the flow diagram.
- (b) Candidates referred to MEDC and LEDC countries without using specific examples, leading to answers of a generalised form. Similarly, the response often referred to resources and wealth of MEDC nations without selecting and developing specific examples. Some chose to focus on the growing population only and methods of birth control, rather than the protection of resources.

Question 4

- (a) Most candidates were able to suggest relevant reasons for the loss of ice and gave detailed descriptions of global warming. Greater reference needed to be made to the images of the glacier and discussion of the changes over the years, the loss of ice and the growth of the lake, and the increased rate of change shown by the dates.
- (b) Weaker responses focused on human activities which lead to global warming and did not show clear understanding of what an international protocol was. Kyoto and Paris were referred to in better answers but few candidates looked at the different types of water store and how these might be affected. Strong answers understood the difficulties encountered when trying to produce an internationally agreed protocol.

Question 5

- (a) Good answers were able to provide a wide range of examples of human activities which could impact the tropical rainforests. Weaker answers simply copied the text from the figure with little development.
- (b) Some weaker candidates were unsure about ecotourism and used inappropriate examples such as zoos or wildlife attractions. Advantages and disadvantages were listed and lacked developed examples which limited the level achieved. Stronger responses covered a range of examples and some candidates referred to the benefits afforded to local human populations.

ENVIRONMENTAL MANAGEMENT

Paper 8291/22
Paper 22

Key messages

- Candidates should be aware of the equal balance between **Section A** and **Section B** of the paper and plan their time and answers accordingly.
- In **Section A**, candidates should note the number of marks available for each part question. This would give them an indication of the amount of content and detail expected.
- Candidates should be clear about the differences in meaning of command words such as state, suggest, explain, describe, outline and assess to ensure that instructions are followed correctly when answering.
- Candidates should avoid repeating the question in their answer to make best use of the time available during the examination.

General comments

There was a reasonably good response to all questions on this paper and performance was relatively even across the two sections of the paper. Topics which were found to be most challenging were the explanation of changes in the hydrological cycle which lead to drought and the effects of changes in a food web. A significant number of candidates had difficulty describing changes to a food web as a result of an invasive species entering.

Many answers showed a good understanding of terms and attention to detail, with effective use of exemplar material. The more successful responses included effective use of appropriate examples to illustrate key points along with supporting details using appropriate terminology.

Comments on specific questions

Section A

Question 1

- (a) (i) This was well answered by candidates.
- (ii) Good use was made of the diagram to describe two changes in the movement of water after urban development.
- (iii) Most candidates were able to describe the effects of urban development on flooding. Weaker answers referred to building and deforestation rather than the increased volume or rate of water entering the rivers. Some candidates referred to pollution and trash entering the water which do not contribute to flooding.
- (b) (i) This was well answered with candidates often providing more creditworthy responses than required to gain full credit. Answers demonstrated good use of compass points.
- (ii) This proved very difficult. More successful candidates understood the relationship between hot temperatures, increased evaporation from the ground and the lack of precipitation. Weaker answers referred to the ground drying out but to none of the causes. Many answers referred to deforestation and urban development but these were not related to changes in the hydrological cycle.

- (iii) This was generally well answered. The more successful answers covered the range of domestic, industrial and agricultural methods and supported these with valid examples. Weaker responses did not respond to the amount of credit available and were short with few examples. When asked to describe, as in this question, candidates should avoid providing lists.

Question 2

- (a) (i) In general, candidates answered this well. The main error was to believe that the absence of coral in the north in 2017 was simply an absence of bleaching.
- (ii) This was well answered with a wide range of direct human activities. Some weaker responses did not refer to direct effects and gave more indirect activities.
- (b) (i) Candidates correctly selected the increase in sea surface temperature and stronger answers included the El Niño effect (rather than referring to the absence being a cause).
- (ii) Candidates responded well, providing a range of valid methods of monitoring. Some gained no further credit for repeating the same method described differently.
- (c) (i) This was generally well answered, although some candidates misunderstood the meaning of the arrows in the food web and referred to jellyfish eating sharks and sea turtles.
- (ii) This proved difficult for candidates with many answers limited to a decrease in coral and decrease in other species. However, stronger answers referred to increased competition for food and a few described the reduction in habitat.
- (iii) Successful answers were able to suggest a range of strategies or provide developed explanations of the strategies. Weaker answers invented strategies which were often quite impractical and unlikely to be effective. Most popular were removal through encouraging fishing/hunting and the introduction of a predator.

Section B

Question 3

- (a) **Question 3** was the least popular of the three choices. Rewilding projects were well understood by candidates who chose this option and a range of advantages and disadvantages were provided. Weaker answers tended to repeat the examples from the text and added little additional material.
- (b) Candidates demonstrated a good understanding of a range of methods to protect areas and their ecosystems. Candidates were able to provide named examples from different countries and to describe their effectiveness. Weaker responses referred to national parks and conservation areas without using named examples or developing the details of the method.

Question 4

- (a) Descriptions of the changes in Lake Chad shown in the diagram were thoroughly described. Less detailed were the effects of these changes on the human population, often being a short list. The most successful answers were more detailed and thorough with this part of the response and referred to drought, loss of agriculture, fishing and possible migration away.
- (b) The factors causing loss of water supplies and strategies to manage the conservation of these supplies were generally well understood. Weaker responses tended to be limited to Lake Chad and did not expand into other situations such as reservoirs, aquifers and other methods which were the indicators of a successful answer.

Question 5

- (a) Candidates generally provided good descriptions of the advantages and disadvantages of using a hydroelectric dam to generate power.
- (b) Candidates referred to MEDC and LEDC countries without using specific examples, leading to answers of a generalised form. Similarly, responses often referred to resources and wealth of MEDC nations without selecting and developing specific examples to illustrate the use of hydroelectric power generation. Few candidates referred to differences in topography as a potential issue between countries.



ENVIRONMENTAL MANAGEMENT

Paper 8291/23
Paper 23

Key messages

Candidates should be aware of the equal balance between **Section A** and **Section B** of the paper and plan their time and answers accordingly.

In **Section A**, candidates should note the number of marks available for each part question. This would give them an indication of the amount of content and detail expected.

Candidates should be clear about the differences in meaning of command words such as state, suggest, explain, describe, outline and assess to ensure that instructions are followed correctly when answering.

Candidates should avoid repeating the question in their answer to make best use of the time available during the examination.

General comments

There was a reasonably good response to all questions on this paper and performance was relatively even across the two sections of the paper. Topics which were found to be most challenging were the explanation of changes in the hydrological cycle which lead to drought and the effects of changes in a food web. A significant number of candidates had difficulty describing changes to a food web as a result of an invasive species entering.

Many answers showed a good understanding of terms and attention to detail, with effective use of exemplar material. The more successful responses included effective use of appropriate examples to illustrate key points along with supporting details using appropriate terminology.

Comments on specific questions

Section A

Question 1

- (a) (i) This was well answered by candidates.
- (ii) Good use was made of the diagram to describe two changes in the movement of water after urban development.
- (iii) Most candidates were able to describe the effects of urban development on flooding. Weaker answers referred to building and deforestation rather than the increased volume or rate of water entering the rivers. Some candidates referred to pollution and trash entering the water which do not contribute to flooding.
- (b) (i) This was well answered with candidates often providing more creditworthy responses than required to gain full credit. Answers demonstrated good use of compass points.
- (ii) This proved very difficult. More successful candidates understood the relationship between hot temperatures, increased evaporation from the ground and the lack of precipitation. Weaker answers referred to the ground drying out but to none of the causes. Many answers referred to deforestation and urban development but these were not related to changes in the hydrological cycle.

- (iii) This was generally well answered. The more successful answers covered the range of domestic, industrial and agricultural methods and supported these with valid examples. Weaker responses did not respond to the amount of credit available and were short with few examples. When asked to describe, as in this question, candidates should avoid providing lists.

Question 2

- (a) (i) In general, candidates answered this well. The main error was to believe that the absence of coral in the north in 2017 was simply an absence of bleaching.
- (ii) This was well answered with a wide range of direct human activities. Some weaker responses did not refer to direct effects and gave more indirect activities.
- (b) (i) Candidates correctly selected the increase in sea surface temperature and stronger answers included the El Niño effect (rather than referring to the absence being a cause).
- (ii) Candidates responded well, providing a range of valid methods of monitoring. Some gained no further credit for repeating the same method described differently.
- (c) (i) This was generally well answered, although some candidates misunderstood the meaning of the arrows in the food web and referred to jellyfish eating sharks and sea turtles.
- (ii) This proved difficult for candidates with many answers limited to a decrease in coral and decrease in other species. However, stronger answers referred to increased competition for food and a few described the reduction in habitat.
- (iii) Successful answers were able to suggest a range of strategies or provide developed explanations of the strategies. Weaker answers invented strategies which were often quite impractical and unlikely to be effective. Most popular were removal through encouraging fishing/hunting and the introduction of a predator.

Section B

Question 3

- (a) **Question 3** was the least popular of the three choices. Rewilding projects were well understood by candidates who chose this option and a range of advantages and disadvantages were provided. Weaker answers tended to repeat the examples from the text and added little additional material.
- (b) Candidates demonstrated a good understanding of a range of methods to protect areas and their ecosystems. Candidates were able to provide named examples from different countries and to describe their effectiveness. Weaker responses referred to national parks and conservation areas without using named examples or developing the details of the method.

Question 4

- (a) Descriptions of the changes in Lake Chad shown in the diagram were thoroughly described. Less detailed were the effects of these changes on the human population, often being a short list. The most successful answers were more detailed and thorough with this part of the response and referred to drought, loss of agriculture, fishing and possible migration away.
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Question 5

- (a) Candidates generally provided good descriptions of the advantages and disadvantages of using a hydroelectric dam to generate power.
- (b) Candidates referred to MEDC and LEDC countries without using specific examples, leading to answers of a generalised form. Similarly, responses often referred to resources and wealth of

MEDC nations without selecting and developing specific examples to illustrate the use of hydroelectric power generation. Few candidates referred to differences in topography as a potential issue between countries.

ENVIRONMENTAL MANAGEMENT

Paper 8291/03
School Based Assessment

This year's report falls into two sections:

- General comments and candidate performance report.
- Three appendices covering Cambridge Assessment administrative procedures.

General comments

The level of credit achieved varied across almost the full range available; most scripts were in the upper part of the range.

A very wide range of topics were investigated, covering an extensive variety of current environmental management issues and showing a high degree of ingenuity on the part of candidates. Many candidates cited an impressive range of published sources and had obviously invested a lot of time gathering background data.

Overall, there were fewer essay style responses and the majority of candidates had made a good attempt to carry out some form of investigation. A greater number of project proposal forms were submitted prior to the June series, which suggests the reasons for the more structured environmental projects evidenced. There were fewer projects where candidates had chosen hypotheses far too broad in scope for them to test effectively, suggesting that candidates had acted upon advice in the initial stages of planning their project.

Where candidates selected the same or a similar topic, there appeared no issue of plagiarism derived from candidates, indicating that candidates had acted upon good guidance given in this area.

The very strongest candidate reports were well structured, provided evidence of collected and collated primary data and often combined this with secondary data sources. In general, improvements that could result in full credit for such candidates would be through evidencing use of a suitable data analysis statistical tool, criterion C2(e), or providing a clear and reflective evaluation of the investigation, i.e. strengths or weaknesses of the study in terms of their methodology, criterion C3(c).

Other issues are as follows:

It is important that centres dispatch the candidate reports on time.

It is important that a representative sample of the coursework completed at each centre, achieving credit across the full range for that centre, is provided in order to ensure candidates are rewarded appropriately.

There was some leniency evidenced, particularly with regard to assessment criteria: C1(b), C2(a) and (e), C3(a) and (b); additional credit was awarded where the work did not show the required level of skill. Candidates must make sure that in order to achieve C3(a), they not only include data in their conclusion, but that the data aligns to their hypothesis or the research question they are testing.

Credit was sometimes awarded for criteria not actually demonstrated in project reports e.g. no credit can be given for use of a statistical tool when one has not been used, or when there is no depth of evaluation of the arithmetical mean. However, some candidates did use a standard deviation in their analysis and discussion of data.

There were many project reports that evidenced an excellent approach towards organisation and structuring of their coursework in a logical order: introduction, methods (justified), results and analysis, conclusion and evaluation, with many using these stages as section or chapter headings. Candidates must continue to recognise the difference between a research report and an extended essay, given the range of assessment criteria, and specifically criterion C2(c) in relation to this.

Candidates should carefully consider each of the following:

- Will my hypothesis or question actually yield viable results?
- Are my methods realistic, practical and relevant; do they include data recording, collation and presentational techniques?
- Are the results and analyses fully representative of the methods referred to in the previous section?
- Does my conclusion sum up and relate my results to the original hypothesis or question?
- Have I evaluated my work in terms of both its successful features and its limitations; what can be done to improve my work?

For administration purposes, it is important that the correct mark from the Coursework Assessment Summary Form has been entered correctly on the MS1 form for each candidate; this should be a mark out of 40. There were occasional transcription errors evidenced with regard to the centre's internal moderation processes. Whilst the mark of the first reviewer can be different to the second reviewer, thus demonstrating rigour and careful consideration to the assessment/moderation process, it is imperative that the internally verified and agreed marks for the whole cohort are clear and correctly transferred to the MS1.

Comments on assessment criteria

Skill C1

Most candidates performed well in this skill area, and there was often an excellent level of detail demonstrated surrounding the background knowledge in relation to the hypothesis or research question.

Either as the project title or as part of an introduction, hypotheses or questions were stated by most candidates, frequently being clearly written and not implicit to the introduction. This is important as a significant number of candidates concluded that their hypothesis was correct, yet there was no evidence anywhere in the script of a research question or hypothesis. Candidates achieving high levels of credit often included the location of the hypothesis within a contents page.

Stating and justifying a methodology was in the main adequate. Good quality research requires the formulation of a plan, detailing research sites, equipment, expected data and how it will be collated and presented. Candidates need to recognise that a detailed methodology is crucial when testing their hypothesis or answering their research question; without this element, there is the risk that the report will become an extended essay, thereby interfering with the achievement of both criteria C1 and C2.

It should also be noted that where reports evidence a limited methodology, such as a brief list without any explanation or justification, it can be difficult to judge whether or not their methodology would be effective in testing their hypothesis or answering their question for criterion C1(d).

Skill C2

In achieving full credit for C2(a), candidates need to make sure all graphs and tables are clearly presented, this includes labelling all axes as well as providing a title. Graphs were sometimes inappropriate for the type of data to be represented; line graphs are suited to continuous data and bar graphs for discrete data. Graphs should have axes containing labelled units and both lines and bars should be easily interpreted.

There were a limited number of candidate reports that are better described as extended essays and contain very little data presented in the form of graphs and/or tables. As a result, it was difficult for these candidates to achieve credit in any criteria that required reference to data; this also negated use of a statistical tool. Often these reports were heavily reliant upon photographic evidence with a limited amount of quantitative data, if any, evidenced. This factor reduces the credit available for the associated criteria. It is better that photographic evidence supplements other forms of information.

The use of a statistical tool was a weakness for many. There is a difference between statistical methods that are used to describe data and statistical tools that are used to analyse data. Candidates need to consider the nature of the data and select an appropriate statistical test. A simple mean is unlikely to yield appropriate analysis unless it is backed up with graphical representation and/or further processing. Credit cannot be awarded where there is no evidence of the use of a statistical tool.

The majority of candidates deserved full credit for the general organisation of their work and the quality of written communication.

Skill C3

Generally, Skill C3 formed the weakest part of a candidate's work. The main weakness in C3(a), the conclusion, was a lack of reference to the data presented in the report. C3(b) was also often very limited, as only a small number of candidates referred to related environmental management principles, without which full credit cannot be awarded. This element also needs reference to the actual data within the report.

Candidates should be aware that the evaluation needs to be a brief summary of those things that went well and not so well i.e. success and limitations. There was confusion between an evaluation and a conclusion. Some candidates evaluated their secondary data, instead of appraising their methodology (success and limitations of the methodology). A relatively small number did not include an evaluation for criterion C3(c).

Concluding comments

The evidence with regard to candidate report submissions, demonstrated a clear and enthusiastic engagement with this element of the Environmental Management syllabus, in which candidates are given the opportunity to research a topic of their choice. The selection of topics was excellent and continued to focus on some very key and current environmental issues at a local level, such as the issue of plastic waste, or issues of water pollution in relation to excessive fertiliser application, to name a few.

The project title must be chosen very carefully, as a significant number tried to review global data, which is extremely challenging given the assessment criteria and word count. The title may be too broad in scope, thereby limiting the testing of the hypothesis effectively. Occasionally, more than one hypothesis was evidenced, and candidates need to be aware that this may have an impact in respect of their methodology being able to securely test all hypotheses.

In addition to the topic chosen, there is the opportunity to learn some research techniques and put them into practice during completion of the assessment. The stronger topics and final reports were often derived from locally based research and the utilisation of primary data.

Appendix 1 is concerned with how centres select their sample for external moderation. Most important it is not necessary for centres with over ten candidates to send all candidates; although extra can be requested by the external Moderator.

Option	Details
<p>Option A: The centre selected sample.</p> <p>It is essential that the marks of candidates from different teaching groups within each centre are moderated internally and the moderated mark out of 40 is entered onto the MS1, Candidate Record Card and Coursework Assessment Summary Form.</p>	<p>You select the sample, according to the criteria below:</p> <ul style="list-style-type: none">1–10 entries: all candidates11–50 entries: 10 candidates51–100 entries: 15 candidates101–200 entries: 20 candidatesOver 200 entries: 10% of candidates <p>The sample should include a candidate with the highest mark and a candidate with the lowest mark in the cohort, with the remaining candidates spread evenly across the mark range. All work which contributed to the candidates' final mark must be included.</p> <p>If more than one teacher has assessed the work, the sample should include an even number of examples of the marking of each teacher.</p> <p>The sample must be sent using a method that provides a tracking facility (i.e. a reputable courier), to arrive by the deadline specified on the previous page. We reserve the right to request additional samples.</p>

Appendix 2

All centres must submit the following completed forms with their sample:

An Individual Candidate Record Card for each candidate with a mark out of 20 doubled to out of 40. Comments should be made so that the external Moderator can clearly determine where and why credit has been given.

A Coursework Assessment Summary Form with candidates inserted in candidate number order as in the MS1.

A MS1 form covering all candidates entered for the examination. Marks out of 40 should be clearly entered and absent candidates given abs or A.

The syllabus contains a detailed amplification of these points.

Appendix 3

For the May/June session centre marks should be submitted by 30th April and the sample should be dispatched at the same time. Therefore, all sample reports should be with Cambridge Assessment no later than 14th May.

For the November session all marks should be submitted by 31st October and the report at the same time so that they are with Cambridge Assessment no later than 14th November.